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The Relationship Between the Availability of Digital Facilities and the Intensity of Technology Use with Elementary School Students' Readiness to Support the Smart City Concept through Technology-Based Learning

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A B S T R A C T

Elementary school students' readiness to meet the demands of a smart city remains relatively low, indicating a gap between technological advancement and students' ability to utilize digital tools effectively. This study aims to examine the relationship between the availability of digital facilities and the intensity of technology use with students' readiness to support the smart city concept through technology-based learning. This study employed a quantitative correlational approach with a sample of 428 fifth-grade students in Balikpapan. The results show that digital facilities availability has a positive and significant relationship with student readiness ($r = 0.578$; $R^2 = 0.334$; $p < 0.001$), while the intensity of technology use demonstrates a stronger positive and significant relationship ($r = 0.712$; $R^2 = 0.507$; $p < 0.001$). Simultaneously, both variables significantly contribute to student readiness ($R = 0.742$; $R^2 = 0.551$; $p < 0.001$). These findings highlight that improving not only access to digital facilities but also the quality and intensity of technology use is essential to strengthen students' readiness in supporting smart city-based education.

1. Introduction

Education in Indonesia is currently undergoing a significant transformation driven by rapid advancements in digital technology and increasing demands for adaptive and innovative learning systems. The integration of technology into education has reshaped teaching and learning practices, encouraging more student centered, interactive, and flexible learning environments, while also promoting innovation in school governance (Hariyanto & Sobandi, 2025). In this context, technology integration and collaborative governance have become essential foundations for the

development of a smart school ecosystem (Munandar, 2025). This transformation not only affects pedagogical practices but also highlights the importance of aligning the education sector with broader digital-based urban development, particularly within the framework of smart cities.

One of the key prerequisites for effective technology-based learning is the availability of digital facilities, including access to devices, stable internet connectivity, and digital learning platforms. These facilities enable students to interact with technology more intensively and meaningfully during the learning process. Previous studies have shown that digital literacy at the elementary school level is influenced by various factors, including teacher readiness, environmental support, and the availability of technological infrastructure (Saifuddin & Putra, 2024). Furthermore, strong digital literacy has been associated with increased student engagement and improved academic performance (Saputra et al., 2024). However, access alone does not guarantee effective learning outcomes without sufficient readiness and meaningful use of technology.

In addition to infrastructure, the intensity of technology use plays a crucial role in shaping students' learning experiences. The intensity of technology use is not merely reflected in how frequently technology is utilized, but also in the quality of students' engagement during the learning process. Continuous and meaningful interaction with digital tools contributes to the development of learning skills, critical thinking, and students' confidence in using technology (Ning et al., 2024). The use of technology-based learning models has also been shown to improve student engagement and learning outcomes (Mustika et al., 2024). The implementation of project-based learning supported by digital media further enhances students' active participation in learning (Utami et al., 2025). These findings indicate that the intensity of technology use is not only a matter of frequency but also reflects the depth and quality of students' learning experiences in digital environments.

The use of digital platforms and interactive learning media also plays an important role in enhancing students' learning experiences. Digital platforms provide opportunities for more flexible, accessible, and student-centered learning processes. The integration of digital applications in learning environments has been shown to increase students' motivation and participation (Ardiana & Lapasere, 2025). The use of social media-based learning platforms also contributes to improving students' learning engagement and motivation (Ratnasari et al., 2022). In addition, technology-supported learning such as video-based learning has been proven to improve students' critical thinking skills (Hartati et al., 2025).

In a broader perspective, the transformation of education is closely linked to the development of smart cities, where education serves as a key pillar in improving the quality of life through the integrated use of technology. Education acts as a bridge between technological advancement and inclusive social development (Scala et al., 2024). The success of smart city implementation is influenced by the integration of technology, environmental factors, and the education sector in shaping an adaptive and technologically literate society (Javidroozi et al., 2023).

Consequently, strengthening technology-based education becomes a strategic step in supporting sustainable urban development.

