



Strengthening teachers' digital competence through school climate, KSRG program, motivation, and transformational leadership

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ABSTRACT

This study examines the effects of the Google Reference School Candidate (KSRG) Program, teacher motivation, and transformational leadership on teachers' digital competence through school climate in State Senior High Schools across West Sumatra Province. A quantitative causal research design was employed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). The study involved 481 teachers selected through purposive sampling from State Senior High Schools across West Sumatra. Data were collected using a five-point Likert-scale questionnaire measuring teachers' digital competence, the KSRG Program, teacher motivation, transformational leadership, and school climate. Data were analyzed using SmartPLS to evaluate the measurement model and structural model. The findings indicate that the KSRG Program ($\beta = 0.246$, $p < 0.001$) and teacher motivation ($\beta = 0.843$, $p < 0.001$) have positive and significant effects on teachers' digital competence, whereas transformational leadership has no significant direct effect ($\beta = -0.083$, $p = 0.061$). The KSRG Program, teacher motivation, and transformational leadership significantly influence school climate, while school climate has a significant negative effect on teachers' digital competence ($\beta = -0.145$, $p = 0.016$). Furthermore, school climate significantly mediates the relationships between the KSRG Program, teacher motivation, transformational leadership, and teachers' digital competence. The study concludes that teacher motivation is the strongest determinant of teachers' digital competence, whereas transformational leadership plays the most prominent role in shaping school climate. These findings highlight the importance of integrating motivational, organizational, and digital transformation initiatives through the KSRG Program to strengthen teachers' digital competence.



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Introduction

The rapid development of digital technology has fundamentally transformed educational practices, requiring schools not only to provide adequate technological infrastructure but also to ensure that teachers possess the digital competencies needed to integrate technology effectively into teaching and learning (Didmanidze et al., 2023; Simatupang et al., 2024). Teachers' digital competence has become a critical factor in the success of

educational digital transformation because it enables teachers to design, implement, and evaluate technology-enhanced learning in pedagogically meaningful ways. However, despite continuous investments in digital education initiatives, many teachers still experience difficulties in integrating digital technologies into classroom practice due to varying levels of digital competence. This condition limits the effectiveness of digital transformation programs and highlights the urgent need to identify the organizational and individual factors that strengthen teachers' digital competence.

Teachers' digital competence is recognized as a key determinant of educational quality in the digital era because it enables teachers to effectively integrate technology into teaching, assessment, and student-centered learning (Diachuk, 2024; González-Medina et al., 2025; Wibawanta et al., 2021). However, empirical evidence indicates that many teachers still face difficulties in applying digital technologies beyond basic instructional functions. Digital tools are often limited to content presentation, while their potential to support collaborative learning, digital assessment, and student engagement remains underutilized. This gap between the expected and actual use of digital technologies demonstrates that teachers' digital competence has not yet reached the level required to support effective digital transformation in schools. Therefore, identifying the factors that strengthen teachers' digital competence has become an important research priority.

Nevertheless, Indonesia's education system continues to face significant challenges in improving learning quality and adapting to the demands of digital transformation. According to the 2025 World Population Review, Indonesia ranks 67th globally in education system quality (DetikEdu, 2025), while the United Nations Development Programme (UNDP, 2025) ranks Indonesia 113th out of 193 countries in the Human Development Index. These rankings indicate that strengthening teacher quality remains a national priority. In the context of digital education, this challenge is reflected in teachers' limited ability to integrate digital technologies effectively into teaching and learning, making teachers' digital competence a critical issue that requires empirical investigation.

Low teacher competency is also reflected in the results of the Teacher Competency Test (UKG) based on certification status released by the Ministry of Education, Culture, Research, and Technology.

