Vol. 14, No. 02, pp. 1008-1022, 2024 DOI: 10.23960/jpp.v14.i2.202474

Jurnal Pendidikan Progresif

e-ISSN: 2550-1313 | p-ISSN: 2087-9849

http://jurnal.fkip.unila.ac.id/index.php/jpp/

The Quality of Teaching Digitalization in Primary School Context and Its Relationship to Leadership and Work Motivation

Sulastri[1], Nurkolis[1*], Widya Kusumaningsih[1] & Milagros Racacho Baldemor[2]

[1]Department of Educational Management, University of PGRI Semarang, Indonesia

[2]College of Graduate Studies, Don Mariano Marcos Memorial State University, Filipina

*Corresponding email: nurkolis@upgris.ac.id

Received: 19 June 2024 *Accepted: 24 July 2024* *Published: 14 August 2024*

Abstract: The Quality of Teaching Digitalization in Primary School Context and Its Relationship to Leadership and Work Motivation. Objectives: This research aims to determine the influence of principal leadership and teacher work motivation on the quality of digitalization of teaching. **Methods**: This research method is quantitative causal comparative with teacher and school principal participants. Population 403 people, research sample 200 people with simple random sampling. The instrument has passed the validity test, reliability test and prerequisite test. Hypothesis testing uses correlation tests and analysis of variance. **Findings**: The research results show that there is a positive influence of the principal's leadership on the quality of teaching digitalization, there is a positive influence of teacher work motivation on the quality of teaching digitalization, and there is a joint positive influence of the principal's leadership and teacher work motivation on the quality of teaching digitalization. **Conclusion**: It can be concluded that the results of this research reaffirm how important the role of school principal leadership and teacher work motivation is in realizing teaching quality.

Keywords: digitalization school management, digitizing schools work, supportive leadership, intrinsic motivation, digital scholarship.

To cite this article:

Sulastri, Nurkolis, Kusumaningsih, W., & Baldemor, M. R. (2024). The Quality of Teaching Digitalization in Primary School Context and Its Relationship to Leadership and Work Motivation. *Jurnal Pendidikan Progresif*, *14*(2), 1008-1022. doi: 10.23960/jpp.v14.i2.202474.

INTRODUCTION

Intelligence engineering and the Internet of Things that marked the industrial revolution 4.0 made human and machine connectivity possible (Schwab, 2019). This revolution cannot be separated from the development of information technology which is applied in various fields of life and changes the way humans live (Rastogi, 2019). Politics in various parts of the world are currently promoting digitalization in all areas including education (Jedeskog, 2007). Digitalization of education has become an educational policy trend in the European Union (Zancajo et al., 2022), with Russia even setting a goal of creating digital schools by 2024 (Griban et al., 2019).

Digitalization of education has opportunities such as expanding boundaries, improving quality, making assessment easier (Frolova et al., 2020), developing school organizations (Genlott et al., 2023). Digitalization of education also has challenges because it is not easy to implement (Jedeskog, 2007). The process of digitizing education is complicated and tends to be difficult to continue (Aesaert et al., 2015; Hauge, 2014; and Chania et al., 2018). Technology applied to education is not something completely new, just repeating previous practices (Glover et al., 2016).

Another challenge of digitalizing education is getting rid of senior teachers whose digital competence is inadequate (Frolova et al., 2020).

The digitalization of education in Indonesia started in 2019 by implementing online teaching, but until now it has not been implemented effectively. The implementation of digitalization of education in Central Java is less effective due to three obstacles, namely pedagogical, technological, and economic constraints (Muhdi & Nurkolis, 2020) and (Muhdi et al., 2020). Likewise, digitalization in Madrasas faces similar problems, namely the internet (Muhdi & Nurkolis, 2020). Digital facilities and parental support vary widely, resulting in digital teaching inequality between different groups of students in Indonesia (Chen et al., 2021). McKinsey reports from developed countries show that teachers in poor schools mentions that digitalization is ineffective (Chen et al., 2021). Based on an initial survey of teachers at the research location, 85% had not implemented digitalization of teaching. Meanwhile, a survey on activities in teacher working groups shows that 80% of schools lack of digital devices such as computers, tablets, internet, and others, so they have not been able to implement digitalization of teaching optimally.

The results of research on the digitalization of teaching show that there are inconsistencies, some positive and some negative. It is also recognized by (Calero & Ferrà, 2014) that although there is a lot of research on digital education, there is no consensus regarding the impact of digital resources on the educational process. Most of the literature considers technology as an opportunity to transform educational processes and pedagogy, align education with the demands of a digital society (Joo et al., 2017), increase peer collaboration, and share information in the classroom (Nelson et al., 2011).

Digitalization of schools in the Maldives began in 1986 and has the potential to make teaching cost-effective and equitable for all children (Azlifa & Saeed, 2021). Digitalization of schools increases students' knowledge base and makes them more confident (Rastogi, 2019). School digitalization has the advantage of expanding boundaries, developing teaching leadership, and modernizing tools for assessment (Frolova et al., 2020). The use of digital technology in education can improve teaching and learning as well as the development of school organizations (Genlott et al., 2023).

