

The Role of Digital Applications in Moderating the Influence of Learning Innovation and Teaching Motivation on Teacher Performance in Public Elementary Schools

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ARTICLE INFO	ABSTRACT
Keywords: Digital Applications, Instructional Innovation, Teacher Motivation, Teacher Performance	The contemporary education system is faced with significant problems in maintaining the quality of instruction, especially related to the performance of educators in the digitalization era. This study aims to analyze the influence of instructional innovation and teacher motivation on teacher performance, as well as to examine the role of digital applications as a moderating variable in this relationship. This quantitative study involved a sample of 88 elementary school teachers in the East Pontianak District. The results indicate that instructional innovation, on its own, has a positive but insignificant effect on teacher performance; this suggests that innovative ideas lacking concrete supporting tools risk increasing cognitive load and reliance on trial-and-error methods in the classroom. Conversely, teacher motivation was found to have a positive and significant impact on teacher performance, underscoring the crucial role of intrinsic motivation in fostering resilience, passion, and teaching productivity. Regarding its moderating role, digital applications significantly strengthened the relationship between instructional innovation and teacher performance by acting as enablers that facilitate more structured and effective innovation implementation. However, digital applications exerted a significant negative moderating effect (a dampening effect) on the relationship between teacher motivation and teacher performance; excessive or administratively heavy technology use can trigger digital fatigue and technostress, potentially eroding the teachers' genuine motivational energy.
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1. INTRODUCTION

The contemporary education system is faced with significant problems in maintaining the quality of instruction, especially related to the performance of educators in the digitalization era. Educator performance can be classified as work output in terms of the quality and quantity obtained by an educator in carrying out his obligations in accordance with the mandate given.

Educator performance has a vital meaning because it has the potential to improve the quality of alumni and foster a symbiotic mutualistic relationship between educational institutions and the public. Previous studies have emphasized that educator performance is greatly influenced by pedagogical reforms. Based on Mulyasa (2021), pedagogical renewal is a must for educators in order to create a

supportive and imaginative educational environment, which will inherently increase the effectiveness of instruction or the performance of the educator.

The work performance of a teacher is very determined by the degree of motivation he has. As explained by Sedarmayanti (2017), an Indonesian education management expert, work performance is the result of a combination of ability and motivation. When motivation is weak, teachers with superior competence are at risk of failing to achieve optimal work results, due to the lack of internal stimuli to welcome professional success. This kind of motivation essentially shapes the teacher's perspective on his or her professional responsibility in facilitating the development of student learning.

In the context of the industrial revolution 4.0, the use of digital platforms has become a crucial factor in determining performance. Rusman (2018) argues that the integration of information technology into the educational process through digital applications provides convenience for educators in administration, the implementation of accurate assessments, and the delivery of teaching materials that are not hindered by geographical and time limitations. The increased efficiency offered by these digital solutions allows educators to allocate more attention to improving the quality of teaching.

Although the Pontianak City Government, through the Education and Culture Office, always strives to improve competence, including managerial coaching and strengthening digital literacy, the actual conditions in the field indicate that there are obstacles in maintaining the consistency of the performance of educators. Internal data from the performance evaluation, which includes the results of academic supervision and the filling of Employee Performance Targets (SKP), show a fairly obvious downward trend in several key indicators of the performance of public elementary school teachers in all sub-districts. Several studies show that innovation in learning has a meaningful positive influence on performance. Wahyuni (2021) stated that the higher the level of innovation in teaching methods applied by teachers, the better the quality of teaching produced. However, these findings are different from the research results of Purwanti & Pasaribu (2024) in the context of other service industries which indicate that innovation sometimes does not have a direct impact on increasing the intensity of work behavior or repurchase intentions if it is not supported by image or reputation factors.