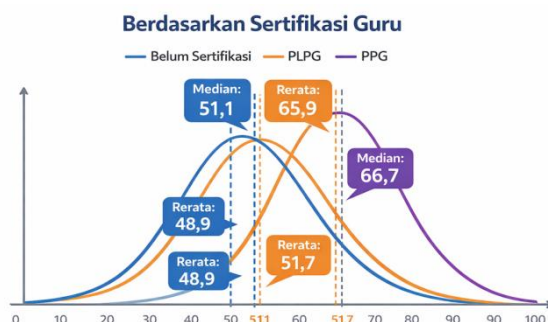


Figure 1 Teacher Competency Test Data by Teacher Certification Status

Based on Figure 1, uncertified teachers achieved the lowest competency scores, with a median of 48.9 and an average of 48.8, while PLPG-certified teachers had a median of 51.1 and an average of 51.7. PPG-certified teachers achieved the highest scores, with a median of 66.7 and an average of 65.9. However, these results still indicate that teacher competency has not reached optimal levels. This finding indicates that certification alone is not sufficient to improve teacher competency, particularly the digital competency required for technology-based learning.

Previous research has consistently reported that many teachers continue to experience difficulties in integrating digital technologies into classroom practice despite ongoing digital transformation initiatives. Common challenges include limited use of digital tools beyond presentation, inadequate integration of collaborative learning platforms, insufficient application of digital assessment, and low utilization of educational technology ecosystems such as Google Workspace. These challenges indicate that strengthening teachers' digital competence remains essential for ensuring the successful implementation of digital transformation programs, including the Google Reference School Candidate (KSRG) Program.

These considerations provide the rationale for selecting the KSRG Program, teacher motivation, transformational leadership, and school climate as the main variables in this study. The KSRG Program represents a school-level digital transformation initiative, teacher motivation reflects individual readiness to adopt technology, transformational leadership provides strategic support for organizational change, and school climate serves as the organizational context that facilitates or constrains technology integration. Examining the

interplay among these variables is therefore expected to provide a more comprehensive explanation of how teachers' digital competence can be strengthened

Previous research has consistently shown that teachers' digital competence is influenced by three interrelated dimensions: individual readiness, organizational support, and digital transformation initiatives. Teacher motivation represents the primary individual factor that drives teachers to adopt and continuously develop digital competencies, whereas transformational leadership and school climate constitute organizational factors that encourage innovation, collaboration, and technology integration. At the institutional level, digital transformation programs such as the Google Reference School Candidate (KSRG) Program provide the infrastructure, training, and policy support necessary for sustainable digital learning (Hayati et al., 2023; Parlina et al., 2023; Emilzoli et al., 2025). Since these four variables have been repeatedly identified as critical determinants of teachers' digital competence, they were selected as the main constructs in this study to explain how teachers' digital competence can be strengthened through the interaction of individual, organizational, and technological factors.

In addition to institutional support, teacher motivation is a key psychological driver of teachers' digital competence because it shapes their intention to adopt, learn, and continuously use digital technologies in teaching. Teachers with higher levels of motivation are more willing to invest time in professional development, experiment with new digital platforms, and overcome challenges encountered during technology integration. Through repeated use and continuous learning, they gradually develop stronger digital knowledge, technical skills, and pedagogical confidence, which ultimately enhance their digital competence. Consequently, motivated teachers are more capable of implementing innovative, collaborative, and technology-enhanced learning practices (Fadilah et al., 2024; Sudiapermana et al., 2025; Alekseeva et al., 2022; Butar et al., 2024; Less, 2023).

Teacher motivation is closely linked to the principal's role in creating conditions that encourage teachers to adopt and effectively use digital technologies. Yahyuni et al. (2024) argue that school leadership enhances teacher competence by providing motivation, professional support, and opportunities for continuous development. In the context of digital transformation, transformational leadership is considered particularly important because it inspires teachers to embrace innovation, supports experimentation with technology-based instruction, and promotes a shared vision for digital learning (Dewi, 2024a; Suparno & Pujianto, 2025; Ashari et al., 2024; Abdullah et al., 2024; Purwanto et al., 2024). However, previous studies have predominantly examined the direct influence of transformational leadership on teacher performance or professional competence, while limited attention has been given to its role in strengthening teachers' digital competence through organizational mechanisms such as school climate, particularly within the implementation of digital transformation initiatives such as the Google Reference School Candidate (KSRG) Program. Addressing this gap, the present study investigates how transformational leadership contributes to teachers' digital competence both directly and indirectly through school climate.