On the other hand, the digitalization of education has given rise to several negative things. The weakness of digitalization of education means that students do not focus on lessons and student behavior such as becomes rude (Rastogi, 2019). The risks of digitalization of education are the unequal distribution of skills between age, gender, region and income, and children are not protected from internet risks from cybercrime and human exploitation (Colombo, 2016).

Various previous studies have not confirmed the quality of digitalization of teaching about the leadership of school principals and teacher work motivation. Therefore, the novelty of this research is related to the research focus and research object. Based on this background, this research aims to determine (a) the influence of the principal's leadership on the quality of digitalization of teaching, (b) the influence of teacher work motivation on the quality of digitalization of teaching, and (c) the influence of the principal's leadership and teacher work motivation together on the quality of teaching.

The hypotheses of this research are (a) there is a positive influence of the principal's leadership on the quality of digitalization of teaching, (b) there is a positive influence of teacher work motivation on the quality of digitalization of teaching, and (c) there is a positive influence of the principal's leadership and teacher work motivation together on the quality of teaching.

METHOD

Participants

The population of this study were all teachers and principals who worked at State Elementary Schools in Paguyangan District, Brebes Regency, Central Java Province, totaling 403 people. The sampling technique for this research was simple random sampling with an error rate of 5% using the Slovin formula so that a sample of 200 people was found. The research variables consist of two independent variables and one dependent variable. The independent variables in this research are the principal's leadership and teacher work motivation, while the dependent variable is the quality of digitalization of teaching.

Research Design and Procedures

This article is based on the results of comparative causal quantitative research carried out in the second semester of the 2023/2024 academic year for six months from January to June 2024. The location at the State Elementary School, Paguyangan District, Brebes Regency, Central Java Province. The research steps begin with constructing a theory for each variable, compiling an instrument grid, developing an instrument, conducting instrument trials, taking research data, tabulating data, analyzing data, interpreting data, and making conclusions.

The instrument created by the researchers themselves was tested first before being used as the final instrument. The instrument was tested on 30 respondents other than research respondents. The instrument in the form of a list of questions was given directly to the respondent and after filling it out it was collected to the researcher. After the trial instrument is filled in, the researcher then carries out a validity and reliability test. A list of valid and reliable questions was used as the final research instrument. After the final instrument was given to 200 research respondents, the results were tabulated and prerequisite tests were carried out, namely the normality test, homogeneity test, multicollinearity test, and heteroscedasticity test. The results meet the requirements for hypothesis testing in the form of correlation and determination analysis. Next, the researchers interpreted the results of the hypothesis test and made conclusions.

Instruments

The research instrument is a non-test in the form of a questionnaire developed by the researchers which is filled out based on the respondent's self-reflection. A Likert rating scale using a score range of 1-5 was employed. Details of the research instrument for each variable can be described as follows.

The quality of teaching digitalization variable consists of three dimensions. First dimension is digital scholarship with four indicators: utilizing learning resources based on digital communication technology; using several online learning media; analyze, communicate, and evaluate digital information sources; as well as digital infrastructure readiness. Second dimension is learning skills with four indicators: able to use digital communication technology in the process of teaching and learning activities; able to carry out learning in the network; able to carry out online learning using various information technology applications; and the readiness of teachers and students. Third dimension is technical dimension consisting of three indicators: mastering teaching techniques using digital technology; able to overcome technical and operational problems of digital media; and able to create interactive learning media. Each indicator is represented by three or four questions so that the total questions on the dimensions of teaching quality are 34 items.

Three-dimensional school head leadership variable as follows. The first dimension namely directives dimension has four indicators: quick to make decisions; determine the distribution of tasks to subordinates; and provide necessary

information and instructions. The second dimension is the supportive dimension with four indicators: showing attention to subordinates; hold continuous personal consultations; provide advice on work related issues; and provide encouragement and motivation. The third dimension is the participative dimension consisting of three indicators: allowing teachers to structure their own work; resolve differences or difficulties with subordinates; and involve others in decision making. Each indicator is represented by three or four questions so that there are a total of 30 questions.

The teacher work motivation variable consists of two dimensions, namely internal dimensions consisting of five indicators: A person's perception of themselves; pride; personal expectations; personal needs; and self-desire. External dimensions consisting of four indicators: type and nature of work; the work group a person joins; work environment situation; and salary. Each indicator is represented by one or three questions so that there are a total of 18 questions.

Before being used to collect research data, the instrument was tested for validity and reliability. The instrument is declared to meet construct validity if the questions get a score > 0.30 (Sugiyono, 2015b). The quality of teaching digitalization variable consists of 34 statement items, of which 4 items are not valid so that there were 31 valid items. The school head leadership variable consists of 30 statements, 6 statements are not valid so there were 24 valid statements. The teacher work motivation variable consists of 18 statements and all were declared valid. All variables have met the reliability test because the Cronbach's Alpha value is e" 0.60. Cronbach's Alpha value is declared quite reliable if it is in the range 0.41-0.60 (Simamora, 2004). The quality of teaching digitalization variable with Cronbach's Alpha 0.947 > 0.60, The school head leadership variable with Cronbach's Alpha 0.92 > 0.60, The teacher work motivation variable with Cronbach's Alpha 0.962 > 0.60.

