# The Influence of Principal Situational Leadership and Teacher Independent Training on the Pedagogical Competence of Mathematics and Natural Sciences Teachers at State Senior High Schools in Pasaman Regency

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**Abstract**

Teachers' pedagogical competence is an essential factor in addressing the challenges of 21st-century education, particularly in the era of the Merdeka Curriculum, which requires teachers to assume adaptive and professional roles. This study aims to examine: (1) the Influence of principals' situational leadership on the pedagogical competence of science teachers at public senior high schools in Pasaman Regency; (2) the effect of teacher independent training on the pedagogical competence of science teachers; and (3) the simultaneous effect of principals' situational leadership and Teacher Independent Training on the pedagogical competence of science teachers at public senior high schools in Pasaman Regency. This study employs a quantitative ex post facto design, using questionnaires on principals' situational leadership, Teacher Independent Training, and pedagogical competence for data collection. These questionnaires were completed by 89 respondents, who served as the sample for this study. The population consisted of 115 science teachers at public senior high schools in Pasaman Regency. The results indicate a significant effect of principals' situational leadership on teachers' pedagogical competence, with a p-value of less than 0.05 in the partial t-test. The second finding confirms the effect of Teacher Independent Training on pedagogical competence, also with a significance value less than 0.05 in the partial t-test. The final finding shows a significant simultaneous effect of principals' situational leadership and Teacher Independent Training on the pedagogical competence of science teachers at public senior high schools in Pasaman Regency, based on the F-test with a p-value of less than 0.05. These findings highlight the principal's role in applying adaptive leadership styles and emphasize the significance of self-directed training for teachers' professional development. This research advocates for optimizing self-directed training and implementing responsive leadership to sustainably enhance teachers' pedagogical competence.

**Keywords: Situational Leadership, Teacher Independent Training, Pedagogical Competence, Science Teachers At Public Senior High Schools**.

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## Introduction

Teacher pedagogical competence has emerged as a critical factor in addressing the complex challenges facing Indonesia's education system, particularly in enhancing the quality of learning processes and student outcomes. This competence encompasses educators' abilities to systematically design, implement, and assess learning activities while maintaining a deep understanding of student characteristics. Teachers who possess strong pedagogical competence are capable of creating positive and enjoyable learning environments that align with students' developmental needs and individual differences. The multifaceted nature of pedagogical competence includes understanding educational foundations, developing relevant curricula, planning structured lessons, implementing educative learning processes, utilizing technology appropriately, and conducting comprehensive evaluations of learning outcomes, as highlighted by Rakha Aditya Putra et al. (2024).

Beyond technical mastery, pedagogical competence requires teachers to establish effective and empathetic communication with students, functioning not merely as information transmitters but as facilitators, supporters, and guides who help students recognize their potential and prepare them to contribute positively to society, according to Ramadhan (2024). The ability to assess and provide constructive feedback is integral to this competence, enabling students to identify areas for improvement and continuously enhance their academic achievement, as noted by Marliana et al. (2024). Indonesian educational policy underscores this importance through Law No. 14 of 2005, which identifies pedagogical skills as one of four essential competencies required for teachers, alongside professional, social, and personality competencies. However, despite this regulatory emphasis, many teachers face obstacles in maximizing their pedagogical competence due to limited planning time, heavy administrative burdens, restricted access to quality training programs, and insufficient institutional support from schools, as documented by Sele & Sila (2022).

Principal leadership plays a strategic role in developing teachers' pedagogical competence by building internal motivation that drives optimal competency development, as Putri Fadillah Wirjaza (2022) suggests. Teaching demands dedication, energy, and high levels of commitment to create meaningful and transformative learning experiences, making inspirational and responsive leadership essential for strengthening teachers' professional spirit and self-confidence. Situational leadership provides principals with the flexibility to develop teachers' adaptability and professional resilience through responsive support tailored to specific needs, as Munahar (2019) explains. Given that each teacher operates at different maturity levels influenced by age, educational background, work experience, and personal characteristics, principals must implement flexible leadership styles that adapt to each teacher's readiness level.

According to Dewi (2022), situational leadership is highly relevant in school human resource management, as it enables principals to adapt their leadership style to individual teacher needs and circumstances, creating harmonious working conditions and supporting effective learning implementation. This approach aligns with Islamic educational leadership principles articulated in Surah An-Nisa' verse 58, which emphasizes fulfilling trusts and judging with justice. Educational leaders must possess the ability to understand situations and act fairly toward their subordinates, principles that resonate with

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situational leadership theory's emphasis on adapting leadership styles to conditions and needs, as Ayu Ikasari & Parida (2022) observe. Principals who effectively implement situational leadership contribute significantly to improving teachers' pedagogical competence by facilitating training and providing access to digital learning resources, which are crucial incentives in an era of rapidly developing information and technology, according to Rismayanti & Wahira (2023).

A crucial element of situational leadership involves recognizing each teacher's stage of competency development and providing appropriate support accordingly. Beginning teachers require more structured guidance focused on pedagogical basics, classroom management, and technology use, while experienced teachers benefit from collaborative approaches that encourage sharing effective practices and engaging in constructive discussions about learning innovation. Situational leadership enables principals to conduct monitoring and evaluation tailored to teacher competency development needs through feedback-based evaluations that provide specific development recommendations rather than merely assessing performance, as Rafiq Wildan & Hartati (2022) suggest. Research by Dwiyani & Sarino (2018) confirms that situational leadership styles significantly impact teacher motivation and performance, with teachers receiving support from flexible and adaptive principals showing greater motivation to improve their pedagogical competence.

Teacher independen training represents another key element in developing sustainable pedagogical competency, particularly given the demands of twenty-first-century education that require teachers to continually update their knowledge and skills. Independen training offers flexibility that allows teachers to choose convenient times and places for learning according to their schedules and commitments, with access to online platforms, courses, webinars, and discussion forums enabling easy access to relevant training materials, as Utomo & Kusumawati (2024) note. This approach encourages teachers to become lifelong learners who regularly update their knowledge and develop new skills implementable in classrooms, according to Bukaryo (2023). Independen training contributes to improved student learning outcomes as teachers who continuously optimize their pedagogical competence become better equipped to design engaging and effective lessons using diverse teaching methods adapted to student needs. Additionally, independen training provides opportunities for teachers to share experiences and best practices with colleagues through professional communities on online platforms, creating support networks that assist in addressing field challenges, as Siregar et al. (2023) emphasize.