The effectiveness of transformational leadership and teacher motivation in improving teachers' digital competence is not expected to occur directly but through the organizational environment in which teachers work. Previous studies have shown that a positive school climate strengthens leadership practices, reinforces teacher motivation, and creates a collaborative culture that supports technology integration (Jannah et al., 2022; Hoy & Miskel, 2015; Thapa et al., 2018; Granziera et al., 2021; Yu & Wang, 2025). In such an environment, teachers are more willing to share digital teaching practices, participate in collaborative learning, and adopt educational technologies more consistently. Therefore, this study conceptualizes school climate as a mediating variable through which the KSRG Program, teacher motivation, and transformational leadership influence teachers' digital competence, rather than merely as a contextual characteristic of the school.

Previous studies have consistently reported that limited teachers' digital competence is a major barrier to the successful implementation of digital transformation initiatives, even exceeding the influence of inadequate technological infrastructure (Suardi, 2024; Golodov et al., 2022; Pettersson, 2021). Inadequate digital pedagogical competence prevents teachers from integrating technology meaningfully into teaching and learning processes (Falloon, 2020). However, existing studies have generally examined the effects of leadership, motivation, digital programs, or school climate separately, with limited attention to how these factors interact to strengthen teachers' digital competence within a comprehensive organizational framework. Moreover, empirical evidence on the mediating role of school climate in the relationship between the KSRG Program, teacher motivation, transformational leadership, and teachers' digital competence remains scarce, particularly in the context of Indonesian public senior high schools. This study addresses these gaps by developing and testing an integrated structural model in which school climate functions as a mediating mechanism linking the KSRG Program, teacher motivation, and transformational leadership to teachers' digital competence. Accordingly, this research aims to examine these relationships among teachers in public

senior high schools across West Sumatra, thereby providing empirical evidence to support school digital transformation and the achievement of SDG 4 on quality education.

Method

This study employed a quantitative approach with a causal research design to examine the direct and indirect relationships among the research variables. A quantitative approach was adopted because it enables the collection of objective and measurable data that can be statistically analyzed to test theoretical relationships among variables. According to Creswell (2014), quantitative research is used to test objective theories by examining the relationships among variables using numerical data and statistical procedures. A causal research design was considered appropriate because this study not only examined the direct effects of the Google Reference School Candidate (KSRG) Program, teacher motivation, and transformational leadership on teachers' digital competence, but also investigated the mediating role of school climate in explaining these relationships. To test the proposed structural model, data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS), which allows the simultaneous estimation of direct and indirect effects among multiple latent variables.

The population of this study consisted of all teachers working in public senior high schools implementing the Google Reference School Candidate (KSRG) Program in West Sumatra Province. These schools were selected because they had officially adopted the KSRG Program as part of their digital transformation initiative. The distribution of the study population across KSRG public senior high schools in West Sumatra is presented in Table 1.

Table 1. Distribution of Research Population

Nama Sekolah	Kab/Kota	Populasi Guru (Ni)	Sampel (ni)
SMAN 3 Painan	Kab. Pesisir Selatan	27	12
SMAN 8 Padang	Kota Padang	65	30
SMAN 11 Padang	Kota Padang	59	27
SMA N 2 Sumatera Barat	Kab. Solok	22	10
SMAN 1 Gunung Talang	Kab. Solok	68	31
SMAN 3 Padang Panjang	Kota Padang Panjang	50	23
SMAN 1 Sumatera Barat	Kota Padang Panjang	26	12
SMAN 4 Pariaman	Kota Pariaman	43	19
SMAN 12 Padang	Kota Padang	64	29
SMAN 3 Bukittinggi	Kota Bukittinggi	57	26
TOTAL		481	219

This study employed total sampling (census sampling). The target population consisted of all teachers working in public senior high schools officially designated as Google Reference School Candidate (KSRG) schools in West Sumatra Province. Because the total population comprised only 481 teachers across ten KSRG schools, all eligible teachers were included in the study. Total sampling was considered appropriate because the population size was manageable and allowed the study to obtain comprehensive information from all teachers within the target population while minimizing sampling bias. This approach is also recommended for structural equation modeling when the entire accessible population can be included.