However, the acceleration of digital transformation in education has not been equally matched by students' readiness, particularly at the elementary school level. Disparities in access to digital facilities and variations in the intensity of technology use may lead to unequal learning readiness among students. Without appropriate intervention, this gap may hinder the effectiveness of technology-based learning, especially within the smart city framework. Therefore, it is necessary to conduct empirical research that examines the relationship between digital infrastructure, technology usage behavior, and students' readiness as a basis for developing more targeted educational policies.

Several previous studies have addressed digital literacy and technology integration in elementary schools. Nurhidayah & Wibowo (2025) focused their research on improving elementary students' digital literacy by utilizing digital storybooks. A research study by Pratolo et al. (2023) examined the digital literacy readiness of teachers and students at the elementary and secondary education levels, while Sari et al. (2024) emphasized on importance of collaboration and innovation in strengthening digital literacy in Indonesia. However, the majority of these studies focus more on aspects of digital literacy or technology-based learning methods without directly linking them to the relationship between the availability of digital facilities, the intensity of technology use.

Thus, there remains a research gap in understanding how these factors interact simultaneously in shaping students' readiness, particularly within the context of smart city-based education at the elementary school level. Unlike previous studies, this research integrates three key variables digital facilities availability, technology use intensity, and students' readiness into a single analytical framework. Students' readiness is positioned as an outcome variable influenced by both infrastructure and behavioral factors, providing a more comprehensive understanding of technology-based learning readiness.

Balikpapan City provides a relevant context for this study due to its strong commitment to smart city development in the education sector. Although various digital programs have been implemented, not all students are able to utilize these facilities effectively. Some students still experience difficulties in operating digital devices and tend to rely on conventional learning methods, indicating that the availability of technology does not automatically lead to optimal use. Based on these considerations, this study aims to analyze the relationship between the availability of digital facilities and the intensity of technology use with elementary school students' readiness to support the smart city concept through technology-based learning, both partially and simultaneously.

2. Methodology

This study employed a quantitative approach using an ex post facto correlational design to examine the relationship between the availability of digital facilities, the intensity of technology use, and elementary school students' readiness to support the smart city concept through technology-based learning. A correlational design enables the identification of the strength and direction of relationships among variables without manipulation, as the variables are observed in their natural setting (Creswell, 2012). This approach was chosen because it is suitable for examining the phenomenon of technology use that has already taken place within the context of real-world learning in elementary schools.

The population of this study consisted of all fifth-grade elementary school students in Balikpapan City. The sample included 428 students selected using purposive sampling, based on the criterion that students had access to digital facilities, such as digital devices and internet connectivity. The selected schools were Google Reference School Candidates designated by the Balikpapan City Education Office, with one school representing each subdistrict. This sampling technique ensured that respondents had relevant experience in using digital technology, thereby supporting the relevance of the data to the research objectives.

Data were collected using a structured questionnaire developed based on relevant theoretical frameworks and previous studies. The instrument measured three main variables: the availability of digital facilities, the intensity of technology use, and students' readiness to support the smart city concept through technology-based learning. The detailed indicators and measurement items for each variable are presented in Table 1.

Table 1. Instrument Blueprint

Variable	Indicator	Number of Items	Source
Availability of Digital Facilities	Device and Digital Infrastructure Availability	5	(Miras et al., 2023; Novitasari et al., 2024)
	Digital Connectivity	5	
	Technology Platforms	2	
Intensity of Technology Use	Frequency of Device Use at Home	5	(Pierce & Cleary, 2024)
	Frequency of Device Use at School	3	
	Access to and Ownership of Digital Devices	4	
Student Readiness to Support the Smart City Concept Through Technology-Based Learning	Technology Readiness	4	(Aydin & Tasci, 2005)
	People Readiness	2	
	Innovation Readiness	3	
	Self-Development Readiness	3	

To ensure clarity and transparency of the measurement instrument, selected representative items from each variable are presented in Table 2.

