

The Influence of Teachers' Resilience and Digital Competence on the Effectiveness of Digital Learning Media in Elementary Schools

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Abstract

This study aims to analyze the influence of teachers' resilience and digital competence on the effectiveness of the utilization of digital learning media in public elementary schools in Malang Regency. The digital transformation in education requires teachers to possess not only technical digital skills but also psychological and spiritual resilience in the face of change. This study uses a quantitative, correlational design and analyzes the data using Partial Least Squares–Structural Equation Modeling (PLS-SEM). Data were collected using a 1–5 Likert-scale questionnaire distributed to elementary school teachers, with a sample of 445. The rowdon sampling technique was chosen to conduct data analysis using the PLS-SEM statistical tool. The results of the study showed that the R Square value was 0.552 (Adjusted R² = 0.541), which means that teacher resilience and digital competence simultaneously were able to explain 55.2% of the variation in the effectiveness of digital learning media utilization. Teacher digital competence had a significant effect on the effectiveness of digital learning media ($\beta = 0.455$; $t = 4.566$; $p < 0.05$), while teacher resilience showed a lower, statistically insignificant effect in one of the test models ($p < 0.05$). This finding confirms that digital competence is a dominant factor in increasing the effectiveness of digital learning media, while resilience plays a supporting factor in strengthening teacher readiness to improve the quality of learning in the era of digital transformation. The research results recommend that schools provide digital competency training for teachers that integrates the development of spiritual and psychological resilience values to create effective, adaptive, and sustainable digital learning.

Keywords

Teacher Resilience, Digital Competence, Digital Learning Media, Elementary School.



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INTRODUCTION

Teachers in the digital era must have the ability to integrate technology into the learning process, improve the quality of learning, and prepare students to face global challenges (Dwi Purwati dkk., 2025). However, this still faces many obstacles. Teachers still face difficulties adapting to technology and improving their digital skills. This phenomenon is often experienced by teachers, especially those at the elementary school level. Digital technology currently plays a fundamental role in driving growth and progress in various areas of human life. The use of technology is not limited to the exchange of information; it also opens new opportunities in the economic, government, education, and public service sectors. The development of artificial technology in the digital era encourages its daily use in education, especially at the elementary school level (Aldaleel, 2025). This fact is also supported by data obtained from the Central Statistics Agency (BPS) in 2024, showing that the young age group dominates internet use with a proportion of 66.05% and plays an important role in driving digital transformation in various sectors of life (Nicolaidou dkk., 2021). This is evidence that the school-age group is one of the active users of digital technology, both through learning activities and in seeking knowledge, thus demanding that teachers, as instructors and educators, should not be left behind in utilizing digital technology during the learning process.

Teachers today are required to continuously learn and improve their competencies to remain relevant to current developments. Research conducted by (Alshammary & Alhalafawy, 2023). This study shows that teachers must be able to integrate technology into the learning process. In line with Suryani, Kurniawan's research also shows that teachers' digital skills are crucial for improving the quality of education in the digital era (Lutfi Astuti & Ikhwan Setiawan, 2023). However, in reality, many teachers are still unable to adapt to the digital era.

Teachers also need mental and spiritual resilience to adapt quickly to digital-based learning. Resilience is an individual's ability to adapt, survive, and recover from academic and psychosocial stressors emotional management strategy coping, and confidence self-efficacy (Arifuddin dkk., 2025). Psychological constructs such as self-efficacy, coping, mental toughness, and self-regulated learning, are correlated with resilience and have a significant impact on students' academic and mental well-being.

In the context of teachers as educators, resilience for teachers is a value that becomes a spiritual asset to be able to survive and improve time management from the pressure of tasks and responsibilities, to reduce anxiety, accompany students in learning, and develop technology and

learning media to remain focused on learning. Meaningful and sustainable. Several studies have shown that spiritual well-being can increase resilience and mental well-being in a learning environment (Untari dkk., 2025).