Data were collected using a questionnaire with a five-alternative Likert scale: Always (SL, score 5), Often (SR, score 4), Sometimes (KD, score 3), Rarely (JR, score 2), and Never (TP, score 1); scoring was reversed for negative statements. The Likert scale is used to measure the attitudes, opinions, and perceptions of an individual or group of people toward a social phenomenon (Sugiyono, 2020). The instrument was developed through the stages of variable determination, indicator and sub-indicator description, framework development, consultation with the supervising lecturer, and pilot testing on 20 teachers outside the research sample.

Data were collected using a questionnaire with a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire was developed based on the operational definitions and indicators of the five research constructs. Prior to the main data collection, the instrument was tested to ensure its validity and reliability. The summary of the validity and reliability testing results is presented in Table 2.

Tabel 2. Rekapitulasi Uji Validitas dan Reliabilitas Instrumen

Variable	Number of Items	Valid Items	Cronbach's Alpha	Category
Teachers' Digital Competence	43	43	0.979	Highly Reliable
KSRG Program	36	36	0.972	Highly Reliable
Teacher Motivation	26	26	0.970	Highly Reliable
Transformational Leadership	32	32	0.991	Highly Reliable
School Climate	36	36	0.978	Highly Reliable

As shown in Table 2, all questionnaire items met the predetermined validity criteria and were retained for the main survey. Furthermore, the Cronbach's Alpha coefficients ranged from 0.970 to 0.991, indicating excellent internal consistency for all constructs. These results demonstrate that the research instrument was appropriate for measuring teachers' digital competence, the KSRG Program, teacher motivation, transformational leadership, and school climate, thereby providing a reliable basis for the subsequent SEM-PLS analysis.

The validity and reliability of the measurement model were further evaluated using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS software. Indicator validity was assessed through outer loading values, convergent validity was evaluated using the Average Variance Extracted (AVE), and discriminant validity was examined using the Fornell–Larcker criterion and the Heterotrait–Monotrait Ratio (HTMT). Construct reliability was assessed using Cronbach's Alpha and Composite Reliability. Data analysis consisted of descriptive and inferential analyses. Descriptive statistics were used to summarize the characteristics of each variable using minimum, maximum, mean, and standard deviation values. Inferential analysis was conducted using SEM-PLS to evaluate both the measurement model (outer model) and the structural model (inner model). The structural model was assessed by examining the coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), direct effects, indirect (mediating) effects, and path coefficients. The significance of the hypothesized relationships was determined using the bootstrapping procedure, with a significance level of $p < 0.05$.

Results and Discussions

To provide an initial understanding of the research variables, descriptive statistical analysis was first conducted before testing the proposed structural model. This analysis summarizes the distribution and central tendency of teachers' responses regarding teachers' digital competence, the implementation of the KSRG Program, teacher motivation, transformational leadership, and school climate. The descriptive findings offer an overview of the existing conditions of each construct and provide the empirical foundation for the subsequent evaluation of the measurement and structural models using SEM-PLS.

Tabel 3. Statistik Deskriptif Variabel Penelitian

Variabel	Skor Min	Skor Maks	Mean	SD
Kompetensi Digital Guru (Y)	88	215	172,87	24,34
Program KSRG (X1)	75	180	148,82	21,30
Motivasi Guru (X2)	68	130	113,04	13,32
Kepemimpinan Transformasional (X3)	85	160	147,57	16,25
Iklim Sekolah (Z)	91	180	160,30	17,27

Table 3 presents the descriptive statistics of the research variables. Overall, the mean scores indicate that teachers reported relatively high perceptions across all study variables. Teachers' Digital Competence recorded the highest mean score ($M = 172.87$, $SD = 24.34$), suggesting that respondents generally perceived themselves as having a good level of digital competence. Similarly, School Climate ($M = 160.30$, $SD = 17.27$) and the KSRG Program ($M = 148.82$, $SD = 21.30$) obtained relatively high mean scores, indicating that respondents perceived the school environment and the implementation of the KSRG Program to be generally supportive of digital learning. Teacher Motivation ($M = 113.04$, $SD = 13.32$) and Transformational Leadership ($M =$

147.57, SD = 16.25) also demonstrated relatively favorable perceptions among respondents, reflecting positive motivational and leadership conditions in KSRG public senior high schools in West Sumatra.