Table 2. Representative Questionnaire Items

Variable	Indicator	Item
Availability of Digital Facilities	Device and Digital Infrastructure	I use digital facilities at school for learning
	Device and Digital Infrastructure	I use digital devices (e.g., Chromebook) during learning activities
	Digital Connectivity	I can access the internet for learning purposes at school
	Technology Platfroms	I use digital learning platforms (e.g., Google Classroom, belajar.id) for studying
Intensity of Technology Use	Frequency of Device Use at Home	I use digital devices at home for learning activities
	Frequency of Device Use at School	I use digital devices during classroom learning
	Access to and Ownership of Digital Devices	I have access to digital devices whenever needed for learning
Student Readiness	Technology Readiness	I can use digital devices for learning without assistance
	People Readiness	I collaborate with classmates when using technology in learning
	Innovation Readiness	I am interested in learning using new digital technologies
	Self-Development Readiness	I use technology to improve my knowledge and skills

All items were measured using a four-point Likert scale (1 = Never, 2 = Sometimes, 3 = Often, 4 = Always). Due to space limitations, only representative items are presented in this table. The instrument was validated through expert judgment and empirical testing using Pearson's Product-Moment correlation, while reliability was assessed using Cronbach's Alpha to ensure internal consistency. The data collection procedure was conducted in several stages, including the development of the instrument based on variable indicators, validation and reliability testing, distribution of the questionnaire to respondents, and data collection and coding.

Data analysis was carried out using both descriptive and inferential statistics. Descriptive analysis was used to provide an overview of the characteristics of each variable, while inferential analysis was applied to examine the relationships between variables. Prior to hypothesis testing, prerequisite tests were conducted, including tests of normality, linearity, multicollinearity, and heteroscedasticity. Pearson's correlation analysis was used to determine the relationships between variables, while simple linear regression and multiple linear regression analyses were performed to assess the contribution of digital facility availability and technology use intensity to students' readiness.

3. Results and Discussion

Data in this study were collected through an online questionnaire administered via Google Forms. The questionnaire was completed by fifth grade elementary school students who met the sampling criteria, particularly those who had access to digital devices and internet connectivity. The data collection process was conducted simultaneously at school, where students accessed the questionnaire using Chromebooks under the supervision and guidance of teachers to ensure proper understanding and completion of all items. All questionnaire items were measured using a four point Likert scale ranging from 1 (Never) to 4 (Always). A total of 428 valid responses were obtained and used for further analysis.

This study provides overview of the characteristics of each research variable, including the availability of digital facilities, the intensity of technology use, and the readiness of elementary school students in order to reinforce smart city concept through technology-based learning. Descriptive analysis is presented through mean, median, mode, standard deviation, as well as minimum and maximum scores. The results of the descriptive analysis are presented in Table 3.

Table 3. Descriptive Data

	Availability of Digital Facilities	**Intensity of Technology Use**	**Elementary School Students Readiness to Support the Smart City Concept Through Technology-Based Learning**
Mean	35,85	33,46	36,29
Median	37	33	36
Mode	37	32	45
Std. Deviation	4,484	4,966	5,360
Minimum	19	20	20
Maximum	45	45	48

Based on Table 3, descriptive analysis indicates all variables the availability of digital facilities, the intensity of technology use, and elementary school students' readiness to support the smart city concept through technology-based learning have moderate means and standard deviations. Based on the mean and standard deviation values above, the digital facility availability categories are as follows. The results of the normality test are presented in Table 4.

Table 4. One-Sample Kolmogorov-Smirnov Normality Test

Variable	**N**	**Statistik K-S**	**Sig. (Asymp. Sig.)**	**Description**
Unstandarized Residual	428	0,043	0,054	Normal

Normality test results using the One-Sample Kolmogorov Smirnov procedure shows that the significance value for all variables is above 0.05. The results of the linearity test are presented in Table 5.

Table 5. Linearity Test

Variable		*Sig. Deviation from Linearity*	Description
Elementary School Students' Readiness to Support the Smart City Concept Through Technology-Based Learning (Y)	Availability of Digital Facilities (X_1)	0,390	Linear
Elementary School Students' Readiness to Support the Smart City Concept Through Technology-Based Learning (Y)	Intensity of Technology Use (X_2)	0,644	Linear

Based on Table 5, the results of the linearity test show that the Sig. Deviation from Linearity value for the variables of availability of digital facilities (X_1) and intensity of technology use (X_2) with the readiness of elementary school students to support the smart city concept through technology-based learning (Y) is > 0.05 so that all variables in this study are linear. The results of the multicollinearity test are presented in Table 6.

