# THE IMPACT OF DIGITAL LEADERSHIP ON IMPROVING ACADEMIC PERFORMANCE IN SMART SCHOOL-BASED HIGH SCHOOLS (SMA) IN ACEH PROVINCE

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**Abstract:** This study explores the impact of digital leadership on the academic performance of high school students in smart schools in Aceh Province. In the era of the Fourth Industrial Revolution, digital transformation has become essential in enhancing educational quality, with digital leadership playing a critical role in the successful implementation of smart schools. Data were collected from 200 respondents, including principals, teachers, and students, across 10 smart schools in Aceh. The study employed Pearson correlation tests and linear regression analysis to examine the relationship between digital leadership and students' academic performance. The findings indicate a significant and positive correlation ($r = 0.65$, $p < 0.01$) between principals' digital leadership and students' academic achievements. The regression analysis further reveals that digital leadership significantly influences academic performance ($\beta = 0.55$, $t = 8.34$, $p < 0.01$), suggesting that strong digital leadership fosters an innovative and supportive learning environment. This study underscores the urgent need for developing digital leadership skills among school principals and teachers as a key strategy to enhance educational quality in Aceh. The empirical evidence provided in this research can serve as a foundation for educational policy-making aimed at optimizing smart school implementation and improving student outcomes in the region.

## INTRODUCTION

Digital transformation has become a key driver across various sectors, including the education sector. In the era of the Fourth Industrial Revolution, the adoption of digital technology in schools is no longer optional but a necessity to enhance the quality of education. Digital transformation in the education sector not only affects the way learning is conducted but also influences school leadership, which plays a crucial role in directing, managing, and improving the quality of education in the digital era.

Smart schools integrate digital technology into both learning processes and school management. In this context, digital leadership plays a vital role in ensuring that all elements of the school, including teachers and students, can optimally utilize technology to enhance academic performance (Chompoowong, Nilsook, & Piriyasurawong, 2023).

The smart school concept, which integrates digital technology into learning processes and school management, has been proven to significantly improve students' academic performance (Jones & Dexter, 2014). The application of technology in schools also allows for personalized learning, which positively impacts students' academic achievements (Zhang, Trussell, Gallegos, & Asam, 2015).

Digital leadership, defined as the ability of leaders to manage and direct the use of digital technology to achieve organizational goals, becomes a critical factor in the successful implementation of smart schools (Sheninger, 2014). In the educational context, digital leadership requires a deep understanding of technology and the ability to lead change within the school environment (Dexter, 2018). School principals with strong digital leadership skills can create an innovative learning ecosystem that supports students' academic performance (Richardson & Sterrett, 2018). Effective digital leadership not only focuses on the use of technology but also on developing a digital culture in schools that supports innovation in learning and improves students' academic achievements. Research shows that teachers' digital capabilities and transformational leadership styles are positively correlated with improvements in students' academic performance (Huamán et al., 2021). Digital leadership is crucial in creating a learning environment that supports students' academic performance, particularly in smart schools (Frolova, Rogach, & Ryabova, 2020).

In Aceh Province, the implementation of smart schools is still in its early stages, with several schools beginning to adopt technology in their learning processes and school management (Yusuf, 2020). However, significant challenges remain in applying this concept, particularly concerning the readiness of school principals and teachers to use digital technology effectively. Previous studies have shown that a lack of digital leadership can hinder the implementation of technology in schools and negatively impact students' academic performance (Wang, 2017).

One important aspect of digital leadership is the ability to facilitate teachers' professional development in using technology (Ertmer & Ottenbreit-Leftwich, 2010; Retnowati & Santosa, 2023). Appropriate training can help teachers enhance their technological skills, ultimately improving the quality of classroom learning (Dexter & Riedel, 2003). Thus, an effective school principal in digital leadership will ensure that teachers have the resources and support needed to successfully implement technology

(Harris & Jones, 2019).