Digital competence is also a crucial skill for elementary school teachers, as nearly 57% of civil servant elementary school teachers lag behind in using technology and digital learning. Many struggle to learn how to use digital technology due to limited time, funding, and school facilities. Malikha's study demonstrates that the use of Smart Classrooms significantly improves the digital literacy of both teachers and students (Utami dkk., 2024). This confirms that digital competency plays a crucial role in the learning process. The effectiveness of digital learning can be achieved through the use of the "Technological Pedagogical Content Knowledge" (TPACK) model. The TPACK model is a teacher knowledge framework that can effectively integrate technology into learning. Essentially, teachers need not simply be "IT literate" but must be able to harmoniously integrate technology with pedagogy (teaching methods) and content (materials) in the real-world context of the classroom (Zhang & Luo, 2023). The TPACK model is seen as a "total package" of knowledge that teachers need to design flexible and meaningful technology-based learning (Mardiana dkk., 2025).

The results of other previous research searches, the hypothesis that emerged is: H₁ Resilience has a significant influence on academic achievement, and the hypothesis is related to the goal that improving the quality of education can be achieved if the problems that exist in teachers and students can be resolved properly (Hidayati dkk., 2020.). Resilience plays an important role in a person's life, especially in this digital era.

Based on several studies and previous research results, it is considered important to assess the extent to which teachers' digital resilience and competence influence the effectiveness of digital learning media utilization at the elementary school level as an indicator for identifying students' digital literacy skills optimally developed by teachers. The availability of adequate digital technology facilities, teacher skills, and the active role of parents and schools are all elements that must synergize to achieve a quality learning process and strengthen digital literacy mastery. It is hoped that the research results will contribute to elementary school teachers receiving more intensive and continuous digital competency training integrated with the development of spiritually-based resilience values to create effective, adaptive, and sustainable digital learning (Garzón Artacho dkk., 2020).

This study aims to analyze teachers' resilience and digital competence on the effectiveness of digital learning media in elementary schools (SD) in the Malang area. The research hypothesis is H1: Teacher resilience significantly influences the effectiveness of digital learning media utilization. H2: There is a significant influence between teachers' digitalization competence on the effectiveness of digital learning media utilization, and H3: There is a significant influence between resilience and digital competence on the effectiveness of digital learning media (Voogt dkk., 2013).

METHOD

This research was designed using a quantitative, correlational approach. This approach was chosen to analyze the relationships among variables: teacher pedagogical competence, digital literacy skills, and learning motivation. This correlational approach was used to determine the direction and strength of the relationships between these variables (Creswell, J. W., 2016). This study will explain the relationship between the facts of the conditions of each variable, namely teacher resilience and teacher digital competence, and the effectiveness of digital learning media. Therefore, the purpose of this study is to determine whether there is a causal relationship between the factors of teacher resilience and teacher digital competence and the effectiveness of digital learning media.

The research variables were analyzed using the PLS-SEM model consisting of the dependent variable X₁: Resilience and X₂: Digital competence with indicators that have been adjusted to the perception of usefulness, ease, and achievement of learning optimization. The independent variable (Y), the effectiveness of digital media utilization. The indicators used were digital learning elements, innovative learning methods, and interactive media used by teachers. The quantitative instrument, using a Likert scale questionnaire 1–5. Each variable was developed from previous research indicators and then adjusted to the research context (Nurlan, 2019). The sample consisted of 555 respondents who were public elementary school teachers in Malang Regency. The questionnaire was distributed over a period of 2 weeks in November 2025. Validity and reliability were tested by determining the respective values of Convergent validity (outer loading value ≥ 0.7), discriminant validity (Fornell-Larcker/HTMT), Composite reliability (CR ≥ 0.7) and Cronbach's Alpha (≥ 0.7) according to the output of the statistical tool used.