Table 6. Multicollinearity Test

Variable	Collinearity Tolerance	Statistics VIF
X_1	0,674	1,483
X_2	0,674	1,483

The results of the multicollinearity test indicate that the Tolerance value for the variables availability of digital facilities (X_1) and intensity of technology use (X_2) is 0,674, while the VIF value for both variables is 1.483. This indicates that there is no multicollinearity among the independent variables in this research model. The results of the heteroscedasticity test are presented in Table 7.

Table 7. Heteroscedasticity Test

Model	Unstandarized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	2,226	0,869		2,563	0,011
X_1	0,37	0,028	0,077	1,314	0,190
X_2	-0,019	0,025	-0,045	-0,759	0,449

Based on the table above, the results of the heteroscedasticity test show that the significance values for the availability of digital facilities (X_1) and the intensity of technology use (X_2) are 0.190 and 0.449, respectively, both exceeding 0.05. Therefore, it can be inferred that the regression model in this study is free from heteroscedasticity. Furthermore, the results of the Pearson correlation analysis are presented in Table 8.

Table 8. Pearson Correlation Test

Variable	Pearson Correlation	Sig. (2-tailed)	Description
$X_1 \rightarrow Y$	0,578	< 0,001	Positive – Moderate
$X_2 \rightarrow Y$	0,712	< 0,001	Positive – Strong

Table 8 show that the availability of digital facilities (X_1) has a positive and significant correlation with elementary school students' readiness to support the smart city concept through technology-based learning (Y). The strength of the relationship between variables X_1 dan Y falls into the moderate category. The variable intensity of technology use (X_2) also shows a significant positive correlation with elementary school students' readiness to support the smart city concept through technology-based learning (Y). The strength of the relationship between X_2 and Y falls into the strong category. The coefficient of determination for the availability of digital facilities is presented in Table 9.

Table 9. Correlation Coefficient of Availability of Digital Facilities with Elementary School Students' Readiness to Support the Smart City Concept Through Technology-Based Learning

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,578	0,334	0,333	4,379

The R Square value of 0.334 shows 33.4% of the variation in elementary school students' readiness to support the smart city concept through technology-based learning is related to the availability of digital facilities, while the rest is influenced by other factors outside the research model. The regression analysis results for the availability of digital facilities are presented in Table 10.

Table 10. Regression Coefficient of Availability of Digital Facilities with Elementary School Students' Readiness to Support the Smart City Concept Through Technology-Based Learning

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	11,509	1,707		6,742	< 0,001
X1	0,691	0,047	0,578	14,628	< 0,001

The equation indicates that constant of 11.509 represents the value of elementary school students' readiness when the availability of digital facilities (X_1) is zero. The regression coefficient of X_1 is 0,691, which is positive, indicating that the availability of digital facilities has a direct relationship with elementary school students' readiness, where an increase in the availability of digital facilities tends to be followed by an increase in elementary school students' readiness. The coefficient of determination for the intensity of technology use is presented in Table 11.

Table 11. Correlation Coefficient of Intensity of Technology Use with Elementary School Students' Readiness to Support the Smart City Concept Through Technology-Based Learning

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,712	0,507	0,506	3,766

A value of R-squared of 0.507 indicates that 50% of the variation in elementary school students' readiness to support the concept of a smart city through technology-based learning is statistically related to the intensity of technology use. A value of adjusted R-squared of 0.506 indicates that the model has a good and stable level of fit. The regression analysis results for the intensity of technology use are presented in Table 12.