The standard deviation values ranged from 13.32 to 24.34, indicating a moderate level of variability in respondents' responses across all constructs. This finding suggests that although teachers generally shared positive perceptions regarding digital competence, the KSRG Program, teacher motivation, transformational leadership, and school climate, differences in perceptions among respondents still existed. These descriptive results provide an initial overview of the research variables and serve as a basis for the subsequent inferential analysis using Structural Equation Modeling–Partial Least Squares (SEM-PLS).

To provide an overview of respondents' distribution across the research variables, the scores were classified into three categories (low, moderate, and high) using the mean and standard deviation approach. Respondents with scores lower than one standard deviation below the mean ($X < M - 1SD$) were classified as low, those with scores between one standard deviation below and above the mean ($M - 1SD \leq X \leq M + 1SD$) were classified as moderate, and those with scores exceeding one standard deviation above the mean ($X > M + 1SD$) were classified as high. This classification was used solely for descriptive purposes to illustrate the distribution of respondents across the study variables.

Tabel 4. Kategorisasi Tingkat Capaian Variabel Penelitian

Variabel	Tinggi f (%)	Sedang f (%)	Rendah f (%)
Kompetensi Digital Guru (Y)	22 (12,4%)	132 (74,2%)	24 (13,5%)
Program KSRG (X1)	40 (22,5%)	114 (64,0%)	24 (13,5%)
Motivasi Guru (X2)	35 (19,7%)	122 (68,5%)	21 (11,8%)
Kepemimpinan Transformasional (X3)	0 (0,0%)	131 (73,6%)	47 (26,4%)
Iklim Sekolah (Z)	30 (16,9%)	120 (67,4%)	28 (15,7%)

As shown in Table 4, the majority of respondents were classified in the moderate category across all research variables. Specifically, 74.2% of respondents reported a moderate level of teachers' digital competence, while 64.0%, 68.5%, and 67.4% were categorized as having moderate perceptions of the KSRG Program, teacher motivation, and school climate, respectively. Similarly, 73.6% of respondents perceived transformational leadership at a moderate level. These findings indicate that although the implementation of the KSRG Program, teacher motivation, transformational leadership, school climate, and teachers' digital competence have been reasonably established, there remains considerable room for further improvement to achieve a higher level of digital transformation in public senior high schools implementing the KSRG Program.

The instrument testing results confirmed that all questionnaire items satisfied the established validity criteria and demonstrated excellent internal consistency. Therefore, all items were retained and used in the main survey. The satisfactory validity and reliability of the instrument indicate that it was appropriate for measuring teachers' digital competence, the KSRG Program, teacher motivation, transformational leadership, and school climate, providing a sound basis for subsequent SEM-PLS analysis.

The descriptive analysis indicates that teachers' digital competence was predominantly at the moderate level (74.2%), suggesting that although teachers have adopted digital technologies in their instructional practices, their competence has not yet reached an optimal level. This finding is consistent with previous studies reporting that many teachers continue to experience difficulties in integrating digital technologies into pedagogy beyond basic instructional functions. For example, Golodov et al. (2022) found that teachers generally possess adequate technical skills but face challenges in applying digital technologies to promote collaborative and student-centered learning. Similarly, Pettersson (2021) reported that limited pedagogical integration of digital technologies remains one of the main barriers to successful digital transformation in schools. These findings are also consistent with Suardi (2024), who emphasized that teachers' digital competence is a more critical determinant of digital transformation success than the availability of technological infrastructure.

