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The Influence of Principals' Digital Leadership on Teachers' Innovative Behavior at Public Senior High Schools in Solok City

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ABSTRACT

This study is based on discussions related to teachers' innovative behavior related to the principal's digital leadership as an influencing factor. This study aims to analyze the influence of the principal's digital leadership on the innovative behavior of teachers in Solok City State Senior High Schools. The method used is a quantitative method. The sample of this study was 147 teachers in Solok City State Senior High Schools and the sample was determined using the Proportionate Stratified Random Sampling Technique by calculating the sample size using the Chocran formula, which was 108 people. Data collection used a questionnaire with a Likert scale model designed to measure two variables, namely the principal's digital leadership and teacher innovative behavior. Data analysis was carried out through descriptive statistical techniques and simple regression analysis to test the influence of both variables. The results of data processing and calculation using SPSS 26, explained that the innovative behavior of teachers was categorized as good and the principal's digital leadership was also categorized as good. It can be concluded that the higher the principal's digital leadership, the better the innovative behavior of teachers in Solok City State Senior High Schools. The magnitude of the influence of the principal's digital leadership on the innovative behavior of teachers in Solok City State Senior High Schools using the t-test of 11.278. The results of the study show that 1) innovative behavior in Solok City State Senior High School is in the good category, namely 4.31 with a percentage of 88%, 2) the digital leadership of the principal in Solok City State Senior High School is in the good category, namely 4.26 with a percentage of 85%, 3) there is an influence between the principal's digital leadership on the innovative behavior of teachers in Solok City State Senior High School by 54.5% and 45.5% is influenced by other factors.

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1. INTRODUCTION

The quality of education and student learning success are significantly influenced by teachers' innovative behavior. Current advances in science and technology are the primary drivers of innovation, driving forces for teachers and students to maintain and improve school quality (Berlian & Arsanti, 2018). Teachers serve not only as transmitters of material but also as agents of change responsible for shaping students' character and competencies through pedagogical innovations relevant to current developments (Tillaar, 2020). In the educational context, this innovative behavior is reflected when teachers are able to integrate the latest methods, strategies, and learning materials into the teaching and learning process (Chou et al., 2019).

The importance of teachers' innovative behavior is increasingly evident in their contribution to improving the overall quality of education. Teachers with high levels of innovative behavior are able to stimulate students' interest in learning, thereby impacting their academic achievement (Hosseini & Shirazi, 2020). Similarly, Maryati et al. (2025) stated that teachers' innovative behavior significantly influences students' learning motivation, which in turn positively impacts learning effectiveness and overall educational quality. Furthermore, Zhu dkk. (2022) in Scientific Reports emphasized that teacher innovative behavior is a crucial factor in increasing student engagement, meeting diverse learning needs, and promoting critical thinking and continuous learning.

Teacher innovative behavior does not develop in a vacuum but is influenced by various factors, one of which is the principal's leadership style. School standards in the current digital era require the integration of technology into the learning process, as nearly all aspects of life have been influenced by developments in information technology, the internet, and digital devices (Somantri, 2021; Landa et al., 2021). This situation demands that educational institutions transform from traditional leadership styles to adaptive and sustainable technology-based leadership (Brooks & Ezzani, 2022). Digital leadership is seen as the capability to lead this transformation by combining a digital mindset and leadership skills to enable organizations to adapt and innovate in the era of disruption (Rudito & Sinaga, 2017).

In Solok City Public High Schools, the principal's digital leadership plays a strategic role as a digital change leader. The principal is expected to facilitate training, ensure access to digital resources, and build a collaborative culture that optimally utilizes technology (Papadakis et al., 2023; Redecker & Punie, 2017). Effective digital leadership can create a conducive work environment, increase teacher confidence, and encourage various learning innovations. Conversely, if digital leadership is not optimal, efforts to transform technology-based learning can be hampered, resulting in teachers' innovative behavior not being optimally developed.

However, the reality on the ground shows a gap between expectations and reality. Based on data from the 2025 Solok City Education Report Card published through the Ministry of Education and Culture's National Assessment & Education Report portal, the achievement of learning quality indicators in Solok City State Senior High Schools (SMA) is suboptimal, particularly in the implementation of learning innovations. The low scores on these indicators are validated by observations and interviews conducted by the author in September–October 2025. Field findings revealed that some teachers are still reluctant to try new methods and their use of technology is not optimal, indicating that teachers' innovative behavior still needs to be improved, in line with the low achievement of indicators in the education report card.