Table 12. Regression Coefficient of Intensity of Technology Use with Elementary School Students' Readiness to Support the Smart City Concept Through Technology-Based Learning

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	10,556	1,242		8,502	< 0,001
X2	0,769	0,037	0,712	20,950	< 0,001

The equation indicates that constant of 10.556 is the value of elementary school students' readiness when the intensity of technology use (X_2) is zero. The regression coefficient of X_2 of 0.769 is positive, which indicates that the intensity of technology use has a direct relationship with the readiness of elementary school students, where an increase in the intensity of technology use tends to be followed by an increase in the readiness of elementary school students. The results of the multiple correlation analysis are presented in Table 13.

Table 13. Multiple Correlation Coefficient

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,742	0,551	0,549	3,600

Based on Table 13, a multiple correlation coefficient value of 0.742 was obtained, indicating a positive relationship with a strong level of relationship strength between the availability of digital facilities and the intensity of technology use simultaneously with the readiness of elementary school students in supporting the concept of smart city through technology-based learning. The coefficient of determination (R Square) of 0.551 indicates that 55.1% of the variation in elementary school students' readiness is statistically related to the two independent variables, while the remaining 44.9% is related to other factors outside the study. The significance of the regression model is presented in Table 14.

Table 14. Significance of the Relationship

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	6762,143	2	3381,072	260,908	< 0,001
Residual	5507,509	425	12,959		
Total	12269,652	427			

Based on the results in Table 14, F-value of 260.908 was obtained with <0.001 significance level, indicating that the multiple regression model involving the variables of availability of digital facilities and the intensity of technology use was statistically significant. These results indicate that both variables simultaneously have a significant relationship with elementary school students' readiness to support the smart city concept through technology-based learning. The results of the multiple regression analysis are presented in Table 15.

Table 15. Multiple Regression Coefficient

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	4,897	1,477		3,315	< 0,001
X1	0,304	0,047	0,255	6,431	< 0,001
X2	0,612	0,043	0,567	14,326	< 0,001

Based on the results of simple linear regression analysis, the regression equation that can be created is:

$$Y = 4{,}897 + 0{,}304X1 + 0{,}612\text{x}2$$

The equation indicates a constant of 4.897 is the value of elementary school students' readiness when the availability of digital facilities (X_1) and the intensity of technology use (X_2) are zero. The regression coefficients of X_1 of 0.304 and X_2 of 0.612 are positive, indicating that the availability of digital facilities and the intensity of technology use have a unidirectional relationship with elementary school students' readiness, where an increase in each variable tends to be followed by an increase in elementary school students' readiness assuming other variables are constant.

The shows that the availability of digital facilities serves as a supporting factor in fostering elementary school students' readiness for technology-based learning. It is in line with research emphasizing that the availability of digital infrastructure is a critical prerequisite for supporting interactive, technology-based learning processes (Adela et al., 2025; Astiti et al., 2023). However, other studies indicate that the presence of digital facilities does not automatically enhance students' readiness unless accompanied by effective utilization strategies (Akarsu, 2025; Naimah et al., 2024). This indicates that digital facilities function more as an enabling factor rather than a primary determinant in shaping students' readiness. Unlike the availability of facilities, the intensity of technology use plays a more dominant role in shaping student readiness. This finding is consistent with research stating that students' active engagement in technology use significantly contributes to the digital literacy development, critical thinking skills, and learning readiness (Consoli et al., 2023;

Ramadhani, 2025). Consistent student engagement in utilizing technology during learning activities fosters digital skills, habits, and mindsets that align with the demands of education in the smart city era (Sudharsono et al., 2025; Yanita & Firdaus, 2025). Therefore, he intensity of technology use becomes a key indicator in assessing students' readiness for digital learning, as sustained engagement enables students to gain interactive, contextual, and adaptive learning experiences that keep pace with the times (Aravantinos et al., 2024; Boateng et al., 2024).

Conceptually, the availability of digital facilities and the intensity of technology use demonstrate a complementary relationship in shaping students' readiness. Digital facilities serve as providers of access, while the intensity of technology use determines the extent to which that access is optimally utilized in the learning process (Hermansah & Jakaria, 2025; Yuliandari, 2025). A synergistic integration between the availability of facilities and technology use enables the creation of relevant learning experiences, enhances students' active engagement, and fosters their readiness to engage in technology-based learning (Ruijia et al., 2025; Sosa-Díaz et al., 2022). Digital infrastructure provides access, while the intensity of technology use determines the extent to which that access is effectively utilized to support the learning process. An imbalance between these two aspects has the potential to hinder students' readiness for technology-based learning.