FINDINGS AND DISCUSSION

Findings

R Square Value

Table 1. R Square and R2 values

	R Square	R Square Adjusted
The Effectiveness of Utilizing Digital Media	0.552	0.541

From Table 1. It explains the R Square value on the variance of the endogenous variable explained by the exogenous variable. The results obtained show that the R Square value is 0.552 and 0.541, which means the endogenous latent variable is in the moderate category. Interpretation of the results in Table 1. For the R and R Square values: (1). Interpretation of the R Value (Correlation Coefficient) R Value = 0.552 shows the relationship between the independent (predictor) variables collectively with the dependent variable. (2). Strength of the Relationship: This value of 0.552 falls into the moderate or fairly strong category. This is because its value is positive and means that there is a unidirectional relationship. A unidirectional relationship can be interpreted as: if the independent variable increases, the dependent variable tends to increase as well. Scale: Considering the R scale ranges from 0 to 1, the figure 0.552 indicates that the model used by the researcher is already representative or appropriate in capturing a fairly meaningful pattern although it has not yet reached the very strong category, which is above 0.7. This categorization is in accordance with the recommendation of Hair et al. (2011) that the R² value for endogenous latent variables is 0.75 (large), 0.5 (medium), and 0.25 (weak). This indicates that these measures originate from the construct itself (Fornell and Larcker, 1981).

Interpretation of R-Squared and Adjusted R-Squared (R²)

The R value is usually slightly above the Adjusted R-Squared (around 0.28 or 28% if calculated from 0.552). However, the main focus in the outcome results is the value of Adjusted R-Squared = 0.541. This is because the Adjusted R-Squared value is much more accurate in measuring the level of connectivity between variables and the sample size studied. Contribution of Influence: A value of 0.551 means that the independent variables in the studied model are able to explain 55% of the variation in the dependent variable. External Factors: The remaining 45% (100% - 55%) is explained by other factors outside the model that are not used by the researcher or fall into the "error" category.

The results from Table 1 can be concluded as follows: The model used has a moderate predictive ability. This can be explained because more than half of the variation in the phenomenon

(55%) in the study conducted on the influence of teacher resilience and digital competence is considered sufficiently good. The very small difference between the R and Adjusted R values (0.551 to 0.541) also indicates that the model used by the researcher is already efficient, meaning the variables used by the researcher are indeed relevant and there is no waste of variables or discarded variables.

Hypothesis Testing

Table 2. P-Value Test and T-Test

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Resilience -> Effectiveness of Learning Media	0.131	0.141	0.108	1,280	0.020
Teacher's Digital Competence-> Effectiveness of Learning Media	0.455	0.462	0.102	4,566	0,000
Digital Transformation -> Effectiveness of Learning Media	0.222	0.218	0.110	2,080	0.033

The explanatory power of the model (R^2) $R^2 Y = 0.541$ or 54.1 % with variations. The results of the relationship between variables (inner model) on all paths in the model have shown significance ($p < 0.05$): X_1 (Resilience) $\rightarrow Y$ (Effectiveness of learning media utilization): $\beta = 0.603$; $t = 15.040$; $p = 0.000$. This result can be interpreted that resilience is a factor that has a positive and supportive influence in increasing the effectiveness of digital learning media utilization. While the variable X_2 (Digital Competence) $\rightarrow Y$: $\beta = 0.0202$; $t = 5.828$; $p = 0.033$ which means that Teacher Digital Competence has a dominant influence on the level of effectiveness of digital learning media utilization.

In statistical analysis, the p-Value (Probability Value) is used to determine whether the research results have statistical significance or are merely due to chance. The commonly used threshold (alpha) is 0.05 (5%).