Innovation will have maximum impact if supported by a qualified digital infrastructure. Without digital applications, innovation tends to be static. With digital applications, innovation becomes more dynamic, measurable, and interactive. This argument is also in line with the opinion of Hattie (2009 & 2023): Emphasizing that technology increases teachers' instructional effectiveness when used to provide quick feedback (a key feature of digital applications). In the education sector, this view is reinforced by the observation that overly complex innovations, without sufficient training, have the potential to complicate teachers' tasks. This is due to increased cognitive load and the need for more preparation time. Furthermore, there was a discussion about the significance of motivation as the main catalyst in determining performance. Conventionally, Sedarmayanti (2017) argues that motivation is a determinant of performance. However, a study by Sohail & Riaz (2020) indicates that in a highly structured or bureaucratic work environment, high motivation does not always lead to a substantial improvement in performance. This depends on the presence of technical competence and adequate systemic support. Furthermore, the findings of Ramadhany Erlinda & Ratnawati (2022) suggest that internal factors, including competence or motivation, often do not have a direct impact on the final outcome (such as retention or performance), but rather require the mediation of certain variables.

Limitations of Previous Research Research conducted by Ramadhany Erlinda & Ratnawati (2022) showed that intermediate variables such as brand image were only able to explain the change in the bound variable by 36.6%. This value is relatively small, so there are still 63.4% of other factors that have not been researched. Therefore, in this study, in addition to including the variables of Learning Innovation, Digital Applications and Teacher Motivation are also included as variables that are estimated to have a strong influence on teacher performance in State Elementary Schools in East Pontianak District.

This research aims to bridge the gap between expectations and reality in the application of digital learning innovations and teachers' motivation that affects their performance, so that it can provide applicable recommendations to improve the quality of education in the elementary school environment. This research is expected to enrich science, especially in the field of education in the management of learning innovations and teacher motivation to use digital applications in learning.

2. METHODS

This study uses a quantitative approach. The population in this study is all State Elementary School teachers in East Pontianak District which totals 322 people. Given that the population is more than 100 people, sampling is carried out at 25% of the total population. The sample in this study amounted to 88 people. The sampling technique used is Proportional Stratified Random Sampling (Sugiyono, 2017), so that each State Elementary School in East Pontianak District gets proportional representatives according to the number of their respective teachers." The number of representative samples amounted to 88 respondents. After the data is collected, the next step is to conduct descriptive statistical analysis (mean, median, mode, standard deviation, frequency, percentage) to describe the characteristics of respondents and the distribution of the research variables and use Sugiono (2022) statistics. The analysis method used in this study is Partial Least Squares (PLS), the software is used to test the relationships between complex variables. This analysis is divided into two main stages: Evaluation of Measurement Model (Outer Model) and Evaluation of Structural Model (Inner Model).

3. RESULTS AND DISCUSSION

Results

The model in this study was carried out using the partial square (PLS) method supported by smartpls 4.0 software. PLS is an alternative method of structural equation modeling, which can be implemented in dealing with very complex variable measurement problems.

The initial stage in the evaluation of the Partial Least Square (PLS)-based research model is to conduct an external model analysis or also known as a measurement model. This analysis is crucial to ensure that each indicator used is truly capable of representing the latent variables being studied. Without valid and reliable instruments, the results of hypothesis testing at a later stage will not have scientifically accountable accuracy.

According to Ghozali and Latan (2020), the outer model defines how each indicator relates to its latent variable. The validity test in the outer model aims to measure the extent to which the indicator is accurate in explaining the variable in question. In line with this, Hair et al., in an adaptation by Sholihin and Ratmono (2021), emphasized that outer model testing is a mandatory prerequisite before conducting an inner model analysis (structural model). The strong validity of the indicators shows that the measuring tools used in this study have good internal consistency and are able to accurately capture empirical phenomena.

