



The contribution of innovation and technology to teacher performance improvement

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ABSTRACT

Innovation and technology have become important elements in the transformation of education in the digital era. Teachers, as key agents of change in education, play a crucial role in integrating technology and implementing innovative methods to enrich students' learning experiences. This research is important to identify the extent to which innovation and technology are able to support teachers' tasks in delivering material more interactively and efficiently. This study uses a quantitative approach with a survey method of 30 teachers at Sultan Agung Private Junior High School Pematangsiantar. The results of the study show that there is a significant positive influence between the application of innovation and technology on improving teacher performance. Innovations in teaching methods allow teachers to be more creative in delivering material, while the use of technology facilitates better interaction with students and facilitates classroom management. Thus, this study emphasizes the importance of developing teachers' ability to innovate and use technology as a strategy to improve the quality of education. This research also provides implications for education policymakers to increase support for training programs and technology development in the school environment.

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INTRODUCTION

In the rapidly developing digital era, the role of innovation and technology in education is becoming increasingly important, especially for educators who are required to adapt to the needs of 21st century learning. Educational technology offers various conveniences in the learning process, both in terms of delivering materials, interacting with students, and evaluating learning outcomes. Teachers as agents of change in schools must be able to utilize technology and implement innovations so that learning becomes more effective and relevant. The application of technology, such as the use of interactive software and digital learning platforms, accompanied by the

implementation of innovations that really have a positive impact is able to improve the quality of learning and student engagement (Sun, Z. & Gao, 2020); (Chen, X., Huang, Y. & Luo, 2021); (Sholeh, 2023).

As an agent of change, Sultan Agung Pematangsiantar Private Junior High School continues to strive to improve the quality of education and build 21st century skills in students by providing full support for technology training to make teachers always at the forefront of utilizing technological advances and providing opportunities for teachers to innovate in learning. (Peraturan Menteri Pendidikan Nasional Nomor 16 Tahun 2007 Tentang Standar Kualifikasi Akademik Dan Kompetensi Guru, 2007) is used as a guideline to measure teacher performance. The results of the interview with the unit leader stated that the performance of the teachers of the Sultan Agung Private Junior High School in Pematangsiantar was not optimal. This can be seen from the fact that teachers have difficulty understanding individual differences between students, both in terms of interests, learning styles, special needs, and socio-cultural backgrounds. Many teachers are poorly trained to recognize or adapt teaching strategies that suit the learning needs of each student. This can lead to an understanding gap, where students feel less motivated or not optimally helped in the learning process. On the other hand, teachers are often faced with limited time and resources to conduct in-depth assessments regarding student characteristics. As a result, some students do not receive proper attention, especially those at the two poles of the learning spectrum, namely students who need more help or students who have higher-than-average abilities.

In addition, there are limitations of teachers in recognizing and facilitating students' talents or interests optimally. Teachers are often focused on measurable academic achievement and curriculum standards, thus paying less attention to individual needs that allow students to develop according to their unique potential. In addition, the limited time and large number of students in one class also make it difficult for teachers to pay special attention to students who need more support in exploring their potential. Often, the school environment has not fully supported creative and varied learning practices, which can actually encourage students to develop their strengths in non-academic areas such as arts, sports, or technical skills. As a result, many students' potentials are neglected or not honed properly, so they are not fully able to explore their abilities or feel less motivated in the learning process.

Innovation in education has a significant impact on improving teacher performance, especially in creating teaching methods that are more effective and relevant to the needs of the times (Kasim, 2020). Teachers who implement innovations, such as the use of digital technology and project-based learning approaches, have higher involvement in the teaching process and are able to motivate students in a better way (Smith, 2020); (Johnson, T., Brown, R., & Walker, 2021); (Mea, 2024). These results are supported by research (Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, 2020), which states that innovations in teaching methods, such as flipped classroom and blended learning, make the learning process more interactive and engaging for students. The innovation of teachers at Sultan Agung Private Junior High School in Pematangsiantar has not been optimal. This can be seen from the fact that many teachers still rely on conventional methods, such as one-way lectures and discussions, so that they are less able to attract students' interest and make the material more relevant to their lives. In addition, there are limitations for teachers in adopting more interactive and collaborative learning methods. Many teachers still rely on traditional teaching methods, such as direct instruction, which limit student exploration and reduce opportunities for independent learning.