The government has established Independent Training (PMM) through the Merdeka Mengajar Platform to support the implementation of the independent curriculum, providing teachers with opportunities to learn independently according to their needs and schedules, as Sri Lena et al. (2023) and Aulia et al. (2023) describe. Regulation of the Director General of Teachers and Education Personnel No. 7606/B.B1/HK.03/2023 mandates that teachers participate in independent training asynchronously to develop competencies, with Utiarahman (2019) suggesting that such training effectively improves pedagogical competence. Previous research supports the effectiveness of both leadership and training interventions, with Dwiyani & Sarino (2018) finding that principals who adapt leadership styles to teachers' abilities and needs improve teaching skills and motivate professional

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development, while R. Y. Anggraini & Uyun (2023) demonstrated that teachers participating in independent training show significant improvements in applying new skills, becoming more confident in designing contemporary and flexible learning strategies that optimize student participation and outcomes.

Regarding interviews with several curriculum representatives regarding the problems encountered related to the pedagogical competency of high school mathematics (MIPA) teachers in Pasaman Regency, Table 1.1 is presented below:

Table 1.1 Problems with Pedagogical Competence of Mathematics and Natural Sciences Teachers in Pasaman Regency

| Indicators | Field Problems |
|---|---|
| Curriculum Understanding | Some science teachers have not fully understood the content and implementation of the current curriculum, including the Independent Curriculum. This affects the optimal implementation of learning according to the expected curriculum standards. |
| Conventional Learning | A small number of teachers still rely on lecture methods that tend to be less interactive. This makes the learning process focus more on teacher instruction rather than on developing students' abilities. |
| Use of Technology | Some teachers are still less able or reluctant to integrate technology into the learning process. This hinders the variety of teaching methods that should support more effective and engaging learning. |
| Learning Preparation | Some teachers do not prepare learning tools optimally. This lack of preparation results in less orderly learning processes that should be more structured and efficient. |
| Classroom Management | Many teachers face challenges in classroom management, especially in maintaining student order and discipline during the learning process. This affects the effectiveness of interaction and students' mastery of the material. |
| Teaching Innovation | Many teachers have not been innovative enough in developing learning techniques that match the diverse characteristics and needs of students. Monotonous approaches make learning feel less relevant for students. |
| Principal Support | Not all principals provide sufficient support in terms of direction and efforts to improve teachers' pedagogical competence. This causes disparities in the development of teacher professionalism across schools. |
| Access to Training | There are obstacles in both access and motivation to participate in relevant and continuous training. This hinders the development of teachers' pedagogical competence, which should be carried out regularly and comprehensively. |
| Situational Leadership of the Principal | Some principals tend to have uniform leadership approaches and are less flexible in responding to teachers' individual needs, affecting their motivation and success in improving competence. |
| Independent Training | Some teachers tend to rely on training organized by schools or education departments without sufficient effort to pursue professional development independently. |

The problems seen in Table 1.1 align with findings by Hoesny et al. (2021), who stated that most educators are inadequately prepared for student success in the classroom. Similarly, Sele & Sila (2022) explain that ineffective classroom management and a lack of mastery of learning components are examples of pedagogical competence issues. It turns out that many teachers in the field still lack a thorough understanding of the implementation of the Independent Curriculum. Teachers do not always have the knowledge or skills to use technology effectively in the classroom, and it can be difficult to identify student-friendly learning strategies, both for independent learning as teachers and for implementing

interactive learning in the classroom. Sa'diah Nisyatun Zyuro (2020) also noted that certified teachers experience challenges in creating learning tools and utilizing technology, necessitating the need for training from the district education office.

The principal's situational leadership and teacher independen training are two interacting and complementary factors in efforts to improve teacher pedagogical competence. Kosmalinda et al. (2023) explain that the principal's situational leadership functions as a motivational and contextual factor. Principals who are able to adapt their leadership style to teachers' needs and characteristics can create a supportive and collaborative work environment. This has proven effective in encouraging teachers' enthusiasm for continuous learning, improving professionalism, and adapting to educational changes in the digital age.

(Zanuba Qathrunnida et al., 2024) further emphasize that teacher independen training plays a crucial role as a pathway to actualizing the motivation derived from the principal's leadership. When the principal provides support in the form of facilitating access to training, providing flexible time, and recognizing the results of self-development, teachers are actively encouraged to participate in various independen training programs that support pedagogical skill updates, technology utilization, and mastery of the latest teaching materials. Access to digital training platforms and self-learning communities allows teachers to tailor training materials to their professional development needs.

Thus, the integration of the principal's situational leadership as a trigger and facilitator with teacher independen training as a medium for actualizing self-development is key to achieving superior, innovative, and responsive pedagogical competencies to the dynamics of the modern education era. In order to avoid a gap between theory and facts in the field, the researcher feels the need to conduct research entitled "The influence of the principal's situational leadership and independent teacher training on the pedagogical competence of MIPA teachers at State Senior High Schools in Pasaman Regency".

**Method**
This study employs a quantitative approach using ex post facto methodology, meaning the researcher does not intervene or control the variables being studied as events occur naturally. The research aims to examine the influence of principals' situational leadership and teachers' independen training on the pedagogical competence of teachers at public high schools in Pasaman Regency (Ibrahim Andi et al., 2018). Statistical calculations will be performed using SPSS Version 29 Regression Analysis to observe interactions between independent and dependent variables based on data collected from field samples. The research will be conducted during the 2024/2025 academic year, from December 2024 to January 2025, across 12 public high schools in Pasaman Regency.

The research population consists of all teachers from public high schools in Pasaman Regency, totaling 115 individuals. The sample is selected using probability sampling with cluster sampling technique, where the population is divided into groups or clusters, and several clusters are randomly selected. Using the Slovin formula with a 5% margin of error, the sample size is calculated as 89 teachers distributed across the 12 schools (Rizkia Namda dwi et al., 2022). This sampling technique ensures that every element within the selected clusters has an equal opportunity to be included in the sample.

Data collection is conducted through questionnaires distributed online via Google Forms, with links shared through WhatsApp. The questionnaire is based on theoretical factors being studied, including Situational Leadership, Independen training, and pedagogical competence,

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using a five-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1). The instrument consists of 15 valid items for situational leadership (Nabilah Maulidah Az-Zahroh et al., 2023), 16 items for independen training (Wahyuningsih, 2019), and 22 items for pedagogical competence (Marwa, 2022). Validity testing is conducted using SPSS Version 29, where items are considered valid if r-calculated > r-table (0.3081 for n=41 respondents), and reliability is confirmed with Cronbach's Alpha values exceeding 0.70 (Budiastuti & Bandur, 2018).