Therefore, in this section, the results of the validity test will be presented to ensure that all statement items in the questionnaire have met the statistical requirements set before testing the relationship between variables

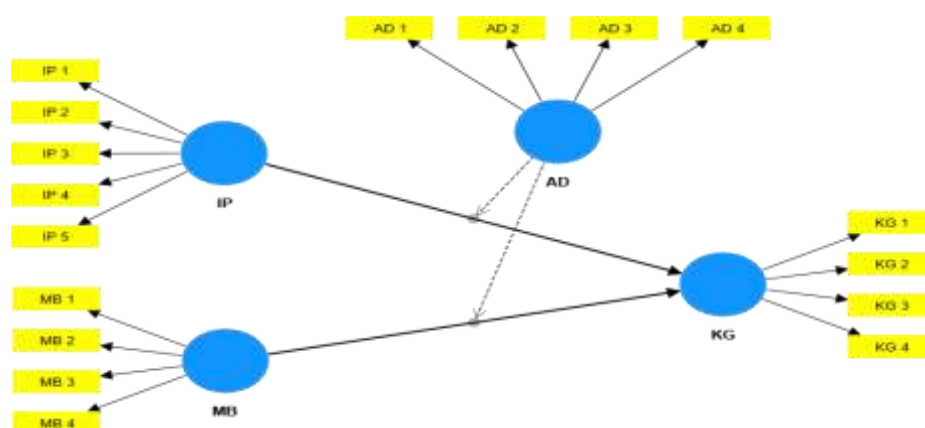


Figure 1. Outer Model of the First Research Variable

Source: data processed with SPSS Year 2026

Based on the results of data analysis in this study, a summary of reliability values for the variables of Learning Innovation (X1), Teacher Motivation (X2), Teacher Performance (Y), and Digital Application (Z) are presented in the following table:

Table 1. Reliability Test Results

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
AD	0,940	0,945	0,958	0,850
IP	0,873	0,879	0,914	0,727
KG	0,807	0,816	0,874	0,636
MB	0,907	0,935	0,936	0,787

Source: SmartPLS processed data, 2026

Based on the empirical data presented in Table 4.12, the Internal consistency is exceptional because the entire research construct, which includes Learning Innovation (X1), Teacher Motivation (X2), Teacher Performance (Y), and Digital Application (Z), shows a very high degree of reliability. This is evidenced by Cronbach's Alpha and Composite Reliability values (both rho_a and rho_c) which significantly exceed the conservative threshold of 0.70. This indicates that the instrument items have a very solid internal coherence in measuring the phenomenon being studied.

The accuracy of the representation of the test variance to the Average Variance Extracted (AVE) value confirms the conclusive fulfillment of the convergent validity. All variables recorded an AVE value above the standard of at least 0.50, with the digital application variable (Z) reaching the highest number of 0.850. This means that the majority of the variances of the empirical indicators are successfully absorbed and explained accurately by their respective latent constructs. Functionally, these results confirm that the research instrument has precise measurement stability. The high reliability value ensures that if this instrument is tested again on different samples but under similar conditions, it will provide consistent measurement results that can be scientifically accounted for.

Inner Model Analysis (Inter-Variable Influence)

As for after going through the outer model evaluation stage which ensures that all research instruments meet the criteria of validity and reliability, the next stage of analysis is the evaluation of the structural model or inner model. This analysis aims to predict the relationship between latent variables and test the strength of the model that has been theoretically constructed.