The dimensions and indicators of the final instrument are the same as the dimensions and indicators of the trial instrument. The only difference is the number of questions for each indicator. In the final instrument, the quality of teaching digitalization variable is represented by two to three questions, the principal leadership variable is represented by two to three questions, and in the teacher work motivation variable represented by one to two questions.

Data Analysis

The data analysis procedure begins with analysis of the normality test, linearity test, multicollinearity test, and heteroscedasticity test. The results stated that this research instrument met the standards of normality, linearity, multicollinearity and heteroscedasticity. Therefore, it meets the requirements to use single and multiple correlation parametric statistics, and also meets the requirements to use variance analysis as a hypothesis test. The results of the correlation test are compared with the correlation standard and the level of significance. The results of the analysis of variance are compared with the F table value and the level of significance is taken into account. The structural model test used to test the relationship between variables is the R Square test, where the R Square value is the coefficient of determination (Sekaran & Bougie, 2016). An R Square value of 0.19 is called weak, an R Square value of 0.33 is called moderate, and an R Square value of 0.67 is called strong (Chin, 1998). Data processing uses Microsoft Excel and data analysis uses SPSS version 25.

■ RESULT AND DISCUSSION

The Influence of Leadership on the Quality of Teaching Digitalization

The leadership theory used in this research is the Path-Goal Theory or path-goal theory. According to the path-goal theory, leaders must adapt their leadership based on the characteristics of followers and the type of task to be completed.

Path-goal theory seeks to increase followers' motivation and happiness in every situation (Northouse, 2021). There are four types of path-goal leadership, namely directive leadership, supportive leadership, participative leadership, and achievement orientation (Luthans, 2005). In this research, only three dimensions were taken, namely directive, supportive and participative.

Directive leaders provide task direction and do not involve teachers in significant decision-making in schools, supportive leadership actively provides support for teachers to develop, and participative leadership empowers followers and integrates their opinions and ideas into the policy process (Northouse, 2021). The indicators for each dimension are described as follows. Indicators of directive leadership are quickly taking action or decisions, assigning tasks to subordinates, and providing necessary information and instructions. Indicators of supportive leadership are showing personal attention to subordinates, holding continuous consultations personally, and being friendly or easy to find. Indicators of participative leadership are allowing teachers to structure their work, resolve differences or difficulties with subordinates, and involve other people in decision-making.

The dimensions of the quality of digitalization of teaching in this research consist of the following dimensions and indicators. The digital scholarship dimension is the teacher's ability to use digital media to process information sources as teaching references (Littlejohn et al., 2013). Indicators include the ability to utilize digital-based learning resources, the ability to access and use online learning media, the ability to access, analyze, communicate, and evaluate digital information sources, as well as the readiness of digital infrastructure in schools. The learning skills dimension is the teacher's skill in using digital media to support online learning (Littlejohn et al., 2013). The indicators are using digital communication technology in the process of teaching and learning activities, being able to carry out online learning using a learning platform, and students' readiness for online learning. The technical dimension is the teacher's ability to solve technical and operational problems by using digital media (Ng et al., 2023). The indicators are mastering teaching techniques using digital technology, the ability to create interactive learning media, and the ability to overcome technical and operational problems with digital media.

Descriptive data on the leadership variable of school principals in Paguyangan District, Brebes Regency with a mean value of 100.51 is included in the very high category. Based on the results of the dimension test, the principal's leadership dimension that received the lowest score was supporting, namely 0.661, while the highest was the directing dimension with a value of 0.702. Meanwhile, the variable quality of digitalization of teaching with a mean value of 125.01 is in the high category. Based on the results of the dimension test, the digital scholarship dimension received a value of 0.646 and the highest was the teaching skills dimension with a value of 0.770.

This data shows that the principal gives more orders or directions than provides support in leading the school. Therefore, the Brebes Regency Education Office needs to reinforce school principals to increase their ability to involve teachers in making decisions. The education department also needs to strengthen the ability of teachers to improve their digital leadership skills so they can process digital information to support teaching references.

The correlation between the principal's leadership and the quality of teaching digitalization is 0.974 with a significance of 0.00 (smaller than 0.05), meaning there is a positive and significant influence. This correlation is in the very strong

category because it is in the range of 0.80-1.00 (Sugiyono, 2015a). Meanwhile, the results of the ANOVA test to determine the influence of the principal's leadership on the quality of digitalization of teaching obtained a calculated F of 3,593 > F table of 3.89 with a significance of 0.00. This means that there is a positive and significant influence of the principal's leadership variable on the quality of digitalization of teaching, as shown in Table 1.

Table 1. Analysis of variance (ANOVA)[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19810.529	1	19810.529	3593.827	.000[b]
	Residual	1091.451	198	5.512	-	-
	Total	20901.980	199	-	-	-

a. Dependent Variable: Digitalization of Teaching in Schools (Y)

b. Predictors: (Constant), Principal Leadership (X1)

The results of the determination test between the principal's leadership and the quality of digitalization of teaching are as shown in table 2, which shows that the effect is visible in the R square results, namely 0.948. The R Square value of 0.948 is higher than 0.67, meaning that the determination of the principal's leadership on the quality of teaching digitalization is strong The R Square value of 0.948 is higher than 0.67, meaning that the influence of the principal's leadership on the quality of teaching digitalization is strong (Chin, 1998). This means that 94.8% of the quality of digitalization of teaching is influenced by the leadership of the school principal, while the remaining 5.2% is influenced by other variables that were not studied.