Previous research has shown that strong digital leadership can encourage better technology use by teachers, which in turn enhances student engagement and achievement. For example, a study by Hsieh et al. (2014) demonstrated that school principals' technology leadership positively influences teaching innovation and students' academic optimism (Hsieh, Yen, & Kuan, 2014). Additionally, research indicates that digital leadership also plays a role in creating a collaborative and innovative school culture, which fosters student engagement in the learning process (Leithwood & Sun, 2012). School principals who encourage technology use among teachers and students can increase student participation in learning activities, ultimately improving their academic performance (Fullan, 2014). Moreover, educational digitization also plays a role in expanding the boundaries of independent learning, developing leadership within the educational environment, and creating more personalized educational pathways that align with students' needs (Frolova, Rogach, & Ryabova, 2020).

In an international context, research by Deng et al. (2020) revealed that leadership experiences among students could improve their academic performance both in the short and long term, highlighting the importance of leadership roles in education (Deng, Li, Wu, & Xu, 2020). Studies in Indonesia have also found that digital leadership significantly influences teachers' acceptance of technology, contributing to the overall improvement of school performance (Sunu, 2022).

In the context of Aceh Province, there is an urgent need to strengthen digital leadership capabilities among school principals to optimize the potential of smart schools in improving students' academic performance (Aziz, 2021). This study aims to explore how digital leadership can influence students' academic performance in smart schools in Aceh Province. Students' academic performance in schools in Aceh remains a concern, with several reports showing a gap between students' achievements in Aceh and other regions in Indonesia (Rahim, 2019). The implementation of smart schools is considered a potential solution to improve the quality of education in this region. However, the success of this implementation greatly depends on the ability of school principals to lead and direct the use of technology in schools (Avolio, 2011).

This study is relevant in light of the global challenges faced by the education sector, including in Indonesia, in integrating technology into curricula and learning.

Strong digital leadership can be key to overcoming these challenges and ensuring that students in Aceh receive a quality education that meets contemporary demands (Hallinger, 2010).

Given the importance of digital leadership, this study is also expected to provide practical recommendations for stakeholders in the education sector in Aceh, including school principals, teachers, and local governments, to develop effective strategies in implementing smart schools (Bennett & Lemoine, 2014). Ultimately, the main objective of this study is to provide insights into how digital leadership can be a determining factor in improving students' academic performance, particularly in developing regions such as Aceh.

As part of efforts to elevate the quality of education in Aceh, this study will also highlight the challenges and opportunities in implementing digital leadership in high schools. The findings of this study are expected to serve as a basis for developing more targeted and evidence-based educational policies (Johnson, 2015).

Finally, this study emphasizes that in today's digital era, the role of leadership is not only limited to administrative aspects but must also include the ability to lead digital transformation in education. Therefore, developing digital leadership among school principals in Aceh is crucial to ensuring that students can fully reach their academic potential (Kotter, 2012).

The proposed study will explore the role of digital leadership in addressing the unique challenges associated with the implementation of smart schools in Aceh Province, a region that still grapples with educational disparities compared to other parts of Indonesia. While existing literature has extensively examined the impact of digital leadership on academic performance in developed educational contexts, there is a significant gap in research focusing on how digital leadership can be effectively harnessed in developing regions with distinct socio-economic and infrastructural challenges, such as Aceh. This study aims to fill that gap by investigating how school principals' digital leadership can overcome barriers to technology adoption and enhance students' academic outcomes in a region with limited resources and varying levels of digital readiness. The novelty of this research lies in its focus on a developing region where the digital transformation of education is in its nascent stages, providing insights into the specific strategies and leadership qualities required to implement smart schools

successfully in such contexts. Additionally, the study will contribute to the broader discourse on educational leadership by highlighting the intersection of digital leadership with regional development, offering practical recommendations for policymakers and educators in Aceh and similar regions. This research not only addresses a critical gap in the existing body of knowledge but also has the potential to guide future educational policies aimed at bridging the digital divide in underdeveloped areas, thereby improving educational equity and quality across Indonesia.

**RESEARCH METHODS**

Inform briefly about the materials and methods used in the research, including the subjects/materials studied, the tools used, the experimental design or design used, the sampling technique, the variables to be measured, the data collection techniques, the analysis and the statistical models used. Avoid writing statistical formulas excessively. If using a well-known method, state the name of the method only. If necessary, state the reference source used as a reference. For qualitative research, research methods can adjust. Manuscripts are written with a line density of 1.5 spacing, Times New Roman 12 font.