Data analysis includes descriptive statistical tests and classical assumption tests (normality, linearity, multicollinearity, and heteroscedasticity) to ensure the regression model's validity. Simple linear regression (Y' = a + bx) is used to analyze the relationship between each independent variable and the dependent variable, while multiple linear regression (Y' = α + b1X1 + b2X2) examines the simultaneous effect of both independent variables on pedagogical competence. The coefficient of determination ($R^2$) is calculated to determine how much variation in the dependent variable can be explained by the independent variables, with values closer to 1 indicating better model fit.

Hypothesis testing is conducted using partial testing (t-test) for individual variable effects and simultaneous testing (F-test) for combined effects, with a significance level of 0.05 (α = 0.05) (Nasution Leni Masnidar, 2017). For the t-test, if the calculated t-value exceeds the table t-value or if the p-value is less than 0.05, the null hypothesis is rejected, indicating a significant influence. Similarly, for the F-test, a p-value less than 0.05 indicates a significant simultaneous effect of both independent variables on teachers' pedagogical competence. All statistical analyses are performed using SPSS Version 29 to ensure accuracy and efficiency in data processing.

## Result and Discussion

### A. Result

This study, which examined the influence of principal situational leadership and teacher independen training on the pedagogical competence of high school mathematics and natural science teachers in Pasaman Regency, involved a population of 115 and a sample of 89 teachers. The sampling technique used simple random sampling. The study had three variables: two independent variables and one dependent variable. The principal's situational leadership served as the first independent variable (X1), teacher independen training served as the second independent variable (X2), and the teacher's pedagogical competence served as the dependent variable (Y).

1. Data Description

Respondents' responses to each question had five answer choices for each variable. Each answer had a score range of 1 to 5, with the highest score being 5 and the lowest being 1. The descriptive statistics were analyzed using SPSS version 29 as follows:

a. Principal Situational Leadership

The descriptive statistics for the principal's situational leadership variable using SPSS 29 are shown in Table 4.1.

Table 4.1. Descriptive Statistics of Principals' Situational Leadership Variables

| | N | Range | Minimum | Maximum | Mean | Std. Deviation | Variance |
|---|---|---|---|---|---|---|---|
| Kepemimpinan Situasional Kepala Sekolah | 89 | 15 | 60 | 75 | 69.09 | 5.638 | 31.787 |
| Valid N (listwise) | 89 | | | | | | |

Based on the data on the Principal's Situational Leadership variable above, the total number of respondents was 89. The maximum score was 75, while the minimum score was 60. The range of 15 was obtained by subtracting the maximum score from the minimum score. The average score of 69.09 was rounded to 69. The number of classes and class intervals can be seen from the following formula:

Number of Classes

K = 1 + (3.3 x log n)

= 1 + (3.3 x log 89)

= 1 + (3.3 x 1.95)

= 1 + 6.43

= 7.43 (rounded to 7)

Class Interval

P = R/K

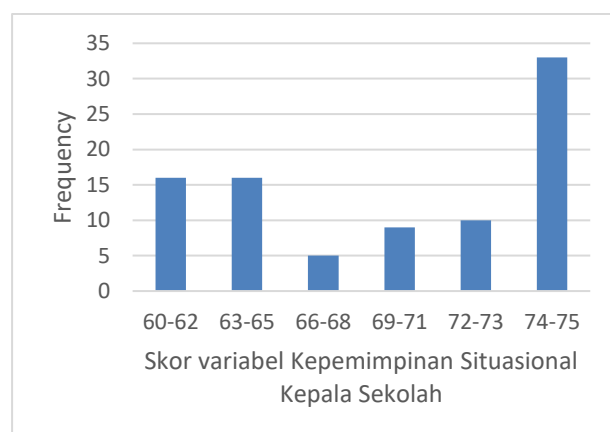P = 15/7

P = 2.2 (rounded to 2)

The frequency distribution of the principal's situational leadership variable can be seen in Table 4.2.

Table 4.2. Frequency distribution of Principals' Situational Leadership

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 60-62 | 16 | 18.0 | 18.0 | 18.0 |
| | 63-65 | 16 | 18.0 | 18.0 | 36.0 |
| | 66-68 | 5 | 5.6 | 5.6 | 41.6 |
| | 69-71 | 9 | 10.1 | 10.1 | 51.7 |
| | 72-73 | 10 | 11.2 | 11.2 | 62.9 |
| | 74-75 | 33 | 37.1 | 37.1 | 100.0 |
| | Total | 89 | 100.0 | 100.0 | |

Then the graph of the frequency distribution above can be seen in Figure 4.1.

Figure 4.1 Frequency distribution graph of the Principal's Situational Leadership variable



From the descriptive analysis of quantitative data, as well as the frequency distribution image above, it can be concluded that the principal's situational leadership competency has been classified as high, as evidenced by 33 respondents (37.1%) having a high score.

b. Teacher Independen training

Data from respondents' responses to the teacher independen training variable on the research instrument. The questionnaire items had five answer choices with a score range of 1-5. The lowest score was 1 and the highest score was 5. The descriptive statistics for the teacher independen training variable can be seen in Table 4.3.

Table 4.3 Descriptive Statistics for the Teacher Independen training Variable

| Descriptive Statistics | | | | | | | |
|---|---|---|---|---|---|---|---|
| | N | Range | Minimum | Maximum | Mean | Std. Deviation | Variance |
| Pelatihan Mandiri Guru | 89 | 24 | 56 | 80 | 71.16 | 6.738 | 45.407 |
| Valid N (listwise) | 89 | | | | | | |

Number of Classes

K = 1 + (3.3 x log n)

= 1 + (3.3 x log 89)

= 1 + (3.3 x 1.95)

= 1 + 6.43

= 7.43 (rounded to 7)

Class Interval

P = R/K

P = 24/7

P = 3.42 (rounded to 3)

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From the teacher independen training variable data, the total number of respondents was 89, with a maximum score of 80 and a minimum score of 56. The range of 24 is obtained by subtracting the maximum score (80) from the minimum score (56). The average teacher independen training score is 71.16, rounded to 71. Furthermore, the number of classes is 7 and the class width is 3. The frequency distribution of the teacher independen training variable can be seen in Table 4.4.

Table 4.4 Frequency Distribution of Teacher Independen training

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 56-59 | 4 | 4.5 | 4.5 | 4.5 |
| | 60-62 | 1 | 1.1 | 1.1 | 5.6 |
| | 63-66 | 22 | 24.7 | 24.7 | 30.3 |
| | 67-70 | 20 | 22.5 | 22.5 | 52.8 |
| | 71-73 | 5 | 5.6 | 5.6 | 58.4 |
| | 74-77 | 14 | 15.7 | 15.7 | 74.2 |
| | 78-80 | 23 | 25.8 | 25.8 | 100.0 |
| | Total | 89 | 100.0 | 100.0 | |

Next, the frequency distribution graph above can be reviewed in Figure 4.2.