The present findings reinforce these previous studies by demonstrating that teachers in KSRG public senior high schools in West Sumatra have not yet fully optimized the implementation of digital technologies despite participating in a structured digital transformation initiative. This condition suggests that strengthening teachers' digital competence requires more than providing digital infrastructure or technology-based programs. Continuous professional development, mentoring, and organizational support are essential to enable teachers to integrate digital technologies effectively into planning, teaching, assessment, and collaborative learning. These findings are consistent with the DigCompEdu Framework and UNESCO (2023), which emphasize that

teachers' digital competence encompasses not only technical proficiency but also the pedagogical capacity to use digital technologies to improve learning quality and student engagement.

The implementation of the Google Reference School Candidate (KSRG) Program was found to be at a moderate level (64.0%), indicating that although the Google Workspace for Education ecosystem has been introduced in participating schools, its implementation has not yet been fully optimized. This finding suggests that many teachers have begun adopting digital platforms; however, the integration of Google Workspace into teaching, assessment, and collaborative learning remains inconsistent. Similar findings were reported by Hayati et al. (2023), who found that the effectiveness of KSRG implementation is often constrained by teachers' varying levels of digital competence, limited participation in continuous professional development, and differences in schools' readiness to implement digital learning. Likewise, Emilzoli et al. (2025) reported that digital transformation programs frequently encounter challenges related to teachers' readiness to adopt new technologies and the sustainability of technology integration in everyday classroom practices.

The moderate level of KSRG implementation observed in this study indicates that the availability of digital platforms alone is insufficient to achieve successful school digital transformation. Instead, effective implementation depends on teachers' ability to utilize Google Workspace pedagogically, continuous mentoring, leadership support, and a collaborative school environment that encourages the sustained use of digital technologies. These findings support OECD (2023), which emphasizes that successful digital transformation requires not only technological infrastructure but also organizational readiness, ongoing professional development, and institutional commitment. Therefore, strengthening the KSRG Program should focus not only on expanding access to digital technologies but also on enhancing teachers' capacity and creating a supportive school environment that enables the effective integration of digital learning.

Teacher motivation was found to be at a moderate level (68.5%), indicating that although teachers demonstrated a willingness to improve their digital competence, this motivation had not yet been fully translated into optimal digital teaching practices. The structural model further revealed that teacher motivation had a positive and significant effect on teachers' digital competence, indicating that motivated teachers were more likely to engage in professional learning, explore new digital technologies, and integrate them into classroom instruction. This finding suggests that motivation functions as an important psychological driver that encourages teachers to continuously develop their digital knowledge, skills, and confidence in using educational technologies.

The findings of this study are consistent with those of Sudiapermana et al. (2025), who reported that motivated teachers are more likely to participate in professional development and adopt digital technologies in teaching. Similarly, Alekseeva et al. (2022) found that higher levels of teacher motivation promote continuous learning and strengthen teachers' capacity to integrate technology into pedagogical practices, while Butar et al. (2024) demonstrated that work motivation contributes to more innovative and technology-enhanced learning. These findings indicate that strengthening teachers' digital competence requires not only technological infrastructure but also strategies that enhance teachers' intrinsic motivation through continuous professional development, recognition, supportive leadership, and opportunities to apply newly acquired digital skills in everyday teaching practices.

School climate was found to be at a moderate level (67.4%), indicating that although schools have created a learning environment that supports digital transformation, the organizational climate has not yet fully fostered collaboration, innovation, and the continuous use of digital technologies. In the structural model, school climate was conceptualized as a mediating variable, indicating that its role extends beyond describing the school environment. Rather, it functions as an organizational mechanism through which the KSRG Program, teacher motivation, and transformational leadership influence teachers' digital competence. This finding suggests that digital transformation initiatives and leadership practices are more likely to strengthen teachers' digital competence when they are accompanied by a supportive and collaborative school climate.

These findings are consistent with Jannah et al. (2022), who reported that a positive school climate enhances the effectiveness of leadership and teacher motivation in improving teacher competence. Likewise, Granziera et al. (2021) found that collaborative school environments encourage teachers to exchange professional knowledge and adopt innovative teaching practices, while Yu and Wang (2025) demonstrated that supportive organizational climates facilitate the sustainable integration of digital technologies into teaching and learning. The present study extends these findings by demonstrating that school climate serves as a mediating mechanism linking the KSRG Program, teacher motivation, and transformational leadership to teachers' digital competence. This result highlights that strengthening teachers' digital competence depends not only on individual readiness or institutional digital programs but also on the creation of an organizational environment that encourages collaboration, innovation, and continuous professional learning.