Technology plays an important role in improving teacher performance by providing convenience in planning, implementing, and evaluating learning more effectively and efficiently (Khayroiyah, S. & Nasution, 2018); (Harahap, 2020). Teachers' performance in learning is supported by the use of ICT, especially for looking for main teaching materials and enrichment, provision of teaching materials, as a medium learning, assisting in the formulation and making of questions, value management, and file storage (Amrullah, A.M., Citriadin, Y. & Thohri, 2023). The use of

technology, such as online learning platforms, interactive media, and evaluation software, is able to increase the effectiveness of teachers in delivering material and monitoring student progress in real-time (Smith, J. & Lee, 2021); (Lestari, D. & Nugroho, 2022). A study by (Wang, 2019); (Lagesang, G.C., Sumual, H. & Parinsi, 2021) highlights that teachers who make optimal use of technology can more easily accommodate different learning styles of students, thereby improving student understanding and engagement in the classroom. In addition, research from (Silvia, M. & Gonzales, 2021); (Anderson, M. & Kim, 2022) reveals that technology encourages teachers to continue learning and adapt to new developments, which ultimately increases their professionalism and motivation in teaching.

The use of technology by teachers of Sultan Agung Private Junior High School in Pematangsiantar has not been optimal. This can be seen from the fact that some teachers experience resistance or rejection of new technology, both because they are used to traditional teaching methods and because of fear of technological complexity. Teachers lack confidence or feel threatened by change so they are reluctant to adopt multimedia in the classroom. Some teachers do not have sufficient skills to use multimedia effectively in the learning process. In addition, some teachers still have low digital literacy, which causes difficulties in finding, verifying, and using online resources optimally.

Based on the above explanation, it is important to deeply examine how innovation and technology can contribute to improving teacher performance, especially at Sultan Agung Private Junior High School Pematangsiantar. The use of innovation and technology in the world of education not only increases the effectiveness of teaching, but also encourages teachers to continue to develop and adapt to the needs of 21st century learning. Therefore, this study aims to analyze the influence of innovation and technology on teacher performance, which is expected to provide guidance for educational institutions in optimizing the potential of technology as a support for improving teaching quality.

RESEARCH METHODOLOGY

The research method used in the study is a quantitative method with a survey approach. This study aims to identify and analyze the relationship between innovation and technology variables and teacher performance. The population of this study is all teachers at Sultan Agung Private Junior High School Pematangsiantar, and the number of samples taken is 30 people. The sampling technique uses purposive sampling, which is to select teachers who are active in using technology in learning activities to get relevant results.

Data was collected through a structured questionnaire consisting of a number of closed questions regarding the application of innovation, the use of technology, and aspects of teacher performance. Each response from the questionnaire will be measured using a Likert scale with five answer choices, ranging from "strongly disagree" to "strongly agree." The collected data will be analyzed using descriptive statistical methods to see the distribution of data and inferential statistics in the form of linear regression analysis to determine the influence of innovation and technology on teacher performance (Sugiyono, 2017). Before conducting the analysis, validity and reliability tests will be carried out to ensure that the questionnaire used is feasible and consistent. The results of this study are expected to provide a clear picture of the extent to which innovation and technology affect teacher performance, as well as provide strategic recommendations for the development of education quality in the school.

Dalam penelitian ini, pengurangan data dilakukan melalui proses seleksi dan penyederhanaan data mentah yang telah dikumpulkan, seperti hasil kuesioner, wawancara, atau observasi. Data yang tidak relevan dengan fokus penelitian akan dieliminasi, sementara data yang mendukung tujuan penelitian diorganisir secara sistematis untuk mempermudah analisis. Penyajian data dilakukan dengan menggunakan tabel, diagram, atau narasi deskriptif untuk menggambarkan temuan secara jelas dan terstruktur, sehingga memudahkan pembaca dalam memahami pola

hubungan antara inovasi, teknologi, dan kinerja guru. Teknik penyajian ini juga dapat mencakup pengelompokan data berdasarkan kategori tertentu, seperti tingkat adopsi teknologi atau jenis inovasi yang diterapkan. Penarikan kesimpulan dilakukan dengan menganalisis pola-pola yang muncul dari data yang telah disajikan, menggunakan metode induktif atau deduktif. Proses ini bertujuan untuk mengidentifikasi hubungan antara variabel penelitian, membandingkan temuan dengan teori yang relevan, serta menghasilkan simpulan yang sesuai dengan tujuan penelitian. Dengan pendekatan yang sistematis, proses ini memastikan bahwa hasil penelitian akurat, valid, dan dapat memberikan kontribusi signifikan dalam memahami dampak inovasi dan teknologi terhadap kinerja guru.

RESULTS AND DISCUSSIONS

Before conducting the analysis, validity and reliability tests will be carried out to ensure that the questionnaire used is feasible and consistent. Table 1 and Table 2 show the results of validity and reliability testing.