Table 2. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.974[a]	0.948	0.948	2.348

a. Predictors: (Constant), Principal Leadership (X1

This result of research shows how important the leadership role of school principals is in implementing digitalization. Various research results show that for the digitalization of education to be successful, the role of the school principal is dominant. The effective use of digital technology in schools requires fundamental changes from previous habits and requires the commitment of school leaders and authorities (Genlott & Grönlund, 2013). In order for digitalization of education in schools to be effective, there are four categories of implementation, namely determining direction, developing people, developing organizations, and developing teaching and learning (Dexter, 2008).

School digitalization requires supporting institutional conditions for digital innovation, consideration of situational factors, and support from educational organizational resources (Frolova et al., 2020). For digital transformation to occur, change and support must occur at several layers of the organization (Lindqvist & Pettersson, 2018) including organizational, cultural, and administrative changes (Blau & Shamir-Inbal, 2017).

Digitalization of education can be applied in three areas, namely new ways of teaching processes, ways of working, and ways of managing educational organizations (Pettersson, 2021). The digitalization of schools in Poland is

related to ICT media and school management (Szyszka et al., 2022). Digitalization of schools in Russia through curricular and extracurricular activities aimed at the active use of digital educational resources. Forms of school digitalization are electronic journals and electronic diaries (Machekhina, 2017). School digitalization in Sweden uses more information technology to support administration (Klaassen & Löwstedt, 2020).

The application of digitalization of education is related to organizational and leadership changes (Bejinaru, 2019). School digitalization is basically a system for creating an electronic digital school management system, innovative electronic information in the school environment, organizing network-based educational programs, and developing teachers' digital competence and students' digital literacy (Boronenko et al., 2020). School digitalization includes educational organization systems, school administration, and teacher work (Griban et al., 2019). The principals encourage teacher collaboration between teachers. When school principals support collaboration between teachers to develop new teaching practices then teachers may be more inclined to collaborate (OECD, 2016) including new practices in the digitalization of teaching.

This research shows how important the role of school principals as educational leaders is to support the quality of teaching through their teachers. So, school principals need to be able to implement their role as leaders in planning, organizing, implementing, and controlling school programs. The results of this research also indicate that school principals who have good leadership will be able to provide good quality teaching as well.

The Influence of Work Motivation on the Quality of Teaching Digitalization

Work motivation consists of two dimensions, namely the internal dimension called motivational, and the external dimension called origin (Herzberg, 2017). Thus, there are two dimensions of teacher work motivation variables in this research, namely internal dimensions and external dimensions. Internal dimension indicators are a person's perception of themselves, self-esteem, personal hopes, needs, and desires. External dimension indicators are job groups, work environment situations, and salary.

Based on descriptive data, the teacher work motivation variable has an average score of 204.86, which is in the high category. Based on the results of the dimension test, shows that the dimension with the highest value is internal, namely 0.628, while the lowest is the external dimension, namely 0.409. These results show how important internal motivation is for a teacher to be able to improve his performance, in this case, quality digital teaching.

The results of this research support the results of previous research. Intrinsic motivation will play a more important role compared to extrinsic motivation. Extrinsic motivation often hinders someone from performing well. This is because external policies are routine so they lose their motivational effect (Penninckx et al., 2016) and ignoring intrinsic motivation is an excessive justification (Levy et al., 2017). This is also in line with the research results mention that the relationship between teacher work motivation and school reform shows that intrinsic motives are considered the most important motives, while financial incentives have very weak or insignificant value. small influence on work (Mintrop & Ordenes, 2017).

The correlation between teacher work motivation and the quality of digitalization of teaching is 0.339 with a significance value of 0.00 which is smaller than 0.05, which means there is a positive and significant relationship between variables X1 and Y. This correlation value is in the weak category because it is in the range of 0.200-0.399 (Sugiyono, 2015a). Meanwhile, the results of the ANOVA test to determine the effect

of teacher work motivation on the quality of digitalization of teaching obtained a calculated F value of 25,715 > F table of 3.89 with a significance value of 0.00. Thus, it can be concluded that there is a positive and significant influence of teacher work motivation on the quality of digitalization of teaching, as shown in Table 3.

Table 3. Analysis of variances (ANOVA) [a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2402.553	1	2402.553	25.715	.000b
	Residual	18499.427	198	93.431	-	-
	Total	20901.980	199	-	-	-

a. Dependent Variable: Digitalization of Teaching in Schools (Y)

b. Predictors: (Constant), Work motivation of Teacher (X2)

The results of the determination test between teacher work motivation and the quality of digitalization of teaching can be seen in table 4, which shows that the effect is R square, namely 0.115. The R Square value of 0.115 is close to 0.19, meaning that the determination of teacher work motivation on the quality of digitalization of teaching is weak (Chin, 1998). Thus, it can be interpreted that 11.5% of the quality of digitalization of teaching is influenced by teacher work motivation, while 88.5% is the influence of variables that were not studied.