Figure 4.2 Frequency distribution of Independent Training Variables
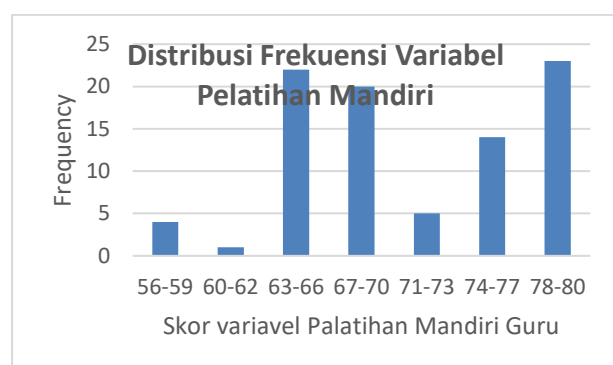


From the descriptive analysis of quantitative data and the frequency distribution diagram above, it can be concluded that 23 respondents (25.8%) have a high independent training score.

c. Teacher Pedagogical Competence

Data on the teacher pedagogical competence variable were taken from respondents' answers to the research instrument. The questionnaire items ranged from 1 to 5. The lowest score among the answer choices was 1 and the highest score was 5. The descriptive statistics for the teacher pedagogical competence variable can be seen in Table 4.5.

Table 4.5. Descriptive Statistics for the Teacher Pedagogical Competence Variable

| Descriptive Statistics | | | | | | | |
|---|---|---|---|---|---|---|---|
| | N | Range | Minimum | Maximum | Mean | Std. Deviation | Variance |
| Kompetensi Pedagogik Guru | 89 | 28 | 82 | 110 | 98.98 | 8.360 | 69.886 |
| Valid N (listwise) | 89 | | | | | | |

Number of Classes

$K = 1 + (3.3 \times \log n)$

$= 1 + (3.3 \times \log 89)$

$= 1 + (3.3 \times 1.95)$

$= 1 + 6.43$

$= 7.43$ (rounded to 7)

Class Interval

$P = R/K$

$P = 28/7$

$P = 4$ (rounded to 3)

From the data on the teacher pedagogical competency variable, the total number of respondents was 89. The maximum score obtained from the data was 110 and the minimum score was 82. The range obtained from the difference between the maximum and minimum scores was 110 – 82 = 28. The average teacher pedagogical competency score was 98.98 (rounded to 99). Furthermore, the

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number of classes was 7 and the class interval was 4. The frequency distribution of the teacher pedagogical competency variable can be reviewed in Table 4.6.

Table 4.6 Frequency Distribution of Teachers' Pedagogical Competencies

|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 82-85 | 3 | 3.4 | 3.4 | 3.4 |
|  | 86-89 | 12 | 13.5 | 13.5 | 16.9 |
|  | 90-94 | 18 | 20.2 | 20.2 | 37.1 |
|  | 97-98 | 8 | 9.0 | 9.0 | 46.1 |
|  | 99-102 | 14 | 15.7 | 15.7 | 61.8 |
|  | 103-106 | 8 | 9.0 | 9.0 | 70.8 |
|  | 107-110 | 26 | 29.2 | 29.2 | 100.0 |
|  | Total | 89 | 100.0 | 100.0 |  |

The frequency distribution graph can then be viewed in Figure 4.3.

Figure 4.3 Frequency distribution of the teacher pedagogical competency variable.
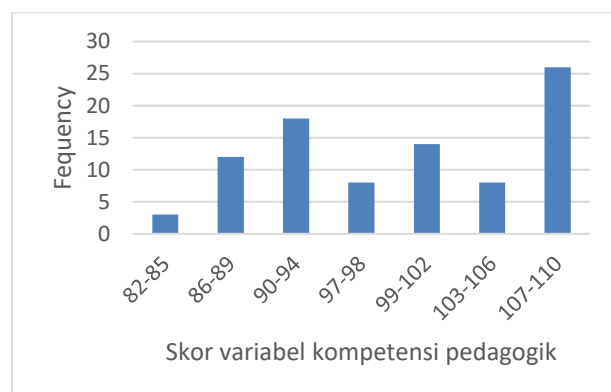


From the descriptive analysis of quantitative data and Figure 4.3 frequency distribution above, information was obtained that the pedagogical competence of 26 respondents (29.2%) of teachers was classified as high.

2. Analysis Prerequisite Tests

a. Classical Assumption Test

The results of the Classical Assumption Test are a summary or output of a series of statistical tests run to determine whether the data used in the analysis meets certain requirements. This test aims to assess whether the data is suitable for analysis using a specific statistical method, such as linear regression. Some of the assumptions tested include normality, multicollinearity, and heteroscedasticity. If the test results indicate that all assumptions are met, the next statistical analysis can be run with a higher level of confidence.

1) Normality Test

The normality test is a statistical procedure to determine whether the original data from a population is normally distributed. This normality test can be performed in several ways using SPSS version 29. One method is by examining the histogram graph, as shown in Figure 4.4.

Figure 4.4 Histogram Graph of Normality Test
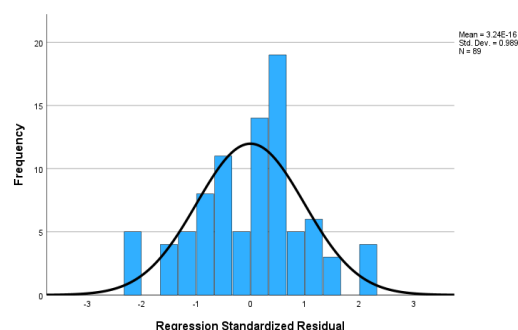


From Figure 4.4, the histogram looks like a bell, so the situational leadership variable, the teacher independen training variable, and the teacher pedagogical competence variable can be said to be normally distributed. In addition, through the P-P plot graph obtained from SPSS version 29, it can be seen in Figure 4.5.