**RESULTS AND DISCUSSION**

**1. Research Results**

After data from 200 respondents (principals, teachers, and students) at 10 smart schools in Aceh Province were collected and analyzed, the results showed a significant relationship between principals' digital leadership and students' academic performance. The statistical analysis conducted included Pearson correlation tests and linear regression analysis.

**1.1 Descriptive Analysis**

The following table presents a summary of the descriptive statistics of the two main variables measured in this study: digital leadership and students' academic performance.

**Table 1. Descriptive Analysis**

| Variable | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|
| Digital Leadership | 3.85 | 0.76 | 2.50 | 5.00 |
| Students' Academic Performance | 80.45 | 6.32 | 65.00 | 95.00 |

From the table above, it can be seen that the average score for digital leadership is relatively high (3.85 out of 5), indicating that the principals in the surveyed schools generally possess good digital leadership skills. Students' academic performance is also at a fairly high average, with a mean score of 80.45.

**1.2 Pearson Correlation Test**

A Pearson correlation test was conducted to determine the extent to which principals' digital leadership correlates with students' academic performance. The results of the correlation analysis are shown in the table below:

**Table 2. Pearson Correlation Test**

| Variable | Students' Academic Performance |
|---|---|
| Digital Leadership | 0.65 (p < 0.01) |

The correlation test results show that there is a significant and positive correlation between digital leadership and students' academic performance (r = 0.65, p < 0.01). This indicates that the better the digital leadership applied by the principals, the higher the students' academic performance in those schools.

**1.3 Linear Regression Analysis**

To determine the impact of digital leadership on students' academic performance, a linear regression analysis was conducted. The results of the linear regression analysis are shown in the table below:

**Table 3. Linear Regression Analysis**

| Independent Variable | Beta Coefficient | t-value | Significance (p-value) |
|---|---|---|---|
| Digital Leadership | 0.55 | 8.34 | 0.000 |

The regression model used indicates that digital leadership has a significant influence on students' academic performance ($\beta = 0.55$, t = 8.34, p < 0.01). The beta

coefficient value suggests that for every one-unit increase in digital leadership score, students' academic performance increases by 0.55 units, indicating a fairly strong influence.

**2. Discussion**

The results of this study show that digital leadership has a significant impact on students' academic performance. The positive and significant correlation between digital leadership and students' academic performance strengthens the argument that effective leadership in utilizing digital technology in schools can drive improvements in students' academic achievements.

These findings are consistent with previous research, which shows that digital leadership plays a crucial role in creating a learning environment conducive to innovation and enhancing students' academic performance (Chompoowong et al., 2023). Moreover, the study by Hsieh et al. (2014) also supports these findings, showing that principals' technology leadership positively impacts teaching innovation and students' academic optimism (Hsieh et al., 2014).

Given these findings, it is important for stakeholders in the education sector, particularly in Aceh Province, to strengthen digital leadership capabilities among school principals. This is necessary to optimize the use of technology in the learning process and school management, which in turn will enhance students' academic performance.

Furthermore, the results of this study provide empirical evidence that can be used as a basis for policy-making to support the development of digital leadership in smart schools. Implementing digital leadership training for principals and teachers is a crucial step to ensure the success of digital transformation in the education sector.

**CONCLUSION**

This study concludes that digital leadership has a significant and positive impact on improving the academic performance of high school students in smart schools in Aceh Province. The main findings of this research indicate that principals with skills in digital leadership can create a more innovative and supportive learning environment, which ultimately positively influences students' academic achievements. Effective digital leadership not only facilitates the optimal use of technology in the school

environment but also strengthens the digital culture that drives innovation in the learning process. The strong correlation between digital leadership and students' academic performance underscores the importance of developing digital leadership skills among principals and teachers as a key strategy to enhance the quality of education. Moreover, the results of this study provide empirical evidence that can be used as a basis for educational policy-making, particularly in Aceh Province, to strengthen digital leadership training and development programs in schools. Consequently, the implementation of smart schools can be more optimal, and students' academic performance can continue to improve. Overall, this study asserts that in this digital era, digital leadership is not merely an option but an urgent necessity to improve the quality of education and ensure that students can fully reach their academic potential.

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