Therefore, this research is important to understand how principals' digital leadership influences teachers' innovative behavior in Solok City State Senior High Schools. The purpose of this study is to analyze the influence of principals' digital leadership on teachers' innovative behavior in Solok City State Senior High Schools. The research question posed is: "Is there a significant influence of principals' digital leadership on teachers' innovative behavior in Solok City State Senior High Schools?" The benefits of this research include contributions to the development of educational management science, as well as benefits for principals, teachers, and stakeholders in improving principals' digital leadership through teachers' innovative behavior in schools.

2. METHOD, DATA, ANALYSIS

This research uses a quantitative method to assess the influence of the principal's digital leadership on the innovative behavior of teachers at a public high school in Solok City. The population was 147 teachers, and the sample size was 108. Proportional Stratified Random Sampling was used to draw the sample. The Cochran formula was used to determine the sample size. The data collection instrument was a questionnaire structured on a Likert scale. As with the Likert scale, Sugiyono. (2019) stated that the Likert scale is used to measure the attitudes, opinions, and perceptions of an individual or group of people regarding social phenomena. There are five answer options: Strongly Agree (SS), Agree (S), Disagree (SOS), Disagree (TS), and Strongly Disagree (STS).

The research phase began with the development of a questionnaire framework, which required guidance from the supervising lecturer in formulating statements for each questionnaire. A pilot test of the questionnaire was conducted with 30 teachers outside the research sample. The results of the questionnaire trial were then analyzed using SPSS (Statistical Package for the Social

Sciences) version 26 to determine its validity and reliability. After testing and analysis, the questionnaire was distributed to respondents, and the collected data was analyzed by calculating the average of respondents' answers using the mean formula. The research results were then processed to determine the level of achievement using research classification and categories. After that, classical assumption tests were conducted with normality and linearity tests, followed by simple linear regression tests, and finally, hypothesis tests with T and R^2.

3. RESULT AND DISCUSSION

Result

The results of the study on the influence of the principal's digital leadership on the innovative behavior of teachers at Solok City State Senior High Schools have two variables, namely the principal's digital leadership variable (X) and the teacher's innovative behavior variable (Y).

Principal's Digital Leadership

Viewed from five aspects, namely 1) digital innovation culture, 2) digital-based development, 3) digital literacy skills, 4) digital organizational governance, 5) digital communication. The following research results have been conducted to determine the influence of the principal's digital leadership on the innovative behavior of teachers at Solok City State Senior High Schools are explained in the following table:

Table 1. Research results on the Principal's Digital Leadership Variable

No	Indicator	Average		%TCR	Classification
1	Digital Innovation Culture	4.31		86%	Good
2	Digital-Based Development	4.14		85%	Good
3	Digital Literacy Skills	4.30		86%	Good
4	Digital Organizational Governance	4.23		84%	Good
5	Digital Communication	4.32		86%	Good
	Average score	**4.26**		**85%**	**Good**

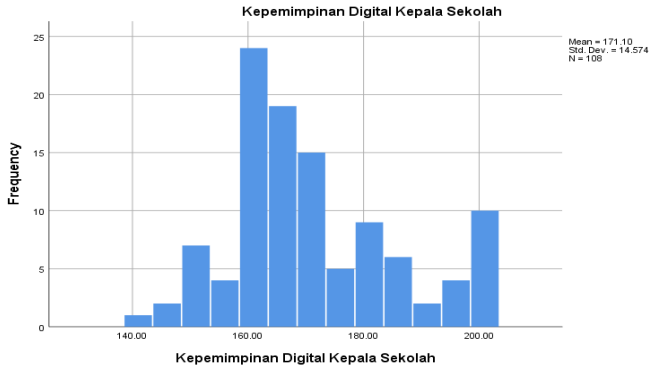

Figure 1Histogram of Digital leadership of the Principal

Table 1 shows that the highest average score is found in the digital communication indicator with an average score of 4.32 with a percentage of 86%. While the lowest average is found in the digital-based development indicator with an average score of 4.14 with a percentage of 85%. In general, the average score of digital leadership of school principals in Solok City State Senior High Schools is 4.26 with a percentage of 85%. This means that the digital leadership of school principals in Solok City State Senior High Schools is already in the good category.