Figure 4.5 P-P Plot Normality Graph

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Kompetensi Pedagogik

|  |  | Unstandardized Residual |
|---|---|---|
| N |  | 89 |
| Normal Parameters[a,b] | Mean | .0000000 |
|  | Std. Deviation | 5.97416701 |
| Most Extreme Differences | Absolute | .081 |
|  | Positive | .055 |
|  | Negative | -.081 |
| Test Statistic |  | .081 |
| Asymp. Sig. (2-tailed)[c] |  | .200[d] |
| Monte Carlo Sig. (2-tailed)[e] | Sig. | .151 |
|  | 99% Confidence Interval   Lower Bound | .142 |
|  | Upper Bound | .160 |

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.
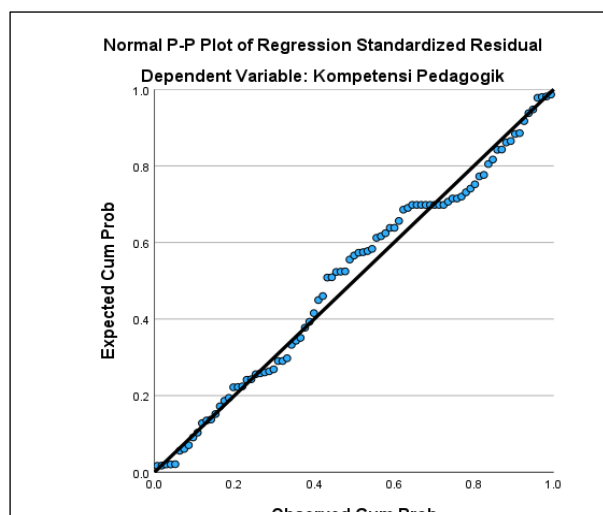e. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.

Figure 4.5 above shows that the points are spread along the diagonal line. Therefore, the residual values for the principal's situational leadership, teacher independen training, and teacher pedagogical competence variables can be stated as normally distributed.

In addition to graphical analysis, statistical analysis can also be conducted using the Kolmogorov-Smirnov (KS) test. A normal distribution is assumed when the Asymp.sig. (2-tailed) value is greater than or equal to an alpha value of 5% (0.05), and an abnormal distribution is assumed when the Asymp.sig. (2-tailed) value is less than or equal to an alpha value of 5% (0.05). The findings of the Kolmogorov-Smirnov (KS) test analysis are shown in Table 4.7.

Table 4.7. Kolmogorov-Smirnov Test Results Table

From the data in Table 4.7, the asymp.sig. (2-tailed) value is 0.200. This result is 0.200 > 0.05 (alpha value), so it can be said that the three variables (2 independent variables and 1 dependent variable) have a normal data distribution. From this conclusion, it can be said that the residual data meets the requirements for normality.

2) Linearity Test

A linearity test was conducted to assess the significance of the relationship between the independent variable (principal situational leadership) and the dependent variable (teacher pedagogical competence). The decision was made by comparing the deviation from linearity value with the error rate or alpha value ($\alpha = 0.05$). If the deviation from linearity value is greater than $\alpha = 0.05$, it can be concluded that the two variables have a linear relationship. Details of the linearity test results can be seen in Table 4.8.

Table 4.8 Linearity Between Principal Situational Leadership and Teacher Pedagogical Competence

| | | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|---|
| Kompetensi Pedagogik Guru * Kepemimpinan Situasional Kepala Sekolah | Between Groups | (Combined) | 2316.682 | 15 | 154.445 | 2.941 | 0.001 |
| | | Linearity | 1797.235 | 1 | 1797.235 | 34.226 | 0.000 |
| | | Deviation from Linearity | 519.447 | 14 | 37.103 | 0.707 | 0.761 |
| | Within Groups | | 3833.273 | 73 | 52.511 | | |
| | Total | | 6149.955 | 88 | | | |

From Table 4.8 above, the deviation from linearity value of the principal's situational leadership variable with the teacher's pedagogical competence variable is 0.761. When compared to the alpha value of 0.05, 0.761 > 0.05. This means that the linear relationship model is acceptable because there is no significant deviation from linearity. Likewise, the linearity sig is equal to 0.000. (0.000 < 0.05) then there is a significant linear relationship between the principal's situational leadership and the teacher's pedagogical competence. Based on these two things, it can be concluded that the variable regression line is linear and can be used to estimate the magnitude of the teacher's pedagogical competence variable.

Table 4.9 Linearity of teacher independent training and teacher pedagogical competence

| | | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|---|
| Kompetensi Pedagogik Guru * Pelatihan Mandiri Guru | Between Groups | (Combined) | 3513.672 | 20 | 175.684 | 4.532 | 0.000 |
| | | Linearity | 2859.636 | 1 | 2859.636 | 73.761 | 0.000 |
| | | Deviation from Linearity | 654.036 | 19 | 34.423 | 0.888 | 0.598 |
| | Within Groups | | 2636.283 | 68 | 38.769 | | |
| | Total | | 6149.955 | 88 | | | |

From Table 4.9 above, the deviation from linearity value of the teacher independen training variable with the teacher pedagogical competence variable is 0.598. When compared to the alpha value of 0.05, 0.598 > 0.05, meaning there is no significant deviation from linearity. Likewise, the linearity value obtained is 0.000. When compared to the alpha value of 0.05, 0.000 < 0.05, meaning there is a linear relationship between teacher independen training and teacher pedagogical competence. Based on these two things, it can be said that

the regression line for the variable is linear and can be used to estimate the magnitude of the teacher pedagogical competence variable.

3) Multicollinearity Test
The multicollinearity test is a statistical procedure for detecting a strong correlation between independent variables in a linear regression model. This phenomenon occurs when two or more independent variables exhibit a perfect or nearly perfect linear relationship, which can disrupt the accuracy of regression coefficient estimates. Multicollinearity is a condition in which the independent variables in a regression model are linearly correlated with each other, either partially or completely. This causes instability in estimation results and difficulty in isolating the influence of each variable on the dependent variable. Using SPSS Version 29, the multicollinearity test is identified through the VIF value. If the tolerance value is >0.1 and the VIF is <10, multicollinearity is not present. The results of the analysis can be seen in Table 4.10.

Table 4.10. Multicollinearity Test

| Model | | Collinearity | |
|---|---|---|---|
| | | Tolerance | VIF |
| 1 | Kepemimpinan Situasional Kepala Sekolah | 0.626 | 1.599 |
| | Pelatihan Mandiri Guru | 0.626 | 1.599 |
| a. Dependent Variable: Kompetensi Pedagogik Guru | | | |

From Table 4.10, the tolerance value of the independent variables of the principal's situational leadership (X1) and teacher independen training (X2) is 0.626, so it is above 0.1 (0.626 > 0.1). The VIF value of both variables X1 and X2 is 1.599 which means it is below 10 (1.599 < 10). Therefore, it can be stated that there is no multicollinearity in this regression analysis or there is no multicollinearity between the independent variables so that the analysis can be continued.