The implications of these findings suggest that efforts to enhance student readiness in the context of a smart city should not only focus on providing digital infrastructure, but must also be directed toward improving the quality of technology use in learning. Schools and policymakers need to design learning strategies that encourage active student engagement, such as the use of interactive learning models, the integration of digital platforms, and the continuous strengthening of digital literacy. Additionally, teacher's role is essential in guiding the use of technology so that it is not merely used as a tool but as a meaningful learning medium.

This study has several limitations. First, the use of an ex post facto design limits the study's ability to explain causal relationships between variables. Second, data collection via questionnaires may introduce respondent bias. Third, this study was conducted only with fifth-grade students in a single city, so the generalizability of the findings remains limited. For this reason, future research is recommended to employ experimental or mixed-methods designs in order to acquire more comprehensive understanding, as well as to broaden the scope of the study to ensure that the results are more representative. In addition, the use of observational methods or interviews may be considered to supplement the quantitative data obtained.

4. Conclusion

This study confirms that both the availability of digital facilities and the intensity of technology use significantly contribute to elementary school students' readiness to support the smart city concept through technology based learning. More

importantly, the findings reveal that students' readiness is not solely determined by access to digital infrastructure, but is more strongly influenced by the intensity and quality of technology use in the learning process. The main contribution of this study lies in demonstrating an integrative relationship between digital facilities availability and technology use intensity in shaping students' readiness. This provides a more comprehensive understanding that effective technology based learning requires not only adequate infrastructure but also meaningful and consistent student engagement. In practical terms, these findings suggest that efforts to enhance students' readiness should go beyond providing digital facilities and focus on encouraging active and purposeful use of technology in learning. Teachers play a crucial role in facilitating this process, while policymakers are expected to support sustainable digital literacy programs and equitable access to technology. This study is limited to a specific context and research design. Therefore, future research is recommended to involve broader samples and alternative approaches to further explore students' readiness in technology-based learning environments.

References

Adela, D., Cahya, R., Sarah, S., & Ruswandi, S. (2025). Digital Education for Primary School Children: Opportunities, Challenges, and Implementation Gaps in the Global Age of Technology †. *Engineering Proceedings*, *107*(1). https://doi.org/10.3390/engproc2025107113

Akarsu, A. H. (2025). Beyond the walls: Investigating outdoor learning experiences of social studies teacher candidates in Türkiye. *Teaching and Teacher Education*, *154*(November 2024), 104876. https://doi.org/10.1016/j.tate.2024.104876

Aravantinos, S., Lavidas, K., Voulgari, I., Papadakis, S., Karalis, T., & Komis, V. (2024). Educational Approaches with AI in Primary School Settings: A Systematic Review of the Literature Available in Scopus. *Education Sciences*, *14*(7), 744. https://doi.org/10.3390/educsci14070744

Ardiana, R. N., & Lapasere, S. (2025). The Effect of Problem-Based Learning Model Assisted by Wordwall Application on Student Learning Outcomes in Grade V IPAS Subject. *Journal of Educational Sciences*, *9*(4), 2463–2472. https://doi.org/10.31258/jes.9.4.p.2463-2472

Astiti, A. D., Murti, R. C., & Hakiki, M. (2023). Development of web-based digital libraries as learning resource facilities in elementary schools. *Jurnal Kajian Informasi & Perpustakaan*, *11*(1), 147. https://doi.org/10.24198/jkip.v11i1.42192

Aydin, C. H., & Tasci, D. (2005). Measuring readiness for e-learning: Reflections from an emerging country. *Educational Technology and Society*, *8*(4), 244–257.