Interpretation of p-Value = 0.000 for the digital competence variable

The value obtained in Table 2 is well below the threshold of 0.05 ($p < 0.05$), which means that the significance value: This variable has a very significant effect on the dependent variable. Its meaning: This study has rejected the Null Hypothesis (H_0), which means that the probability that this relationship occurs merely by chance is almost zero (very small) with a confidence level of p-value 0.000 or $p < 0.001$, which is very high (above 99.9%), indicating that the variable truly has a real effect.

Interpretation of p-Value = 0.0202 for the resilience

This value is also below the threshold of 0.05 ($p < 0.05$). Significance: The resilience variable has a significant effect. Meaning: this result also rejects the Null Hypothesis (H_0) for the resilience variable. Although not as strong as the 0.000 value, this result is still statistically valid to indicate a real effect or relationship with a confidence level of 92.8%.

Discussion

The results of the study indicate that teacher resilience has a non-dominant influence on the effectiveness of digital learning media utilization. The test of the influence of resilience was significant ($p < 0.05$) at $p = 0.033$. This indicates that teachers' psychological and spiritual resilience are important drivers and supports in dealing with the emotional aspects of work pressure and digital transformation. These factors directly determine the effectiveness of digital learning media utilization in the learning process. This can be explained theoretically by the fact that resilience functions as psychological capital in dealing with academic stress and technological change. Resilient teachers tend to have strong emotional management, adapt well to changes in curriculum and technology, and have high self-efficacy. These results are in line with the opinion that spiritual well-being can increase resilience, mental well-being, and resilience in the learning environment (Utami dkk., 2024).

Several studies show that competencies (pedagogical, professional, PCK, self-efficacy, enthusiasm) are directly and strongly related to student learning outcomes: In elementary school science learning, teacher competencies (PCK, self-efficacy, enthusiasm) are positively related to students' interests and conceptual understanding; teaching quality mediates this relationship. (Pradana, 2023). Correlational studies in elementary schools found a strong correlation between teacher competencies (pedagogical, professional, social, personality) and student learning outcomes ($r = 0.651$), (Mardiana dkk., 2025) A synthesis study showed that teachers' teaching competence and self-efficacy beliefs were related to instructional quality and academic success, although the pathway of influence often went through the classroom process (teaching quality). Another study at Tonekabon Elementary School showed that teachers' instructional competence had a direct effect on service-

learning outcomes ($\beta = 0.231$), while the remainder was influenced by teachers' ability and commitment to teaching (Liu dkk., 2022).

In the perspective of Islamic education itself, teacher resilience based on the values of patience, tawakkul, and mujahadah al-nafs is assumed to be a spiritual foundation that can strengthen teachers' commitment in the process of making changes when delivering learning materials, even though its influence is not statistically dominant, this value still plays a role in forming the professional character of teachers who are adaptive and have integrity.

The Influence of Teachers' Digital Competence on the Effectiveness of Digital Learning Media

Teachers' digital competence has been shown to have a significant and dominant influence on the effectiveness of digital learning media utilization ($\beta = 0.455$; $p < 0.05$). This finding indicates that teachers' technical abilities in operating digital devices, utilizing learning platforms, and designing interactive media are key factors in the success of digital-based learning. However, in the context of digital media implementation, the effectiveness of digital media utilization is largely determined by the technical aspects and operational skills possessed by teachers.

This is in line with the digital literacy theory presented by Mishra and Koehler (2006) which describes the ability of teachers to integrate technology with pedagogy and content in the learning process. This confirms that the effectiveness of digital learning is largely determined by technology-based pedagogical skills (Technological Pedagogical Content Knowledge/TPACK). TPACK consists of three main components, namely: (a) Content Knowledge (CK): knowledge of the content of the subject being taught, (b) Pedagogical Knowledge (PK): knowledge of learning methods and strategies, and (c) Technological Knowledge (TK): knowledge of the technology used in learning (Absari dkk., 2020).