4) Heteroscedasticity Test
The heteroscedasticity test is a procedure performed in regression analysis to describe

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whether the variation or dispersion of residual values from a regression model is not constant across the range of independent variable values. In an ideal regression model, the residuals or errors from the model should have the same variance (homoscedasticity). However, if the variance of the residuals fluctuates, this indicates a heteroscedasticity problem. This problem can lead to inefficient estimation and biased hypothesis testing, even though the regression coefficients remain undistorted. The heteroscedasticity test can be observed in SPSS version 29 through a heteroscedasticity graph, namely a scatterplot between the independent and dependent variables, as shown in Figure 4.6.

Figure 4.6 Heteroscedasticity Scatterplot Graph
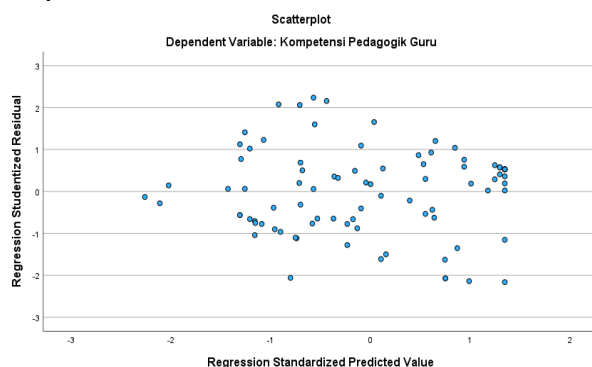


The dots do not form a visible pattern and appear to be randomly scattered in Figure 4.6. Thus, in the regression analysis, the main independent variables of situational leadership, teacher independen training, and teacher pedagogical competence do not show heteroscedasticity.

3. Hypothesis Testing

Using SPSS Version 29, hypothesis testing was conducted following data presentation from descriptive analysis and completion of preparatory tests. This analysis examines three hypotheses: the influence of principal situational leadership on teacher pedagogical competence, the effect of teacher independen training on teacher pedagogical competence, and the combined effects of principal situational leadership and teacher independen training.

a. The influence of the principal's situational leadership on teachers' pedagogical competence

The first hypothesis test concerns the influence of principal situational leadership on teacher pedagogical competence, with two hypotheses formulated as the null hypothesis (H0) stating there is no influence of principal situational leadership on the pedagogical competence of MIPA teachers at State Senior High Schools in Pasaman Regency, and the alternative hypothesis (Ha1) stating there is an influence of principal situational leadership on the pedagogical competence of MIPA teachers at State Senior High Schools in Pasaman Regency.

The initial stage employs a partial t-test to determine whether the independent variable (X1) partially influences the dependent variable (Y), with criteria based on calculated t-value and t-table value where the independent variable influences the dependent variable if the calculated t-value exceeds the t-table value, and does not influence if the calculated t-value is less than the t-table value, as well as criteria based on significance value where the independent variable influences the dependent variable if the significance value is less than 0.05, and does not influence if the significance value exceeds 0.05.

Table 4.11 Partial T-Test of Principal's Situational Leadership on Teachers' Pedagogical Competence

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| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | 43.598 | 9.270 | | 4.703 | 0.000 | | |
| | Kepemimpinan Situasional Kepala Sekolah | 0.802 | 0.134 | 0.541 | 5.994 | 0.000 | 1.000 | 1.000 |

a. Dependent Variable: Kompetensi Pedagogik Guru

Based on the data presented in Table 4.11, the calculated t-value of 5.994 exceeds the t-table value (α; n-k-1 = 0.05; 89-2-1 = 86) of 1.98793, indicating that principal situational leadership influences teacher pedagogical competence. Similarly, the significance value of the principal situational leadership variable is 0.000, which is less than 0.05 (0.001 < 0.05), leading to the rejection of the null hypothesis (H0) and acceptance of Ha1. Table 4.11 also reveals a constant value (a) of 43.598 and a situational leadership coefficient value (b/regression coefficient) of 0.802, with the positive regression coefficient (b=0.802) indicating a positive influence of the principal situational leadership variable (X) on the teacher pedagogical competence variable (Y), expressed through the regression equation Y = 43.598 + 0.802x, confirming that principal situational leadership positively influences teacher pedagogical competence, thus rejecting H0 and accepting Ha1, while the magnitude of this influence is determined through the coefficient of determination presented in Table 4.12.

Table 4.12
Test of the Determination Coefficient of the Principal's Situational Leadership on the Pedagogical Competence of Mathematics and Natural Sciences Teachers

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .541ᵃ | 0.292 | 0.284 | 7.073 |

a. Predictors: (Constant), Kepemimpinan Situasional Kepala Sekolah
b. Dependent Variable: Kompetensi Pedagogik Guru

Table 4.12 shows the correlation value (R relationship) is 0.54, while the determination value (R Square) is 0.292. This means that the influence of situational leadership on the pedagogical competence of high school mathematics teachers in Pasaman Regency is 29.2%. Meanwhile, the remaining 70.8% is influenced by other aspects.

b. The Influence of Independent Teacher Training on Teacher Pedagogical Competence

The second hypothesis test in this analysis examines the influence of independen training on teacher pedagogical competence, with two hypotheses formulated as the null hypothesis (H0) stating there is no influence of independen training on the pedagogical competence of MIPA teachers at State Senior High Schools in Pasaman Regency, and the alternative hypothesis (Ha2) stating there is an influence of independen training on the pedagogical competence of MIPA teachers at State Senior High Schools in Pasaman Regency. To test whether independen training influences teacher pedagogical competence, a t-test was conducted, specifically a partial t-test to determine whether the independent variable (X2) partially influences variable Y, with decision-making criteria based on calculated t-value and t-table value where the independent variable influences the dependent variable if the calculated t-value exceeds the t-table value and does not influence if the calculated t-value is less than the t-table value, as well as criteria based on significance value from SPSS output where the independent variable influences the dependent variable if the significance value is less than 0.05 and does not influence if the significance value exceeds 0.05, with data analysis facilitated using SPSS Version 29 and t-test results presented in Table 4.13.