Boateng, S. L., Penu, O. K. A., Boateng, R., Budu, J., Marfo, J. S., & Asamoah, P. (2024). Educational technologies and elementary level education – A bibliometric review of scopus indexed journal articles. *Heliyon*, *10*(7), e28101. https://doi.org/10.1016/j.heliyon.2024.e28101

Consoli, T., Désiron, J., & Cattaneo, A. (2023). What is "technology integration" and how is it measured in K-12 education? A systematic review of survey

instruments from 2010 to 2021. *Computers & Education*, *197*, 104742. https://doi.org/10.1016/j.compedu.2023.104742

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Pearson Education, Inc.

Hartati, F. D., Islami, N., & Rahmad, M. (2025). Needs Analysis of Learning Video Development Using Edpuzzle Based Problem Based Learning to Improve Critical Thinking Skills of High School Students. *Journal of Educational Sciences*, *7*(1), 27. https://doi.org/10.31258/jes.7.1.p.27-34

Hermansah, & Jakaria. (2025). Efektivitas Media Pembelajaran Berbasis Digital Terhadap Motivasi dan Hasil Belajar Siswa di Sekolah Dasar. *Jurnal Ilmiah Pendidikan Dasar (JIPDAS)*, *5*(3), 2670–2680. https://doi.org/https://doi.org/10.37081/jipdas.v5i3.3101

Javidroozi, V., Carter, C., & Grace, M. (2023). Smart , Sustainable , Green Cities : A State-of-the-Art Review. *Sustainability*, *15*(5353), 1–28. https://doi.org/https://doi.org/10.3390/su15065353

Miras, S., Ruiz-Bañuls, M., Trigueros, I. M. G.-, & Mateo-Guillen, C. (2023). Implications of the Digital Divide: A Systematic Review of its Impact in the Education Field. *Journal of Technology and Science Education*, *13*(3), 936–950. https://doi.org/https://doi.org/10.3926/jotse.2249

Munandar, D. R. (2025). Integration of Technology and Governance in Indonesian Schools: Toward a Smart School Ecosystem. *AL-ISHLAH: Jurnal Pendidikan*, *17*(2), 2147–2158. https://doi.org/10.35445/alishlah.v17i2.7529

Mustika, L., Yantoro, Y., & Sastrawati, E. (2024). Application of the TPACK Approach in Increasing Student Learning Activity Through the PBL Model in Mathematics Learning in Class V Elementary Schools. *Journal of Educational Sciences*, *8*(1), 103. https://doi.org/10.31258/jes.8.1.p.103-117

Naimah, Muttaqin, M. F., & Meilina. (2024). Implementasi Literasi Digital pada Siswa Sekolah Dasar. *Jurnal Ilmiah Pendidikan Profesi Guru*, *7*(1), 85–94. https://doi.org/10.23887/jippg.v7i1.75992

Ning, G., Luo, H., Yin, W., & Zhang, Y. (2024). Exploration of the Application and Practice of Digital Twin Technology in Teaching Driven by Smart City Construction. *Sustainability*, *16*(23). https://doi.org/10.3390/su162310312

Novitasari, R. A., Marmoah, S., & Budiharto, T. (2024). Pelaksanaan intervensi digitalisasi sekolah pada program sekolah penggerak di sekolah dasar. *Didaktika Dwija Indria*, *12*(6), 451–456. https://doi.org/https://doi.org/10.20961/ddi.v12i6.89973

Nurhidayah, F. N., & Wibowo, S. E. (2025). Improving Children's Digital Literacy: A Quantitative Study on the Use of Digital Storybooks in Elementary Schools. *Jurnal Ilmiah Sekolah Dasar*, *9*(2), 252–262. https://doi.org/10.23887/jisd.v9i2.92649

Pierce, G. L., & Cleary, P. F. (2024). The persistent educational digital divide and its impact on societal inequality. *PLoS ONE*, *19*(4 April), 1–23. https://doi.org/10.1371/journal.pone.0286795

Pratolo, B. W., Fatimah, N., Soviyah, S., & Ali, Z. (2023). Digital Literacy readiness: Voices of Indonesian Primary and Secondary English Teachers.