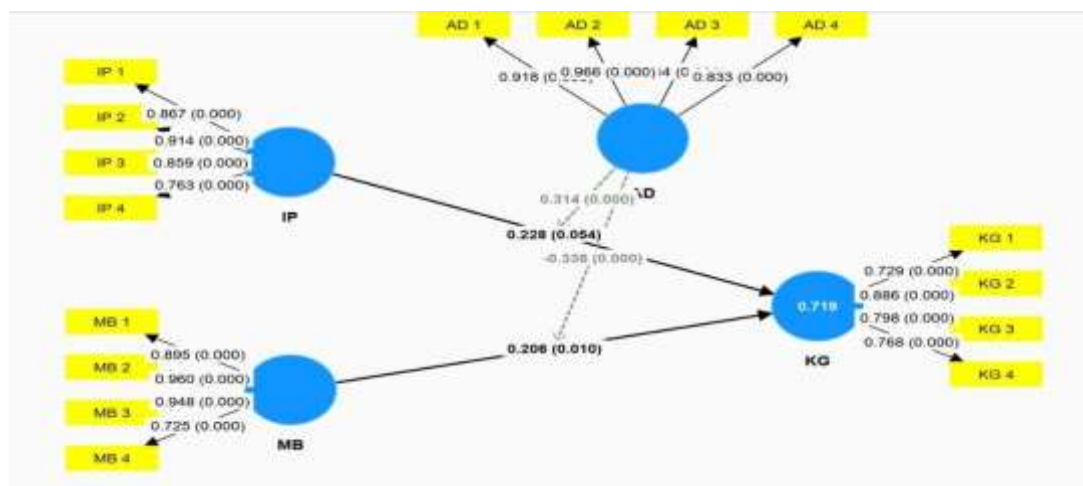


Figure 2. Structural Models

Source: smartPLS processed data, 2026

Tabel 3. Path coefficients-Mean, STDEV, T Values, P Values

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
AD → KG	0,532	0,522	0,110	4,842	0,000
IP → KG	0,228	0,241	0,118	1,930	0,054
MB → KG	0,206	0,195	0,080	2,575	0,010
AD x IP → KG	0,314	0,291	0,083	3,790	0,000
AD x MB → KG	-0,336	-0,312	0,076	4,424	0,000

Source: SmartPLS processed data, 2026

The inner model shows the strength of the relationship between constructs through the Path Coefficient value. With the following details:

1. X1. Learning Innovation → Y. Teacher Performance

The value of the Original Coefficient of the Sample with a value of 0.228 (Positive), T-Statistic with a value of 1.930 (< 1.96) and the P-Value with a value of 0.054 (> 0.05). This shows that learning innovation has a positive but not significant effect on teacher performance. Every improvement in learning innovation has not been able to be followed by an improvement in teacher performance. Thus, Hypothesis 1 which reads that Learning Innovation has a positive impact on Teacher Performance, is unacceptable.

2. X2. Teacher Motivation → Y. Teacher Performance

Value of Original Sample Coefficient with value of 0.206 (Positive), T-Statistic with a value of 2.575 (> 1.96) and P-Value with a value of 0.010 (< 0.05).

The Influence of Learning Innovation (IP) on Teacher Performance (KG)

The results of the analysis showed a unique relationship, where Learning Innovation independently had a positive but insignificant influence on Teacher Performance (coefficient = 0.228; $p = 0.054$). Theoretically, if referring to Rogers' Diffusion of Innovations Theory, an innovation does not necessarily directly improve the performance of an organization or individual before passing the implementation stage supported by the right channels. These non-significant findings are theoretically explained by Serdyukov (2020), who posits that innovative ideas or updates of methods designed by teachers are often only abstract concepts if they do not have concrete supporting instruments or infrastructure. When teachers try to innovate without adequate tools, they are faced with increased

cognitive overload and trial-errors that take up class time. As a result, stand-alone innovations have not been able to make a strong enough contribution to boost teacher performance scores statistically in this study.

The Influence of Teacher Motivation (MB) on Teacher Performance (KG)

The test results proved that Teacher Motivation had a positive and significant effect on Teacher Performance (coefficient = 0.206; $p = 0.010$). The main theoretical underpinning of this relationship is the Self-Determination Theory (SDT) by Decy & Ryan (updated by Howard et al., 2021). Based on SDT theory, motivation (especially intrinsic motivation such as soul calling, autonomy, and a sense of competence) is the main driving force for individual behavior. Highly motivated teachers will show strong resilience, high dedication in the classroom, and commitment to continuously improve the quality of teaching. This is in line with the opinion of Hasibuan (2016) that the importance of motivation is because motivation is something that causes, channels, and supports human behavior, so that they are willing to work hard and enthusiastically to achieve optimal results. "Providing the right motivation will increase one's job motivation, job satisfaction, and work productivity." So it can be implied that teachers' ethics have a strong motivation for learning (either because of a supportive school environment or the satisfaction of seeing students succeed), their passion and teaching productivity will increase sharply, which automatically boosts the quality of their performance.