Table 4.13
Partial T-Test of Teacher Independent Training on Teacher Pedagogical Competence

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 38.781 | 6.953 | | 5.577 | 0.000 |
| | Pelatihan Mandiri Guru | 0.846 | 0.097 | 0.682 | 8.696 | 0.000 |

a. Dependent Variable: Kompetensi Pedagogik Guru

Table 4.13 indicates that the calculated t-value is 8.696, which when compared to the t-table value ($\alpha$;n-k-1=0.05; 89-2-1 = 86) of 1.98793 shows that 8.696 exceeds 1.98793, meaning that independen training influences teacher pedagogical competence. Similarly, the significance value of the independen training variable (X2) on teacher pedagogical competence (Y) is 0.000, and since 0.000 is less than 0.05, this indicates that the independent variable (teacher independen training) influences the dependent variable (MIPA teacher pedagogical competence). Additionally, the table reveals a constant value (a) of 38.781 and a teacher independen training value of 0.846, showing that the regression coefficient (b = 0.846) is positive, which means the influence of the teacher independen training variable (X2) on the teacher pedagogical competence variable (Y) is positive, expressed through the regression equation Y = 38.781 + 0.846x. Based on the t-test results, significance value, and regression coefficient value, it can be concluded that the teacher independen training variable (X2) influences the pedagogical competence variable (Y), with the magnitude of this influence determined through the coefficient of determination presented in Table 4.14.

Table 4.14.
Test of the Determination Coefficient of Teacher Independent Training on Teacher Pedagogical Competence

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .682ᵃ | 0.465 | 0.459 | 6.150 |

a. Predictors: (Constant), Pelatihan Mandiri Guru
b. Dependent Variable: Kompetensi Pedagogik Guru

Table 4.14 shows the coefficient of determination (R Square) of 0.465. This indicates that the independent variable (teacher independen training) has a 46.5% effect on the dependent variable (teacher pedagogical competence) of mathematics and natural sciences teachers. The remaining 53.5% is influenced by other factors.

According to the t-test results, the significance value, the regression coefficient, and the t-test result indicate that the second hypothesis, H02, is rejected and Ha2 is accepted, indicating that teacher independen training has a positive and significant effect on teacher pedagogical competence.

c. The Influence of the Principal's Situational Leadership and Teacher Independent Training Simultaneously on Teacher Pedagogical Competence

The third hypothesis test examines the simultaneous influence of situational leadership and teacher independen training on pedagogical competence, with both the null hypothesis (H0) and alternative hypothesis (Ha) being tested in this third hypothesis. The null hypothesis (H0) states there is no simultaneous influence of situational leadership and independen training on the pedagogical competence of MIPA teachers at State Senior High Schools in Pasaman Regency, while the alternative hypothesis (Ha3) states there is a simultaneous influence of principal situational leadership and independen training on the pedagogical competence of MIPA teachers at State Senior High Schools in Pasaman Regency. In this research, the researcher analyzed data by conducting multiple linear regression tests, specifically utilizing the simultaneous F-test to determine whether the independent variables (situational leadership and independen training) have an effect on the dependent variable (teacher pedagogical competence) simultaneously. For this hypothesis test, the researcher analyzed data using SPSS version

29, with the obtained analysis results presented in Table 4.15.

Table 4.15.
Simultaneous F-Test of Principal Situational Leadership and Teacher Independen training

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 3009.176 | 2 | 1504.588 | 41.198 | <.001$^b$ |
| | Residual | 3140.779 | 86 | 36.521 | | |
| | Total | 6149.955 | 88 | | | |

a. Dependent Variable: Kompetensi Pedagogik Guru
b. Predictors: (Constant), Pelatihan Mandiri Guru, Kepemimpinan Situasional Kepala Sekolah

Table 4.15 shows that the calculated F value between the principal's situational leadership and teacher independen training (X) on teacher pedagogical competence (Y) is 41.198 and the F_table is F(k,n-k) = F (2.89-2) = 3.103 with a Sig level <0.001 <0.05. This suggests that there is an influence between situational leadership and teacher independen training on teacher pedagogical competence.
To determine the magnitude of the influence of the principal's situational leadership and teacher independen training on the pedagogical competence of high school mathematics teachers in Pasaman Regency, we can see Table 4.16.

Table 4.16. Correlation Coefficient of Principal Situational Leadership and Teacher Independen training

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .700$^a$ | 0.489 | 0.477 | 6.043 |

a. Predictors: (Constant), Pelatihan Mandiri Guru, Kepemimpinan Situasional
b. Dependent Variable: Kompetensi Pedagogik Guru

The correlation value (R-square) of 0.700 is shown in Table 4.16. The coefficient of determination (R-square) of 0.489 indicates that the dependent variable data can be well explained by the independent variables. Consequently, the dependent variable (teacher pedagogical competence) is 48.9% influenced by the independent variables (principal situational leadership and teacher independen training). External influences account for the remaining 51.1%.

In addition to the F-test, multiple linear regression can be used through the t-test analysis.
Table 4.17 Multiple linear regression T-test

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 29.234 | 8.304 | | 3.521 | 0.001 |
| | Kepemimpinan Situasional Kepala Sekolah | 0.292 | 0.144 | 0.197 | 2.024 | 0.046 |
| | Pelatihan Mandiri Guru | 0.696 | 0.121 | 0.561 | 5.761 | 0.000 |

a. Dependent Variable: Kompetensi Pedagogik Guru

Based on Table 4.17, the constant value is 29.234, while the principal's situational leadership and teacher independen training (b1, b2, / regression coefficient) are 0.292 and 0.163, respectively. Therefore, the regression coefficient is positive. It can be concluded that the situational leadership and teacher independen training variables influence teacher pedagogical competence. Therefore, the regression equation can be written as:
Y = a + b1x1 + b2x2
Y = 29.234 + 0.292x1 + 0.696x2

Furthermore, Table 28 also shows that the sig. value is 0.001 < 0.05. This indicates that the principal's situational leadership (X1) and teacher independen training (X2) variables influence teacher pedagogical competence (Y). Therefore, for the third hypothesis test, H0 is rejected and Ha3 is accepted, stating that situational leadership and teacher independen training simultaneously influence teacher pedagogical competence.

**B. Discussion**
1. Discussion on Principal's Situational Leadership Affects Teachers' Pedagogical Competence

The results of the study show that the principal's situational leadership influences the pedagogical competence of SMAN MIPA teachers in Pasaman Regency with a contribution of 29.2%. The results of the

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hypothesis test show a calculated t value of 5.994> t table 1.98793 and a significance value of 0.000 <0.05 so that H0 is rejected. The regression equation y = 43.598 + 0.802x identifies that for every one unit increase in the principal's situational leadership, the teacher's pedagogical competence increases by 0.802, although there is still 70.8% of the variance in teacher pedagogical competence influenced by other factors.

The principal is able to provide clear and firm instructions (telling) for novice teachers, explain the reasons for decisions with two-way communication (selling) to increase motivation, involve teachers in deliberation and decision-making (participating) to foster a sense of appreciation, and delegate tasks (delegating) to senior teachers to encourage independence and learning innovation. Situational leadership is not only pedagogically relevant but also in line with Islamic principles in QS Al-Baqarah verse 30 about the caliph as a trust that requires responsibility, QS Shad verse 26 about justice in decision-making, and the Hadith of Bukhari which emphasizes that "each of you is a leader and will be asked to account for it."