Table 1.
Validity Test Results

Variable	Item Instrument- Total Correlation	r-table	Result
Innovation	0.496	0.3	Valid
Technology	0.602	0.3	Valid
Teacher Performance	0.712	0.3	Valid

Based on the results of the validity test in Table 1 above, it can be seen that the calculation of each variable is greater than the critical (0.3), so it can be concluded that all indicators of this research variable are valid (Ghozali, 2018).

Table 2.
Reliability Test Results

Variable	Cronbach's Alpha	Instrument Items	Result
Innovation	0.969	12	Reliable
Technology	0.969	9	Reliable
Teacher Performance	0.968	42	Reliable

Based on the results of the reliability test in Table 2 above, it shows that all indicators have a value of Cronbach's alpha if item deleted > 0.70 so it can be concluded that all indicators of the variables in the study are reliable (Ghozali, 2018).

Normality Test

Normality test to determine whether the data obtained has a normal or near-normal distribution. The results of the normality test can be seen in the following Table 3:

Table 3.
Normality Test Results

Variable	N	K-S Test	Asymp. Sig. (2- Tailed)
Innovation	30	0.803	0.539
Technology	30	1.278	0.076
Teacher Performance	30	0.667	0.766

Based on the table of normality test results in Table 3 above, the Asymp Sig. (2-Tailed) value of each variable is above 0.05 so it can be concluded that each variable has a normal distribution (Ghozali, 2018).

Multiple Linear Regression

The main function of linear regression testing is to understand and predict the relationship or influence between the predictor variable and the response variable. The results of linear regression analysis can be seen in the following table:

Table 4.
The Results of the Multiple Linear Regression Test

Model	Unstandardized Coefficients		Standardized Coefficients
	B	Std. Error	Beta
1 (Constant)	72.072	19.419	
Innovation	1.479	.472	.489
Technology	1.048	.491	.333

a. Dependent Variable: Teacher Performance

Based on the results of multiple linear regression analysis, the regression equation $Y = 72.072 + 1.479 X_1 + 1.048 X_2$ was obtained. This regression equation shows that both innovation and technology contribute positively to teacher performance. In this context, innovation has a slightly greater influence than technology on improving teacher performance, but both play a significant role. This model illustrates that strategies that focus on increasing innovation and use of technology in schools can be effective in improving teacher performance.

Correlation Coefficient and Determination Coefficient

Correlation coefficient testing provides information about the strength and direction of the relationship between variables, while the determination coefficient indicates how well the model or independent variable explains the variation in the dependent variable. These two tests are very important in regression and correlation analysis to understand the linkage and effectiveness of variables in a model.

The results of the calculation of the correlation coefficient and determination coefficient can be seen in the following table:

Table 5.
Correlation Coefficient and Determination Coefficient Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.719 ^a	.517	.482	8.828

a. Predictors: (Constant): Innovation, Technology

b. Dependent Variabel: Teacher Performance

Based on Table 5 above, the correlation coefficient (r) of 0.719 shows a strong relationship between innovation and technology and teacher performance at Sultan Agung Private Junior High School Pematangsiantar. The determination coefficient (R) of 0.517 shows that the innovation and technology variables can be responsible for 51.7% of the teacher's performance, while the other 48.3% can be responsible for other unrelated variables.

Hypothesis Testing

Hypothesis testing serves to determine whether there is enough evidence from the data sample to support or refute a statement or conjecture about the population. In research, hypothesis testing is very important because it helps researchers in making objective and reliable conclusions based on data. The results of hypothesis testing can be seen in the following table:

Table 6.
Calculated F Test Results

Model	F	Sig.
1 (Constant)	14.471	.000 ^b
Residual		

 Total

- a. Predictors: (Constant), Innovation, Technology
 b. Dependent Variable: Teacher Performance