Transformational leadership was perceived at a moderate level, with 26.4% of respondents rating it as low and no respondents perceiving it as high. These findings suggest that principals have not yet consistently demonstrated transformational leadership behaviors that encourage teachers to adopt and integrate digital technologies into their professional practice. Limited communication of a shared digital vision, insufficient encouragement for innovation, and inadequate support for continuous professional development may have reduced teachers' perceptions of transformational leadership. As a result, teachers may receive less strategic guidance and organizational support in developing their digital competence.

The structural model further revealed that transformational leadership did not have a significant direct effect on teachers' digital competence, but significantly contributed to the development of a supportive school climate, which subsequently mediated its influence on teachers' digital competence. This finding indicates that principals' leadership alone is insufficient to improve teachers' digital competence unless it first creates an organizational environment that promotes collaboration, innovation, and continuous professional learning. Similar findings were reported by Yahyuni et al. (2024), who found that school leadership enhances teacher competence primarily by fostering supportive organizational conditions rather than through direct influence. Likewise, Purwanto et al. (2024) argued that transformational leadership contributes to educational digital transformation by establishing a shared vision, strengthening collaborative culture, and encouraging continuous professional development. Therefore, the findings of this study highlight that the effectiveness of transformational leadership depends on its ability to cultivate a positive school climate, which subsequently facilitates the strengthening of teachers' digital competence.

Overall, the findings demonstrate that strengthening teachers' digital competence cannot be explained by a single factor but rather by the interaction of individual, organizational, and institutional factors. The SEM-PLS analysis confirms that teacher motivation, the KSRG Program, transformational leadership, and school climate collectively contribute to strengthening teachers' digital competence, although their effects operate through different mechanisms. In particular, the findings highlight the important mediating role of school climate in translating leadership practices and digital transformation initiatives into improvements in teachers' digital competence.

This study contributes to the existing literature by proposing and empirically validating an integrated model that explains how organizational and individual factors interact to strengthen teachers' digital competence within the implementation of the Google Reference School Candidate (KSRG) Program. Unlike previous studies that examined these variables separately, this research demonstrates that school climate functions as a key organizational mechanism linking the KSRG Program, teacher motivation, and transformational leadership to teachers' digital competence. These findings provide a more comprehensive understanding of school digital transformation and offer empirical evidence to support policies and leadership strategies aimed at strengthening teachers' digital competence in achieving sustainable digital education and SDG 4.

Conclusions

The findings of this study indicate that teachers' digital competence, the implementation of the Google Reference School Candidate (KSRG) Program, teacher motivation, transformational leadership, and school climate were generally perceived at a moderate level among public senior high school teachers in West Sumatra. Among these variables, transformational leadership demonstrated the greatest need for improvement, indicating that principals have not yet fully optimized their role in driving digital transformation within schools. These findings emphasize that strengthening teachers' digital competence requires an integrated approach that combines effective digital transformation programs, strong teacher motivation, transformational school leadership, and a collaborative school climate. The study also contributes to the literature by highlighting the importance of considering organizational and individual factors simultaneously in strengthening teachers' digital competence within the context of school digital transformation.

Based on these findings, education authorities and school principals should prioritize strengthening principals' transformational leadership capacity through continuous professional development, digital leadership training, and mentoring programs while fostering a collaborative and innovation-oriented school climate that supports the effective implementation of the KSRG Program. Future studies are encouraged to expand this research by involving different educational levels, broader geographical contexts, or additional organizational and technological variables to provide a more comprehensive understanding of the factors influencing teachers' digital competence. Furthermore, mixed-method or longitudinal research designs may be employed to gain deeper insights into how teachers' digital competence develops over time and how digital transformation initiatives can be sustained in educational institutions.

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