Table 4. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.339[a]	0.115	0.110	9.666

a. Predictors: (Constant), Work motivation of Teacher (X2)

The results of the research above support the results of previous research to determine the influence of teacher motivation variables and teaching variables. Researchers have varied focuses in approaching teaching quality, two core components of teaching quality are teacher knowledge and motivational disposition (Kunter et al., 2013; Fauth et al., 2019; Senden et al., 2022). Research shows that teachers' success in encouraging student learning varies (Fauth et al., 2019; Hattie, 2012; Kyriakides et al., 2013). Student learning outcomes depend on the quality of the teaching they receive, which in turn depends on teacher competency (Fauth et al., 2019; and Kunter et al., 2013). Empirical studies show that scaffolding, teacher feedback, clarity of presentation, and adequate pacing can promote classroom learning (Hattie, 2012; and Seidel & Shavelson, 2007). In Russia, education problems are mainly related to student motivation, not digital literacy. So the priority direction of state policy in the field of education must be the development of highly qualified teachers (Polikarpova et al., 2020).

School principals have a strategic role to continue to motivate teachers so that the quality of teaching by utilizing digital devices can improve. Ensuring that teachers are motivated and fully engaged in their work is essential to achieving educational success (Levatino et al., 2024), and it is one of the roles of the principal as a motivator. Teachers with work motivation have an energetic force that not only attracts individuals to the teaching profession but also influences the time, dedication, and effort they devote to their role (Kanfer et al., 2017). On the other hand, teachers

who do not have work motivation will have broad implications for educational achievement and the quality of the education system (De Clercq et al., 2021 and Lazarides & Schiefele, 2021).

The results of this research indicate that teachers must always have high self-esteem, high personal expectations, and a high need for development to realize digital teaching performance. Internal motivation is better than external motivation because internal motivation can be controlled by a teacher himself. If a teacher depends on external motivation, then in a work environment that is less supportive or the level of remuneration is lower, his motivation will decrease.

The Influence of Leadership and Work Motivation on the Quality of Teaching Digitalization

The joint correlation between principal leadership and teacher work motivation and the quality of teaching digitalization is 0.974 at a significance value of 0.00 which is lower than 0.05. Thus, it can be interpreted that there is a positive and significant influence between variables X1 and X2 on Y.

This correlation is in the very strong category, seen from the range of 0.80-1.00 (Sugiyono, 2015a). The results of the ANOVA test to determine the joint influence of the principal's leadership and teacher work motivation on the quality of digitalization of teaching obtained a calculated F value of 1,794 > F table of 2.65 with a significance value of 0.00. This means that there is a positive and significant influence of the principal leadership variables and teacher work motivation together on the quality of digitalization of teaching, as shown in Table 5.

The results of the joint determination test between the principal's leadership and teacher work motivation on the quality of digitalization of teaching are as in table 6, which shows that the effect is R square, namely 0.948. The R Square value of 0.948 is higher than 0.67, meaning that the determination of the principal's leadership and teacher work motivation on the quality of teaching digitalization is strong (Chin, 1998). The results show that the influence of variables X1 and This means that 94.8% of the quality of digitalization of teaching is influenced by the joint factors of the principal's leadership and teacher work motivation, while the remaining 5.2% is the influence of variables outside those studied.

Table 5. Analysis of variances (ANOVA) [a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19814.049	2	9907.025	1793.942	.000b
	Residual	1087.931	197	5.522	-	-
	Total	20901.980	199	-	-	-

a. Dependent Variable: Digitalization of Teaching in Schools (Y)
b. Predictors: (Constant), Principal Leadership (X1) and Teacher Work Motivation (X2)

Table 6. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.974[a]	0.948	0.947	2.350

a. Predictors: (Constant), Principal Leadership (X1) and Teacher Work Motivation (X2)

This indicates that school principals cannot be alone in realizing the quality of digitalization of teaching, they must collaborate with teachers. In order to get support from teachers, it is necessary to apply supportive leadership or participative leadership. Because these two leaderships see teachers making policies so that teachers feel valued. If teachers feel appreciated, their work motivation will increase and the impact can improve the quality of teaching.

The quality of teaching is generally considered to be one of the main influences on student learning (Hattie, 2012). Thus, the quality of digitalization of teaching also influences student learning outcomes. The principal as the school manager must make a policy so that the implementation of digitalization of teaching can be carried out by teachers. Based on research results, the main factors hindering school digitalization efforts are the lack of digital education policies and strategies, lack of teacher training in ICT education, and limited awareness of school management regarding digitalization processes and concepts (Azlifa & Saeed, 2021). The research results show that the principal variable is the most influential in digital transformation in schools in the context of Educational Digital Resources. Other key factors include school contextual variables, technical support and EDR-related services, and the principal's professional and personal profile (Navaridas-Nalda et al., 2020). School principals must also maintain digitalization security, as more than 30% of digital users face cyberbulling and personal interference from strangers. So it is necessary to develop managerial mechanisms that will mitigate critical situations and digitalization risks (Skobeltsina et al., 2021 and Skobeltsina et al., 2021).