The Role of Digital Application Moderation (AD) in the Relationship of Learning Innovation (IP) to Teacher Performance (KG)

One of the most important findings in this study is that Digital Applications are proven to significantly moderate and strengthen the relationship between Learning Innovation and Teacher Performance (coefficient = 0.314; $p = 0.000$). This strengthening effect is comprehensively explained through the theoretical foundation of TPACK (Technological Pedagogical Content Knowledge) developed by Koehler and Mishra (updated by Mishra, 2020). When teachers master the slice between technology, pedagogy, and content (TPACK), they no longer feel anxious or stuttering technology in the classroom. This confidence triggers a strong intrinsic motivation. Confident teachers have more stable performance, are more courageous to innovate, and are not easily stressed in the face of curriculum challenges. Digital applications act as enablers or practical bridges.

Complex innovation ideas executed manually can now be implemented easily, structured, and engaging with the help of digital applications (e.g. digital quiz interactivity, abstract concept visualization, or flipped classroom Learning Management System-based classrooms). This interaction produces synergies that massively multiply the effectiveness of teacher teaching, thus being able to significantly improve their performance.

The Role of Digital Application Moderation (AD) on the Relationship of Teacher Motivation (MB) to Teacher Performance (KG)

On the other hand, statistical testing showed that Digital Applications moderated significantly but in a negative direction/weakened the relationship between Teacher Motivation and Teacher Performance (coefficient = -0.336; $p = 0.000$). This phenomenon of dampening effect can be dissected theoretically using the concepts of Technostress and Cognitive Load Theory in the context of the adoption of educational technology (Syvänen et al., 2022).

Theoretically, when teachers have high intrinsic work motivation (focusing on emotional aspects, moral guidance, and humanistic face-to-face interaction with students), digital application interventions that are too intensive or bureaucratic-administrative can actually create digital fatigue.

Expert opinions from Taimalu and Luik (2021) support this by stating that the pressure of digital overload forces teachers to shift their focus and valuable time to solving technical problems of the application. As a result, teachers' pure motivational energy to teach is distorted or eroded by the rigid demands of technological adaptation. The effect of this negative interaction shows that the higher the dependence or compulsion on the use of digital applications, the strength of the work motivation relationship in producing optimal performance will tend to flatten or decrease.

4. CONCLUSION

Based on the results of data analysis and discussions that have been carried out in the previous chapter regarding efforts to improve teacher performance in State Elementary Schools in East Pontianak District by involving 88 respondents, the following conclusions can be drawn: 1) Learning Innovation (X1) has a positive but not significant effect directly on Teacher Performance (Y). This indicates that the ideas or learning renewal methods designed by teachers have not been able to change or improve performance significantly if the innovative ideas stand alone without being supported by the right execution media. 2) Teacher Motivation (X2) has a positive and significant effect directly on Teacher Performance (Y). Psychological motivation, both in the form of internal commitment and external rewards, has proven to be an effective driving force for teachers to perform at their best in the classroom. 3) Digital Application (Z) has a positive and significant effect with Learning innovation (X1) on Teacher Performance (Y). Statistical testing significantly proves that digital applications play a role as a moderation variable that strengthens the relationship between innovations, learning and teacher performance. These results confirm that digital platform engagement acts as an accelerator of effectiveness; Innovative ideas in learning will result in a much more exponential increase in educator performance if optimally integrated with digital technology. 4) Digital Application (Z) is not significant with the motivation of the Teacher (X2) to the Teacher's Performance (Y). The negative effect of this interaction indicates the phenomenon of technostress or digital fatigue. The results of the data analysis rejected the fourth hypothesis which assumes that digital applications strengthen the influence of motivation on teacher performance. On the contrary, it was found that there is a significant negative moderation role. This phenomenon indicates that instead of being a catalyst, excessive or overly complex use of digital applications has the potential to become an administrative/technical burden that distorts the positive contribution of work motivation to the effectiveness of teacher performance in the field.

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