TPACK (Technological Pedagogical Content Knowledge) emphasizes the integration of three aspects: technological knowledge, pedagogy, and content. Learning will be effective if teachers not only master technology but are able to align it with teaching methods and learning materials contextually (Wardani dkk., 2024) Systematic reviews show that teachers'

TPACK competencies are strongly correlated with the effectiveness of technology-based learning, including improvements in learning structure, interaction, and student engagement (Arifuddin dkk., 2025). In the context of learning, teachers with high digital competency can be predicted to be able to design interactive learning and select media, integrate digital media according to learning objectives, optimize online learning platforms, and increase student participation and motivation. This is important because empirical conditions indicate that some elementary school teachers still experience limitations in mastering technology, which is a challenge in itself. Therefore, capacity building through ongoing training, digital workshops, and school infrastructure support is an urgent need.

The model of effectiveness of digital media utilization, Media characteristics, Task suitability, Student characteristics, and Learning Design (K3D) that can be recommended will be presented in the following table:

Table 1. Model of effectiveness of K3D digital media utilization

Model Components	Core Learning	Indicator Reference
Characteristics of the selected digital media	Interactivity, multi-model (text-image-video-audio)	LMS, mobile apps, simulations, digital storytelling
Task-Technology-Fit	Suitability of media features to learning objectives, task types, and content characteristics	Discussion features for collaborative assignments, simulations for abstract concepts
Student characteristics	Media/digital literacy, motivation, education level, study habits Literacy level	Media literacy level influences online learning outcomes
Learning design & teacher role	Scaffolding, instructional guides, blended vs. full online, collaborative vs. individual	Online Blended Learning

This model is in line with previous research, which shows that the characteristics of digital media such as the use of text, images, and videos chosen by teachers in the learning process, can improve student achievement in understanding teaching materials (Alshammary & Alhalafawy, 2023) Research, it turns out, that student characteristics also influence online learning outcomes. The choice of digital media for online learning can influence the effectiveness of the teaching delivered by teachers in terms of learning (Pradana, 2023). This confirms that the effectiveness model of digital media that can

improve student learning outcomes cannot be separated from the determining components of K3D.

Based on the PLS-SEM analysis, the main findings are: (1) Digital competence has a positive and significant effect on the effectiveness of using digital learning media. This means that the higher the teacher's ability to integrate technology, pedagogy, and content, the more effectively digital media is used in learning. (2) Teacher resilience affects the effectiveness of using digital media, but its contribution is not as strong as digital competence. Resilience serves as a supporting factor that strengthens teachers' readiness and adaptation to technological changes. (3) Simultaneously, both variables are able to explain more than half of the variation in the effectiveness of using digital learning media, with R^2 in the medium category. Thus, H_1 can be accepted because resilience has an effect, although not as dominant, at 0.033, whereas H_2 has a significant and dominant effect on the effectiveness of digital learning media. These results are in accordance with previous research which shows that teachers' digital competence has a positive effect on innovative work behavior; digitally competent teachers tend to use technology to create effective, creative, innovative, independent, and enjoyable learning (Lutfi Astuti & Ikhwan Setiawan, 2023).

The interpretation of the research results shows that the effectiveness of using digital media in elementary schools is more determined by teachers' technical and pedagogical capacity with technology than by psychological factors alone. This indicates that: (1) Mastery of digital devices alone is not enough, (2) teachers must be able to integrate technology pedagogically, and (3) mental resilience helps teachers remain adaptive when facing technological challenges, work pressure, or changes in the learning system. Another explanation is that digital competence is the "driving engine," while resilience is the "system's endurance." Thus, digital competence becomes the dominant factor, while resilience plays a reinforcing role in increasing the effectiveness of digital learning (Nurfadhilah dkk., 2025).

Compared to previous research, this finding is more consistent because it emphasizes several concepts, namely: the TPACK Model (Mishra & Koehler) states that the effectiveness

of digital learning is highly determined by the integration of technology, pedagogy, and content knowledge, and Albert Bandura's self-efficacy theory explains that self-belief and individual resilience affect work performance and adaptation to change. This study reinforces earlier studies that state that digital competence has a direct influence on the quality of technology-based learning, while resilience often acts as a supporting or moderating variable (Shi dkk., 2025).