The results of this study are in line with the study by Labib & Asy'ari (2025) which showed that situational leadership has a significant influence on teacher professionalism and adaptation, the research by Mahatika & Hendriani (2022) on the application of the telling, selling, participating, and delegating model at SMP Negeri 5 Batusangkar, the research by Juhor (2014) on the effectiveness of situational leadership in strengthening teacher commitment, and the research by Suhardi (2019) and Dwiyani & Sarino (2018) which found a positive influence of situational leadership on teacher performance of 27% and 28.75%, respectively. The research by Rosna Karyawati et al. (2022) also strengthens the finding that situational leadership can increase

teacher motivation, performance, and commitment and create an adaptive and productive work environment.

2. Discussion on the Impact of Independent Teacher Training on Teacher Pedagogical Competence

The results of the study revealed that independent teacher training significantly influenced the pedagogical competence of high school mathematics and natural science teachers in Pasaman Regency, contributing 46.5%. The hypothesis test results showed a calculated t-value of 5.577 > t-table 1.98793 and a significance value of 0.000 < 0.05, thus rejecting H0. The regression equation y = 38.781 + 0.846x indicates that for every one unit of independent training, teacher pedagogical competence increases by 0.846, although 53.5% of the variance in teacher pedagogical competence is still influenced by other factors. The independent training material is considered to be in line with the latest developments in education, the visual display and digital platform facilitate understanding of the material, the flexibility of learning methods through the Merdeka Mengajar (PMM) Platform allows teachers to adapt learning to their time and learning style, adequate facilities facilitate teacher participation, and independent training encourages teachers to be more reflective and enthusiastic about trying out learning innovations.

The findings of this study are very relevant to Islamic values in QS Al-Mujadilah verse 11 about the importance of increasing knowledge, the Prophet's Hadith "Indeed, I was sent to perfect noble morals" (HR. Ahmad), QS Ar-Ra'd verse 11 about the importance of personal initiative in self-development, the story of the Prophet Moses and Khidir in QS Al-Kahfi verses 60-82 which reflects self-directed learning, the Hadith "Whoever takes the path to seek knowledge, Allah will make easy for him

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the path to heaven" (HR. Muslim), and the Hadith "Seek knowledge from the cradle to the grave" (HR. Ibn Majah) about lifelong learning.

The results of this study are in line with the research of Nurkhairunnisa et al. (2024) which shows that PMM significantly improves teachers' pedagogical abilities, the research of Rahma et al. (2024) which found the contribution of independent training using PMM by 26.9% in SMA Negeri 21 Makassar, the research of Hidayati et al. (2023) who found a training effect of 19.8% on Muhammadiyah vocational school teachers throughout Pekalongan Regency, and research by Supardi U.S. & Rosdiana Rosdiana (2024) on the effectiveness of independent training in PMM in improving teachers' pedagogical and professional abilities.

3. Discussion on the Impact of Situational Leadership and Independent Teacher Training on Teacher Pedagogical Competence

Research results indicate a 48.9% effect of situational leadership and independent teacher training on the pedagogical competence of high school mathematics and natural science teachers in Pasaman Regency. According to Aditama & Andari (2022), situational leadership is an effective approach to improving teacher competence that emphasizes flexibility and adapts skills to the situation. Principals can implement training and education programs that support the use of virtual reality-based learning media and develop e-learning modules and digital literacy skills.

Research by Hayati (2021) found that situational leadership and training education had a significant positive impact on teacher performance related to improving pedagogical competence. Research by Munir et al. (2023) found that principals can positively influence teachers' teaching abilities by implementing situational leadership, which includes providing consistent support, establishing clear directions, and encouraging professional development. Although principals face several obstacles in determining appropriate training, such as difficulty identifying teacher readiness, effective time management, and resistance to change. The relationship between the research results and Islamic values can be seen in QS Al-Ashr verses 1-3 which emphasize the importance of time, patience, faith, and good deeds.

This verse is very relevant where flexible situational leadership and consistent independent training reflect the principles of patience and hard work in improving teacher competence. Principals who implement situational leadership must be able to guide and advise teachers patiently so they can develop optimally, while teachers who undertake independent training demonstrate sincerity and perseverance in developing themselves to improve the quality of learning. Thus, QS Al-Ashr verses 1-3 reinforce the importance of patience, cooperation, and faith in the process of developing teacher pedagogical competence as found in this study.

## Conclusion

Based on the research findings and discussions presented in the previous chapters, this study establishes three significant conclusions regarding the pedagogical competence of science and mathematics teachers at public high schools in Pasaman Regency. First, principals' situational leadership demonstrates a meaningful influence on teachers' pedagogical competence, as evidenced by statistical analysis where the t-calculated value of 5.994 exceeds the t-table value of 1.98793, with a significance level below 0.05, leading to the acceptance of the alternative hypothesis

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and rejection of the null hypothesis. The coefficient of determination (R square) of 0.292 indicates that situational leadership accounts for 29.2% of the variance in pedagogical competence, while the remaining 70.8% is influenced by other factors outside this study. Second, teachers' independen training proves to exert a significant and positive influence on pedagogical competence, with a t-calculated value of 8.696 substantially surpassing the t-table value of 1.98793 and significance below 0.05, resulting in rejection of the null hypothesis and acceptance of the alternative hypothesis. The R square value of 0.465 reveals that independen training contributes 46.5% to pedagogical competence, with 53.5% attributable to other variables beyond this research scope.

Third, when examined simultaneously, principals' situational leadership and teachers' independen training demonstrate a combined positive and significant impact on the pedagogical competence of science and mathematics teachers at public high schools in Pasaman Regency. The empirical evidence is reflected in the regression equation $Y = 29.234 + 0.292\ X1 + 0.696\ X2$, where the model constant is 29.234, the situational leadership coefficient (X1) is 0.292, and the independen training coefficient (X2) is 0.696. The F-test results show an F-significance of 0.001, which is less than 0.05, and an F-calculated value of 41.198 that far exceeds the F-table value of 3.101, confirming that both variables jointly influence pedagogical competence. The combined contribution of these two variables amounts to 48.9% of the variance in teachers' pedagogical competence, while the remaining 51.1% is influenced by other factors not covered in this study. These findings underscore the importance of both external leadership support and internal teacher initiative in enhancing professional competence, suggesting that educational institutions should develop comprehensive strategies that integrate adaptive leadership practices with sustained self-directed professional development programs to optimize teaching quality and student learning outcomes.

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