If the quality of teaching is interpreted more broadly, including student teaching outcomes or student achievement, then the results of other research are still subject to controversy. A meta-analysis of 48 empirical studies on the relationship between digital device use and students' academic performance, overall found a positive correlation between digital device use and academic achievement (Wang et al., 2024). When digital teaching is used as a substitute for non-technological teaching, there is no substantial change in students' cognitive learning outcomes. However, cognitive learning outcomes improve when technology provides specific support for teaching activities. Digital technology that offers more advanced teaching activities produces higher cognitive learning outcomes for students (Sailer et al., 2024).

Increasing investment in digital resources in education is a strategy adopted worldwide to improve student performance in the digital era. However, whether these investments are effective and how to realize their positive impacts remains unclear. Research results show that digital resources in education are negatively related to students' academic achievement (Wang & Wang, 2023). Not all advanced digital developments in a country mean there is an integration of digital teaching by teachers in the classroom and students' digital competence. Students' digital readiness significantly influences their achievement, and when combined with teachers' digital teaching integration, students' digital capital has a greater relationship to academic performance (Jeong et al., 2024).

■ CONCLUSION

The conclusion of this research again emphasizes how important the role of school principal leadership is in realizing quality education. Likewise, teachers' work motivation to realize good digital teaching which ultimately has a positive impact on student learning outcomes is also reaffirmed.

It is recommended that heads of government and regional governments make digital investments in education to be right on

target. Digital devices must be able to be integrated into the learning process by teachers so that they will have a positive impact on the quality of learning and student achievement. It is recommended that other researchers continue research on the influence of principal leadership and teacher work motivation on student learning outcomes. Arenas of education digitalization research that are still rare are the digitalization of school management and the digitalization of work culture in schools that need to be explored further.

■ ACKNOWLEDGMENT

This research was funded by the Directorate of Research, Technology and Community Service of the Ministry of Education, Culture, Research and Technology with Main Contract Number 033/LL6/PB/AL.04/2024 and Derivative Contract Number 021/LPPM-UPGRIS/SP2H/PENELITIAN/VI/2024.

■ REFERENCES

Aesaert, K., Van Braak, J., Van Nijlen, D., & Vanderlinde, R. (2015). Primary school pupils' ICT competences: Extensive model and scale development. *Computers and Education*, *81*, 326–344. https://doi.org/10.1016/j.compedu.2014.10.021.

Azlifa, M., & Saeed, F. (2021). The challenges to digitalization of schools in the Maldives 58 The Challenges to Digitalization of Schools in the Maldives. *International Journal of Social Research and Innovation*, *5*(2), 57–76.

Bejinaru, R. (2019). Impact of digitalization on education in the knowledge economy. *Management Dynamics in the Knowledge Economy*, *7*(3), 367–380.

Blau, I., & Shamir-Inbal, T. (2017). Digital competences and long-term ICT integration in school culture: The perspective of elementary school leaders. *Education and Information Technologies*, *22*(3), 769–787. https://doi.org/10.1007/s10639-015-9456-7.

Boronenko, T., Kaysina, A., & Fedotova, V. (2020). *The School Innovative Educational Model: Issues of Digitalization*.

Calero, J., & Ferrà, J. O. E. (2014). *Recursos escolares y resultados de la educación*. Fundación Europea Sociedad y Educación.

Chen, L.-K., Dorn, E., Sarakatsannis, J., & Wiesinger, A. (2021). Teacher survey: Learning loss is global—and significant. *Public & Social Sector Practice. McKinsey & Company*, 1999–2003.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern Methods for Business Research*, *295*(2), 295–336.

Colombo, M. (2016). Introduction to the Special Section. The Digitalization of Education Practices: How Much and What Kind? *Italian Journal of Sociology of Education*, *8*(2), 2016. https://doi.org/10.14658/pupj-ijse-2016-2-1.

De Clercq, M., Watt, H. M. G., & Richardson, P. W. (2021). Profiles of teachers' striving and wellbeing: evolution and relations with context factors, retention, and professional engagement. *Journal of Educational Psychology*, *114*(3), 637–655. https://doi.org/10.1037/edu0000702.

Dexter, S. (2008). Leadership for IT in schools. *International Handbook of Information Technology in Primary and Secondary Education*, 543–554.

Fauth, B., Decristan, J., Decker, A. T., Büttner, G., Hardy, I., Klieme, E., & Kunter, M. (2019). The effects of teacher competence on student outcomes in elementary science education: The mediating role of teaching quality. *Teaching and Teacher Education*, *86*, 1–14. https://doi.org/

10.1016/j.tate.2019.102882.

Frolova, E. V, Rogach, O. V, & Ryabova, T. M. (2020). Digitalization of education in modern scientific discourse: new trends and risks analysis. *European Journal of Contemporary Education*, *9*(2). https://doi.org/10.13187/ejced.2020.2.313.

Genlott, A. A., & Grönlund, Å. (2013). Improving literacy skills through learning reading by writing: The iWTR method presented and tested. *Computers and Education*, *67*, 98–104. https://doi.org/10.1016/j.compedu.2013.03.007.