Mastery of technology and digital innovation competencies enables teachers to use innovative methods (VR/AR, digital assessments, immersive learning experiences) that enhance student engagement and learning outcomes (Aldaleel, 2025). Many teachers still perform poorly in the dimension of digital content creation, even though this is said to be a fundamental pillar for realizing a new teaching innovation landscape. This aligns with Artacho's research, which states that innovative digital content creation by a teacher can result in creative and interactive learning innovate (Zhang & Luo, 2023). This study found a significant gap, particularly in the creation of media-utilization content, innovative methodologies, assessment strategies, and feedback; strengthening these areas is seen as key for current educational innovation. Data and digital teaching competencies predict teachers' ability to empower students (including students' digital competency, ethical use of technology, and collaboration). This confirms that the digital competence possessed by teachers is able to bring changes in learning through the selection and utilization of media and teaching materials that are more likely to capture students' attention and enthusiasm (Robandi dkk., 2025).

Theoretically, research results can be explained through two main foundations: The TPACK model explains that effective digital learning occurs when teachers are able to integrate: Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). The higher the digital competence, the more optimal the integration. According to Bandura, individuals with high self-efficacy will: Be more confident in facing challenges, not easily give up, and be adaptive to changes. In this context, resilience helps teachers remain consistent and avoid burnout when facing the digital transformation of education (Setiawati dkk., 2025).

The practical implication is that schools need to conduct TPACK-based training continuously, and there is a need for teacher professional development programs that include strengthening technology competence and training in stress management and resilience reinforcement, as well as the need for the education office to provide infrastructure and technical support so that the training can be implemented optimally. The theoretical implication of this study is to strengthen an integrative model between digital competence and resilience in explaining the effectiveness of digital learning, contribute empirically to the development of digital education models at the elementary school level, and open opportunities for the development of new conceptual models based on teachers' digital competence and psychological capital (Dwiningrum dkk., 2023).

This study is still limited to a sample size of only elementary school teachers in one area, so generalization is limited. Data were obtained through self-report questionnaires, which are subject to potential subjective bias, and the study design is cross-sectional, so it cannot determine long-term causal relationships. Other variables, such as principal support, school facilities, and organizational culture, have not been analyzed, so further research recommendations are needed focusing on: (1) Using longitudinal or experimental designs to test causal relationships, (2) Developing mediation or moderation models (e.g., resilience as a moderator between digital competence and effectiveness), (3) Expanding the sample to other educational levels (middle school, high school), and (4) Using a mixed-methods approach to deepen the understanding of phenomena with other variables that have not yet been studied (Armawi dkk., 2021).

CONCLUSION

The main findings in the study show that the R Square value is 0.552 (Adjusted R² = 0.541), which means that teacher resilience and digital competence simultaneously can explain 55.2% of the variation in the effectiveness of digital learning media utilization. This finding confirms that digital competence is a dominant factor in enhancing the effectiveness of digital learning media, while resilience plays a supporting role in strengthening teacher readiness to improve learning quality in the digital era.

This research contribution emphasizes the importance of strengthening digital competency training for teachers integrated with the development of spiritual and psychologically-based resilience values to create effective, adaptive, and sustainable digital learning.

Recommendations from the research results, so that teachers can adapt quickly to digital technology and utilize digital learning media more effectively, are (a). Local governments need to organize ongoing digital training for elementary school teachers, (b). Schools need to provide adequate technological facilities, (c). Programs to strengthen teacher character and spirituality continue to be developed as a foundation for professional resilience, and (d). Collaboration between schools and parents in students' digital literacy needs to be strengthened. Teacher resilience functions as psychological capital in navigating work pressures and technological changes in the school learning process.

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