Teacher Innovative Behavior

Viewed from five aspects: 1) idea exploration, 2) idea generation, 3) idea promotion, 4) idea implementation, and 5) reflection. The following table explains the results of the research conducted to determine the influence of the principal's digital leadership on the innovative behavior of teachers at Solok City State Senior High Schools:

Table 1. Research Results on Teacher Innovative Behavior Variables

No	Indicator	Average	%TCR	Classification
1	Idea Exploration	4.45	89%	Good
2	Idea Generation	4.35	87%	Good
3	Promoting Ideas	4.35	87%	Good
4	Implementation of Ideas	4.47	89%	Good
5	Doing Reflection	3.89	89%	Good
	Average score	**4.31**	**88%**	**Good**

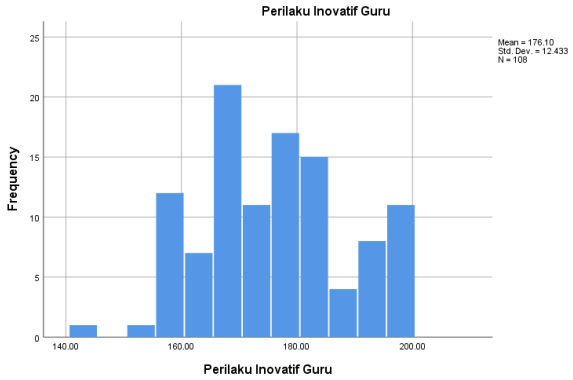

Figure 2. Histogram of Teacher Innovative Behavior

Table 2 shows that the highest average score was found in the idea implementation indicator, with an average score of 4.47 with a percentage of 89%. Meanwhile, the lowest average was found in the reflection indicator, with an average score of 3.89 with a percentage of 89%. In general, the average score for innovative behavior of teachers at Solok City State Senior High Schools was 4.31 with a percentage of 88%. This means that the digital leadership of principals at Solok City State Senior High Schools is already in the good category.

The Impact of Principals' Digital Leadership on Teachers' Innovative Behavior

The prerequisite tests and hypothesis tests in this study are as follows:

1. Prerequisite Test
   a. Normality Test Results

The normality test aims to determine whether the data in the study is normally distributed. If the distribution is normal, then alternative non- parametric tests can be used. The normality test in this study was processed using SPSS version 26. To obtain an overview of the normality test for innovative teacher behavior and digital leadership of school principals, see the following table:

Table 2. Normality Test Results

Principals' Digital Leadership and Teachers' Innovative Behavior	
Asymp.Sig .(2-Tailed)	Sig
0.200	0.05

If the significance value is > 0.05, then it is declared normally distributed. If the significance value is < 0.05, then the data is declared not normally distributed. The results of the normality test obtained a significance value of 0.200, meaning 0.200 > 0.05, the normality test conducted indicates that the data obtained is normally distributed.

   b. Linearity Test Results

The linearity test aims to determine whether the principal's digital leadership variable data tends to form a linear line with the teacher's innovative behavior variable. If the significance value is greater than alpha 0.05, this indicates a linear regression line. However, if the significance value is less than alpha 0.05, this indicates a linear regression line. 0.05 means the regression is non-linear. To determine whether the regression is linear or not, see the following table:

Table 3. Linearity Test Results

Principals' Digital Leadership and Teachers' Innovative Behavior	
Asymp.Sig .(2-Tailed)	Sig
0.412	0.05

Linearity test, it shows a significance value (*Sig).* In the deviation from linearity namely 0.412, it can be concluded that there is a linear influence between variable X (digital leadership of the principal) and variable Y (innovative behavior of teachers) due to deviations from linearity. (0, 412) > significance level (0.05) so there is a linear effect.

2. Hypothesis Testing

a. Simple Linear Regression Test Results

A simple linear regression test is used to test or predict the influence of one variable or independent variable (the principal's digital leadership on the dependent variable (teacher innovative behavior). The results of the simple linear regression test can be seen in the following table:

Table 4. Results of Regression Analysis of Principal Digital Leadership Variables and Teacher Innovative Behavior

Coefisien^{a}						
Model		Unstandardized Coefficients		Standardized Coefficient	t	Significance
		B	Coefficient	Beta		
1	(Constant)	68,296	9,593		7,119	.000
	Principal's Digital Leadership	.630	.056	.739	11,278	.000
a. Dependent variable: Teachers' innovative behavior						

Based on Table 5, the results of data testing using hypothesis testing data analysis state that the t-test obtained t count results are greater than t table, namely 11.278 > 1.659 and with a significance level of 0.000 < 0.05. This indicates that partially the principal's digital leadership variable has a positive and significant effect on teacher innovative behavior.