Genlott, A. A., Grönlund, Å., Viberg, O., & Andersson, A. (2023). Leading dissemination of digital, science-based innovation in school–a case study. *Interactive Learning Environments*, *31*(7), 4171–4181. https://doi.org/10.1080/10494820.2021.1955272.

Glover, I., Hepplestone, S., Parkin, H. J., Rodger, H., & Irwin, B. (2016). Pedagogy first: realising technology enhanced learning by focusing on teaching practice. In *British Journal Of Educational Technology* (Vol. 47, Issue 5). http://shura.shu.ac.uk/11879/.

Griban, O., Griban, I., & Korotun, A. (2019). Modern teacher under the conditions of digitalization of education. *Advance in Economics, Business and Management*, 605–608.

Hattie, J. (2012). Visible Learning for Teachers: Maximizing Impact on Learning. Routledge.

Hauge, T. E. (2014). Uptake and use of technology: Bridging design for teaching and learning. *Technology, Pedagogy and Education*, *23*(3), 311–323. https://doi.org/10.1080/1475939X.2014.942750.

Herzberg, F. (2017). Motivation to work. Routledge.

Jedeskog, G. (2007). work in the teachers' world. In *Seminar.net-International journal of media, technology and lifelong learning* (Vol. 3).

Jeong, D. W., Moon, H., Jeong, S. M., & Moon, C. J. (2024). Digital capital accumulation in schools, teachers, and students and academic achievement: Cross-country evidence from the PISA 2018. *International Journal of Educational Development*, *107*, 1–13. https://doi.org/10.1016/j.ijedudev.2024.103024.

Joo, Y. J., Park, S., & Shin, E. K. (2017). Students' expectation, satisfaction, and continuance intention to use digital textbooks. *Computers in Human Behavior*, *69*, 83–90. https://doi.org/10.1016/j.chb.2016.12.025.

Kanfer, R., Frese, M., & Johnson, R. E. (2017). Motivation related to work: A century of progress. *Journal of Applied Psychology*, *102*(3), 338–355. https://doi.org/10.1037/apl0000133.

Klaassen, J., & Löwstedt, J. (2020). Digitalization in schools: four examples of embeddedness. *Research in Organizational Change and Development*, *28*, 103–126. https://doi.org/10.1108/S0897-301620200000028004.

Kunter, M., Klusmann, U., Baumert, J., Richter, D., Voss, T., & Hachfeld, A. (2013). Professional competence of teachers: Effects on instructional quality and student development. *Journal of Educational Psychology*, *105*(3), 805–820. https://doi.org/10.1037/a0032583.

Kyriakides, L., Christoforou, C., & Charalambous, C. Y. (2013). What matters for student learning outcomes: A meta-analysis ofstudies exploring factors of effective teaching. *Teaching and Teacher Education*, *36*, 143–152. https:/

/doi.org/10.1016/j.tate.2013.07.010.

Lazarides, R., & Schiefele, U. (2021). Teacher motivation: Implications for instruction and learning. Introduction to the special issue. *Learning and Instruction*, *76*, 1–3. https://doi.org/10.1016/j.learninstruc.2021.101543.

Levatino, A., Ferrer-Esteban, G., & Verger, A. (2024). Unveiling teachers' work preferences: A conjoint experiment on the implications of school governance reform across three countries. *Teaching and Teacher Education*, *146*, 1–14. https://doi.org/10.1016/j.tate.2024.104631.

Levy, A., DeLeon, I. G., Martinez, C. K., Fernandez, N., Gage, N. A., Sigurdsson, S. Ó., & Frank-Crawford, M. A. (2017). A quantitative review of overjustification effects in persons with intellectual and developmental disabilities. *Journal of Applied Behavior Analysis*, *50*(2), 206–221. https://doi.org/10.1002/jaba.359.

Lindqvist, H., & Pettersson, F. (2018). Leading For Digitalization: Exploring The Leadership Perspective. *International Conference on Information Communication Technologies (ICICTE)*, 371–381. http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-151165.

Littlejohn, A., Beetham, H., & McGill, L. (2013). Digital literacies as situated knowledge practices: Academics' influence on learners' behaviours. In *Literacy in the digital university* (pp. 126–136). Routledge.

Luthans, F. (2005). Organizational Behavior. McGraw-Hill. In *International Edition. Managment Series. New York*.

Machekhina, O. N. (2017). Digitalization of education as a trend of its modernization and reforming La digitalización de la educación como tendencia de su modernización y reforma. In *Pág* (Vol. 38).

Mintrop, R., & Ordenes, M. (2017). Motivação dos professores para trabalhar na era dos incentivos extrínsecos extrínsecos: Metas de desempenho e compromissos pró-sociais ao serviço da equidade. *Education Policy Analysis Archives*, *25*. https://doi.org/10.14507/epaa.25.2482.

Muhdi, M., & Nurkolis, N. (2020). The Implementation of E-Learning in Raudhatul Athfal and Madrasah During The Covid-19 Pandemic in Central Java. *Edukasia: Jurnal Penelitian Pendidikan Islam*, *15*(1), 57–78.

Muhdi, Nurkolis, & Yuliejantiningsih, Y. (2020). The Implementation of Online Learning in Early Childhood Education During the Covid-19 Pandemic. *JPUD - Jurnal Pendidikan Usia Dini*, *14*(2), 247–261. https://doi.org/10.21009/jpud.142.04.