Based on Table 6 above, the hypothesis test with an F_{cal} value of 14.471 > F_{table} of 3.354, or a significance level of 0.000 which is smaller than α (0.05), shows that innovation and technology make a positive and significant contribution to the performance of teachers of Sultan Agung Pematangsiantar Private Junior High School. Innovation and technology affect teacher performance by providing access to a variety of tools and methods that enrich the learning process and increase efficiency. The use of digital devices, such as online learning platforms and classroom management software, allows teachers to create a learning environment that is more flexible, interactive, and responsive to student needs. Technology allows teachers to access a wider variety of teaching materials and update their knowledge quickly, so they can teach more effectively and in accordance with the times. Innovations such as student data analysis help teachers understand student learning patterns in more depth, allowing for adjustments to teaching strategies to support individual progress. In addition, technology-based training and collaborative platforms expand teachers' networks in sharing best practices and innovative teaching methods. Overall, innovation and technology strengthen teachers' capacity to deliver more meaningful teaching, increase their productivity, and make it easier for them to adapt teaching methods to diverse student needs, positively impacting learning outcomes. These results are in line with a study conducted by (Al-Fadhli, H. dan Al-Harbi, 2019) which found that teachers who adopt educational technology in their teaching have improved performance in terms of lesson planning, implementation, and classroom management. On the other hand, research (Zhang, H., Liu, F. & Li, 2021) shows that the successful implementation of technological innovations in learning is highly dependent on teachers' attitudes and skills in adopting these technologies. Innovation is needed so that the use of digital technology can be carried out optimally and comprehensively. For this reason, cooperation from all elements of society is needed to support to optimize various educational innovations based on digital technology (Ambarwati, 2021).

Table 7.
Test Results tcalculated Innovation against Teacher Performance

Model	T	Sig.
1 (Constant)	4.246	.000
Innovation	4.652	.000

- a. Dependent Variable: Teacher Performance

Based on Table 7 above, it can be seen that the t_{count} value on the innovation variable is 4.652 > t_{table} is 2.04841 or a significant level of 0.000 < α (0.05), showing that innovation makes a positive and significant contribution to the performance of teachers of Sultan Agung Pematangsiantar Private Junior High School. The innovation of the teachers of Sultan Agung Pematangsiantar Private Junior High School can be seen from the adoption of technology and learning methods that suit the needs of students. Teachers of Sultan Agung Private Junior High School Pematangsiantar use a digital learning platform to prepare and deliver material interactively, so that students can more easily access information and be actively involved in the learning process. The technology also allows teachers to compile app-based assessments, which provide real-time student performance evaluation data. This helps teachers identify areas that need improvement in each student, as well as provide more targeted input. This innovation is also supported by periodic training given to teachers so that they are always able to keep up with the development of modern teaching methods. As a result, teachers at Sultan Agung Private Junior High School Pematangsiantar are not only more effective in delivering materials, but also more responsive to the individual needs of students, which ultimately improves the quality of education at this school. The results of this

study are in line with research (Karim, 2019); (Erawati, 2020) which found that innovation has a positive impact on improving teacher performance.

Table 8.
Test Results tcalculated Technology against Teacher Performance

Model	T	Sig.
1 (Constant)	6.837	.000
Technology	3.815	.001

a. Dependent Variable: Teacher Performance

Based on Table 8 above, it can be seen that the t value on the innovation variable is 3,815 > t table is 2.04841 or a significant level of $0.001 < \alpha (0.05)$, indicating that technology makes a positive and significant contribution to the performance of teachers of Sultan Agung Pematangsiantar Private Junior High School. Through the use of digital devices, such as laptops and projectors, teachers can display the subject matter in a more engaging and interactive way, making it easier for students to understand the topics being taught. E-learning platforms and classroom management apps allow teachers to digitally monitor student attendance, assignment performance, and progress, saving administrative time and allowing for a greater focus on teaching. In addition, technology makes it easier for teachers to access additional materials and relevant up-to-date learning resources, expanding their horizons and teaching ideas. This technology support allows teachers at Sultan Agung Private Junior High School Pematangsiantar to improve their performance by providing a more adaptive, efficient, and engaging learning experience for students. This result is in line with (Hero, 2019); (Harahap, 2020) found that technology makes a positive contribution to improving teacher performance.

CONCLUSION

Innovation and technology have a significant role in improving teacher performance in the school. The application of innovation in learning strategies and the use of digital technology has been proven to enrich teaching methods and help teachers in delivering material more effectively and efficiently. Technology, such as e-learning platforms and classroom management applications, also makes it easier for teachers to assess and monitor student development, so that the available time can be allocated more optimally for teaching. Overall, the results of this study confirm that the combination of innovation and technology has a positive impact on teacher professionalism and productivity, as well as creating a more adaptive and responsive learning environment at Sultan Agung Private Junior High School Pematangsiantar. This study has limitations in the scope of a limited sample, focuses only on the influence of innovation and technology without considering other variables, and the duration of the study is short so that it cannot measure the long-term impact. In addition, the data collection methods and technology exploration used have not fully illustrated the complexity of application in teaching. Future research can expand the scope of the region, integrate other variables such as work motivation and education policy, and develop more specific models of educational technology. Long-term studies and analysis of implementation constraints are also important to support the development of relevant policies and practices.

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