Based on the simple regression analysis in the constant value column of table 3 is 68.296, while the regression direction coefficient value is 0.630. Thus, the equation is Y = 68.296 + 0.630X. Based on this equation, it can be interpreted that the constant of 68.296 suggests that if the value of the principal's digital leadership (X) is zero, then the teacher's innovative behavior (Y) has a value of 68.296. While the regression coefficient of 0.630 states that for every one unit increase in the principal's digital leadership (X), there is an increase in the teacher's innovative behavior (Y) of 0.630X. A positive regression coefficient value indicates that there is a positive influence between the principal's digital leadership and the teacher's innovative behavior. This means that the higher the digital leadership of the principal applied, the more the teacher's innovative behavior will increase, this positive coefficient indicates that increasing the principal's digital leadership will have a direct impact on increasing the teacher's innovative behavior.

b. T-Test Results

To see the significance of the influence of the independent variable (digital leadership of the principal) partially or individually on the dependent variable (innovative behavior of teachers), the significance test (t) is carried out. Decision making in the t test is Decision making in this t test is if the sig value <0.05 or t count> t table then there is an influence of variable X on Y. In addition, if sig > 0.05 or t count <table then there is no influence of variable X on variable Y. The t table value with a confidence level of 0.05 (N = 108) in the distribution of t table values is 1.659. To see the t value again, it can be seen from the table below:

Table 5. T-Test Results

Principal's Digital Leadership	
t count	t table
11,278	1,659

If it can be seen that the calculation results obtained t count = 11.278 > t table = 1.659 and sig 0.000 < 0.05. So, it can be concluded that the principal's digital leadership variable (X) has a positive and significant effect on the teacher's innovative behavior variable (Y) at Solok City State Senior High School.

c. Coefficient of Determination Test (R^2)

The coefficient of determination (R2) test is used to determine the extent to which the independent variable (the principal's digital leadership) explains the dependent variable (teacher innovative behavior). If the coefficient of determination is around zero, the relationship between the two variables is considered weak. Similarly, if the coefficient approaches one, the relationship between the two is considered strong. The results of the coefficient of determination test can be seen in the following table:

Table 6. R2 Test Results

Principals' Digital Leadership and Teachers' Innovative Behavior		
R	R Squared	Adjusted R Squared
0.739	0.545	0.541

Based on the table above, the percentage influence of the independent variable (the principal's digital leadership) on the dependent variable (teacher innovative behavior), or what is known as the coefficient of determination (R Square), is 0.545 or 54.5%. This means that the principal's digital leadership is able to influence teacher innovative behavior by 54.5%, with the remaining 45.5% influenced by other variables outside this study

Discussion

Principal's Digital Leadership

The results of the study describe that the digital leadership of principals at Solok City State Senior High Schools is categorized as good, with an average score of 85%. This indicates that the principals in the research context have implemented the role of digitalization optimally. The principals are able to master the knowledge and skills of other digital technologies such as: interactive whiteboards, document cameras, cloud computing and 3D content. Some functions that can be applied in digital leadership practices in schools are virtual meetings, virtual discussions, various virtual information, virtual teaching and learning supervision. This is intended to create a good teaching and learning process, while also helping to create a new atmosphere in schools through the use of learning technology, such as digital platforms in the world of education (Wulandari et al., 2018).

The principal's ability to innovate in the digital era is crucial for generating new ideas for new products. Failure to change old leadership patterns will cause the organization to regress and remain stagnant, resulting in a failure to adapt to current developments (Sarjito, 2019). Therefore, the principal, as a *leader, must* must have a digital leadership vision and adapt their ideal leadership style to the conditions and demands of the digital age (Jannah, 2020) . Therefore, this high average score underscores the importance of the principal's digital leadership role in enhancing teachers' innovative behavior.

One effort principals can take to optimize digital leadership is to continuously strengthen the development of teachers' digital literacy competencies. Principals need to facilitate training in the use of learning technology, the use of digital-based school management platforms, and the development of innovative learning media. Improving teachers' digital competencies is crucial to supporting educational transformation in the information technology era. This is in line with Donni Juni Priansa's opinion (2017). which states that the development of human resources in education must be directed at increasing adaptive capacity to technological developments. Another effort is to create a culture of digital innovation in the school environment by strengthening technology-based learning collaboration and providing creative space for teachers to develop innovative

learning methods. In the context of developing human resources in education, Hamzah B. Uno (2019) explains that improving the quality of learning is greatly influenced by teachers' ability to utilize technology and develop learning strategies relevant to students' needs.

Teacher Innovative Behavior

The results of the study above describe that the innovative behavior of teachers in Solok City State Senior High Schools is categorized as good with an average score of 88%, indicating a strong positive influence among the elements that shape teachers' innovative behavior, such as generating new ideas in learning, the courage to try different methods or strategies, openness to change, and the ability to adapt learning to the needs and characteristics of students. The high score indicates that teachers not only carry out their duties routinely, but also strive to make innovations to improve the quality of the learning process and outcomes.