Navaridas-Nalda, F., Clavel-San Emeterio, M., Fernández-Ortiz, R., & Arias-Oliva, M. (2020). The strategic influence of school principal leadership in the digital transformation of schools. *Computers in Human Behavior*, *112*, 1–12. https://doi.org/10.1016/j.chb.2020.106481.

Nelson, L., Arthur, E. J., Jensen, W. R., & Van Horn, G. (2011). Trading Textbooks for Technology New Opportunities for Learning An Indiana school district tries digital textbooks and finds many advantages. www.cast.org.

Ng, D. T. K., Leung, J. K. L., Su, J., Ng, R. C. W., & Chu, S. K. W. (2023). Teachers' AI digital competencies and twenty-first century skills in the post-pandemic world. *Educational Technology Research and Development*, *71*(1), 137–161. https://doi.org/10.1007/s11423-023-10203-6.

Northouse, P. G. (2021). Leadership: Theory and practice. Sage Publications.

OECD. (2016). School Leadership for Learning: Insight from TALIS 2013 (TALIS).

OECD. https://doi.org/10.1787/9789264258341-en.

Penninckx, M., Vanhoof, J., De Maeyer, S., & Van Petegem, P. (2016). Enquiry into the side effects of school inspection in a 'low-stakes' inspection context. *Research Papers in Education*, *31*(4), 462–482. https://doi.org/10.1080/02671522.2015.1076886.

Pettersson, F. (2021). Understanding digitalization and educational change in school by means of activity theory and the levels of learning concept. *Education and Information Technologies*, *26*(1), 187–204. https://doi.org/10.1007/s10639-020-10239-8.

Polikarpova, E. V, Shipelik, O. V, & Krylova, I. V. (2020). Digitalization of education: save the human. *International Scientific Conference "Digitalization of Education: History, Trends and Prospects"(DETP 2020)*, 648–654.

Rastogi, H. (2019). Digitalization of Education in India -An Analysis. *International Journal of Research and Analytical Reviews*, *6*(1), 160–167. http://ijrar.com/

Sailer, M., Maier, R., Berger, S., Kastorff, T., & Stegmann, K. (2024). Learning activities in technology-enhanced learning: A systematic review of meta-analyses and second-order meta-analysis in higher education. *Learning and Individual Differences*, *112*, 1–18. https://doi.org/10.1016/j.lindif.2024.102446.

Schwab, K. (2019). *Revolusi Industri Keempat [Fourth Industrial Revolution]*. Jakarta: Gramedia Pustaka Utama.

Seidel, T., & Shavelson, R. J. (2007). Teaching effectiveness research in the past decade: The role of theory and research design in disentangling meta-analysis results. *Review of Educational Research*, *77*(4), 454–499. https://doi.org/10.3102/0034654307310317.

Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building approach*. John Wiley & Sons.

Senden, B., Nilsen, T., & Blömeke, S. (2022). Instructional Quality: A Review of Conceptualizations, Measurement Approaches, and Research Findings. In *Ways of Analyzing Teaching Quality* (pp. 140–172). Scandinavian University Press. https://doi.org/10.18261/9788215045054-2021-05.

Simamora, B. (2004). Marketing Research Philosophy, Theory and Application. In *Jakarta: PT Gramedia Pustaka Utama*.

Skobeltsina, K., Beshenkov, S., & Kuznetsov, A. (2021). Education systems management in critical situations: potential risks of digitalization. *XIV International Scientific Conference "INTERAGROMASH 2021" Precision Agriculture and Agricultural Machinery Industry, Volume 2*, 739–749.

Sugiyono. (2015a). Metode penelitian kuantitatif kualitatif dan r&d *[quantitative qualitative research methods and R&D]*. Bandung: Alfabeta.

Sugiyono. (2015b). Metode penelitian manajemen *[management research methods]* (4th ed.). Bandung: Alfabeta.

Szyszka, M., Tomczyk, Ł., & Kochanowicz, A. M. (2022). Digitalisation of schools from the perspective of teachers' opinions and experiences: the frequency of ICT Use in Education, Attitudes towards New Media, and Support from Management. *Sustainability (Switzerland)*, *14*(14). https://doi.org/10.3390/su14148339.

Wang, Ni, X., Zhang, M., & Zhang, J. (2024). Educational digital inequality: A meta-analysis of the relationship between digital device use and academic performance in adolescents. *Computers and Education*, *213*, 1–16. https://doi.org/10.1016/j.compedu.2024.105003.

Wang, Y., & Wang, Y. (2023). Exploring the relationship between educational ICT resources, student engagement, and academic performance: A multilevel structural equation analysis based on PISA 2018 data. *Studies in Educational Evaluation*, *79*, 1–13. https://doi.org/10.1016/j.stueduc.2023.101308.

Zancajo, A., Verger, A., & Bolea, P. (2022). Digitalization and beyond: the effects of Covid-19 on post-pandemic educational policy and delivery in Europe. *Policy and Society*, *41*(1), 111–128. https://doi.org/10.1093/polsoc/puab016.