English Language Teaching Educational Journal, *5*(2), 129–142. https://doi.org/10.12928/eltej.v5i2.6562

Ramadhani, G. R. (2025). Implementasi Kurikulum Berbasis Teknologi Melalui Penguatan Literasi Digital Siswa Sekolah Dasar. *JPD: Jurnal Pendidikan Dasar*, *16*(2), 369–380. https://doi.org/10.21009/JPD.XXX

Ratnasari, L. T., Mariatun, I. L., & Arief, Z. (2022). Development of Instagram-Based Learning Media to Increase Learning Motivation of Tenth Grader in Economics Subjects at SMA Ar-Raudhah. *Journal of Educational Sciences*, *6*(3), 332. https://doi.org/10.31258/jes.6.3.p.332-340

Ruijia, Z., Wenling, L., & Xuemei, Z. (2025). The impact of Information and Communication Technology (ICT) on learning outcomes in early childhood and primary education: a meta-analysis of moderating factors. *Frontiers in Psychology*, *16*(June), 1–16. https://doi.org/10.3389/fpsyg.2025.1540169

Saifuddin, M. F., & Putra, L. D. (2024). Digital Literacy in Elementary School: A Systematic Literature Review. *Gagasan Pendidikan Indonesia*, *5*(2), 86–99. https://doi.org/10.30870/gpi.v5i2.24830

Saputra, I. A., Ramadhani, A., Zahra Khairunnisa, M., & Ainiyah, D. N. (2024). Pengaruh Literasi Digital terhadap Prestasi Akademik Siswa Menengah Atas. *Jurnal Ilmu Pendidikan Dan Pembelajaran*, *3*(1), 25–31. https://doi.org/10.58706/jipp

Sari, G. I., Winasis, S., Pratiwi, I., Wildan Nuryanto, U., & Basrowi. (2024). Strengthening digital literacy in Indonesia: Collaboration, innovation, and sustainability education. *Social Sciences and Humanities Open*, *10*(August), 101100. https://doi.org/10.1016/j.ssaho.2024.101100

Scala, D., Aguilar Cuesta, Á. I., Rodríguez-Domenech, M. Á., & Cañizares Ruiz, M. del C. (2024). Bibliometric Study on the Conceptualisation of Smart City and Education. *Smart Cities*, *7*(1), 597–614. https://doi.org/10.3390/smartcities7010024

Sosa-Díaz, M. J., Sierra-Daza, M. C., Arriazu-Muñoz, R., Llamas-Salguero, F., & Durán-Rodríguez, N. (2022). "EdTech Integration Framework in Schools": Systematic Review of the Literature. *Frontiers in Education*, *7*. https://doi.org/10.3389/feduc.2022.895042

Sudharsono, M., Sulis Al Saepi, D., Meliawati Putri, F., Azzahra Chandra, N., & Komariyah, S. (2025). Analysis of the Impact of Technology Use on Students' Digital Literacy in Elementary Schools. *Inovasi Sekolah Dasar: Jurnal Kajian Pengembangan Pendidikan*, *12*(1), 333–340. https://doi.org/10.36706/jisd.v12i1.89

Utami, S., BinMGagaramusu, Y., Rahmah, N., Azizah, & Nuraini. (2025). Application of Project Based Learning Model Assisted by Animated Video Media to Improve Student Learning Outcomes in Grade V Elementary School Elementary School. *Journal of Educational Sciences*, *9*(4). https://doi.org/10.31258/jes.9.4.p.1971-1980

Yanita, R., & Firdaus, R. (2025). *Pemanfaatan Teknologi Pembelajaran Interaktif untuk Meningkatkan Keterampilan Literasi Digital Siswa Sekolah Dasar. Educate: Jurnal Teknologi Pendidikan*. *10*(1), 144–154. https://doi.org/10.32832/educate.v10i1.18404

Yuliandari, R. N. (2025). Exploring Elementary School Readiness for Implementing Deep Learning Technology in Digital Education.

International Journal of Elementary Education, *9*(3), 524–533. https://doi.org/10.23887/ijee.v9i3.100529

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