This behavior does not emerge spontaneously, but is influenced by various internal factors such as motivation and personality, as well as external factors such as principal support, the availability of infrastructure, and a conducive work climate. In this regard, the principal's leadership is one of the most significant external factors due to its strategic role in creating a work culture that encourages innovation (Febrina & Susanti, 2024) . Teachers with high levels of innovative behavior are able to stimulate students' interest in learning, which will have an impact on improving academic achievement (Hosseini & Shirazi, 2020) . Innovative behavior will also make teachers better able to identify and recognize learning barriers experienced by students, so that teachers can determine learning methods and approaches that are appropriate to the student's condition.

Efforts that can be made done for improve and maintain behavior innovative teachers are with strengthen development professional sustainable through training, workshops, and communities Study professional based technology. Head school need give chance to the teacher to develop competence pedagogy and technology learning to be able to create varied and relevant learning strategies with demands education 21st century. This is in line with opinion Febrina & Susanti (2024) who emphasized that environment supportive work innovation can grow creativity and behavior innovative teachers.

In addition, the head school can build climate work that encourages creativity and collaboration professional teachers. Giving room for teachers to experiment with method learning new, share practice good, and integrate technology in the learning process is step strategic in grow innovation learning. This effort supported by thought Hosseini et al. (2021) which states that strengthening competence and utilization technology in learning can increase effectiveness of the educational process as well as involvement Study participant educate.

Libr The Impact of Principals' Digital Leadership on Teachers' Innovative Behavior

Based on the results of correlation and simple linear regression calculations, it was concluded that there is a significant influence between the principal's digital leadership and teacher innovative behavior in Solok City State Senior High Schools. At a significance level of 0.05, the coefficient was 0.739 and the correlation test was 11.278. This indicates a significant influence between the principal's digital leadership and innovative behavior.

This is reinforced by research conducted by Tanan & Purbojo (2025). The study showed that teachers' perceptions of the principal's digital leadership style can contribute to teachers' innovative work behavior in schools, although this was not always significant in all school contexts. Maryati. (2025) stated that the significant influence between the principal's digital leadership and teacher innovative behavior indicates that factors such as school culture, organizational support, teachers' digital literacy levels, and the collaborative climate established in the workplace contribute to the influence. Hutahayan. (2020) emphasized that innovative behavior does not emerge spontaneously but rather results from the interaction between individual teacher characteristics and a supportive work environment. In other words, the more positive teachers' perceptions of the principal's ability to utilize technology, build digital communication, and encourage learning transformation, the greater the opportunity for innovative behavior to emerge in teaching practice.

With the support of strong digital leadership from the principal, the principal can encourage teachers to optimally adopt technology in the learning process, while simultaneously fostering a culture of innovation within the school environment. The principal serves not only as a facilitator providing digital resources, but also as a driver of change who fosters teachers' motivation to continuously develop their professional competencies. Apsorn. (2022) added that leaders with a clear digital vision can reduce teachers' psychological barriers in the face of technological disruption, thus making them more willing to undertake pedagogical experiments.

From this description, it can be concluded that the principal's digital leadership influences teachers' innovative behavior. The better the principal's digital leadership, the better the teachers' innovative behavior. Conversely, the less effective the principal's digital leadership, the lower the level of innovative behavior in carrying out their professional duties. This condition can be seen from the reduced initiative of teachers in developing learning ideas, low courage to try new methods or technologies, and minimal efforts to make updates in the learning process.

4. CONCLUSION

The results of the research and discussion conducted in the previous chapter, it can be concluded that. The innovative behavior of teachers at Solok City State Senior High Schools is in the good category, with a score of 4.31 and an achievement percentage of 88%. The highest average score is found in the idea implementation indicator, which is 4.47 with a percentage of 89%, while the lowest average score is found in the reflection indicator, which is 3.89 with a percentage of 89%. The digital leadership of principals at Solok City State Senior High Schools is in the good category at 4.26 with an achievement percentage of 85%. The highest average score is found in the digital communication indicator, at 4.32 with a percentage of 86%, while the lowest average score is found in the digital-based development indicator, at 4.14 with a percentage of 85%. And there is an influence between the principal's digital leadership on the innovative behavior of teachers in Solok City State Senior High Schools. The correlation coefficient obtained is 0.739 and the correlation weight test is 11.278. From the results of the correlation weight test calculation, the calculated t is greater than the t table at a significance level of 0.05, namely 11.278 > 1.659. The criteria in calculating the correlation significance test state that if the calculated t is greater than the t table, then Ho is rejected and Ha which states that there is an influence between the influence of the principal's digital leadership on the innovative behavior of teachers is accepted.

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