Journal of International Conference Proceedings (JICP)
Vol. 9 No. 3, pp. 260-275, October, 2026
E-ISSN: 2621-993X P-ISSN: 2622-0989
https://ejournal.aibpmjournals.com/index.php/JICP/index

The Influence of Transformational Leadership on The Innovative Behavior of Public High School Teachers In Sukabumi Regency

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ARTICLE INFORMATION

Publication information

Research article

HOW TO CITE
Suhendi, Karnati, N., & Sujanto, B. (2026). The influence of transformational leadership on the innovative behavior of public high school teachers in Sukabumi Regency. *Journal of International Conference Proceedings (JICP), 9*(3), 260-275.

DOI:
https://doi.org/10.32535/jicp.v9i3.5148

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Received: 19 August 2026
Accepted: 23 September 2026
Published: 31 October 2026

ABSTRACT

Teachers' innovative behavior is an important factor in improving the quality of learning amidst curriculum changes, technological developments, and the demands of 21st-century education. One factor suspected of playing a role in encouraging teachers' innovative behavior is the principal's transformational leadership. This study aims to analyze the influence of transformational leadership on the innovative behavior of public high school teachers in Sukabumi Regency. This study used a quantitative approach with a survey method. Data were collected through questionnaires given to public high school teachers in Sukabumi Regency, then analyzed using statistical techniques to determine the influence between variables. Transformational leadership was measured through the dimensions of idealized influence, inspirational motivation, intellectual stimulation, and individual consideration, while teachers' innovative behavior was measured through the ability to generate, promote, and implement new ideas in learning. The results showed that transformational leadership had a positive effect on teachers' innovative behavior. This finding indicates that principals who are able to provide inspiration, support, role models, and space for creativity can encourage teachers to be more innovative.

Keywords: Transformational Leadership Innovative Teacher Behavior, Learning Innovation.

INTRODUCTION

Schools are expected to prepare learners for environments shaped by rapid technological change, complex problem solving, collaboration, and continuous learning. This expectation changes the teacher's role from the delivery of established content to the design of learning experiences that help students inquire, create, and apply knowledge. Twenty-first-century teaching therefore requires pedagogical experimentation as well as competence in media, information, and technology (Pujana et al., 2023; Rugaiyah et al., 2022). In technology-enhanced settings, creativity is not an optional personal trait; it is a professional capacity through which teachers adapt curriculum, assessment, communication, and classroom interaction to changing student needs (Rigopouli et al., 2025; Trevallion & Cusanelli, 2021).

Innovative behavior translates that capacity into action. It includes recognizing instructional problems, generating and developing ideas, mobilizing support, and implementing new approaches that improve teaching and learning. The distinction between creativity and innovation is important: creativity produces a useful idea, whereas innovative behavior carries the idea into practice (Amabile, 2017; Bos-Nehles et al., 2017). For teachers, this may involve redesigning a lesson, developing a digital resource, applying a new assessment strategy, or coordinating with colleagues to solve a recurring learning problem. Recent Indonesian evidence links teacher innovativeness to self-efficacy, school climate, psychological empowerment, work engagement, and leadership conditions (Hariyanti & Izzati, 2024; Hidayat & Patras, 2024; Ilmi & Gistituati, 2024; Putri & Rini, 2021).

The empirical setting of the present study is the public senior high school system in Sukabumi Regency, West Java. The dissertation data describe schools working through curriculum change and expanding digitalization while facing unequal levels of infrastructure, technical skill, and readiness to depart from conventional teaching routines. This setting is analytically useful because technology adoption alone does not guarantee pedagogical innovation. Access gaps, confidence, organizational support, and the quality of implementation determine whether digital tools widen opportunity or reproduce existing constraints (Afzal et al., 2023; Ramadass & Shah, 2022). The key managerial question is consequently not whether technology is present, but how school leadership and teacher agency turn it into better professional practice.

Transformational leadership is frequently proposed as a central antecedent of innovation. Transformational leaders communicate an appealing vision, model commitment, provide individualized support, and stimulate followers to reconsider established assumptions (Bass, 1985; Deng et al., 2023). In schools, principals can protect time for experimentation, legitimize calculated risk, recognize teacher initiative, and align digital change with instructional goals. Evidence generally associates such leadership with teacher efficacy, change commitment, creativity, and innovative behavior (Dongxiao et al., 2023; Jun & Lee, 2023; Li & Liu, 2022). AIBPM studies similarly show that leadership-creativity relationships often depend on organizational culture or mediating processes rather than a simple direct effect (Ferdinan & Lindawati, 2021; Hermawan et al., 2022).

Self-efficacy provides one such process. It is the belief that one can organize and execute the actions required to attain a particular performance (Bandura, 1977). Teachers who believe they can master difficult tasks are more likely to set challenging goals, persist after setbacks, and interpret unfamiliar tools as learnable rather than threatening. Self-efficacy thus provides the psychological safety needed to test an idea whose outcome is uncertain. Current research associates efficacy beliefs with

engagement, adaptive performance, technology use, and innovative work behavior (Basileo et al., 2024; Bhati & Sethy, 2022; Choi et al., 2021; Paetsch et al., 2023).

Information and communication technology (ICT) use provides an operational pathway from confidence to innovation. Digital platforms can expand access to resources, accelerate feedback, support collaboration, and enable simulations or multimedia experiences that would be difficult to provide through conventional media (Faisal & Kisman, 2020; Mensah et al., 2023). Yet the benefit depends on pedagogical use, not merely frequency of use. Teachers need to select appropriate tools, organize information, communicate responsibly, create original resources, and evaluate whether technology improves learning. Research on teacher technology use shows that efficacy, digital competence, experience, and organizational conditions jointly influence adoption and persistence (Paetsch et al., 2023; Waloszek, 2024).

Prior studies commonly test isolated relationships, such as leadership with innovation, efficacy with innovation, or digital competence with instructional practice. This fragmentation leaves the mechanism connecting the three domains insufficiently specified. It also helps explain inconsistent findings: transformational leadership sometimes predicts innovative behavior, whereas other studies find a weak, negative, or context-dependent direct relationship (Bogar, 2019; Ferdinan & Lindawati, 2021; Zainal & Matore, 2019). A more complete explanation should distinguish the contextual impetus provided by leadership, the psychological readiness represented by self-efficacy, and the practical capability created through ICT use.

This study addresses that gap by examining how transformational leadership influences the innovative behavior of civil-service teachers in 27 public high schools. It estimates the direct leadership effect and then tests whether self-efficacy and ICT use explain how that influence reaches innovative practice. The study's novelty lies in distinguishing a direct leadership path from the total influence transmitted through a psychological mechanism and a technological-operational mechanism. The resulting evidence contributes to educational management by showing where principal leadership intervention is most likely to produce classroom innovation and offers school systems a basis for integrating leadership development, teacher learning, and digital strategy

LITERATURE REVIEW

Innovative Teacher Behavior

Innovative behavior is a deliberate, multi-stage effort to create and apply ideas that benefit an individual, team, or organization. Its stages include problem recognition, idea exploration, idea generation, idea promotion, and implementation (Bos-Nehles et al., 2017; Choi et al., 2021). In education, the object of innovation may be a learning method, curriculum unit, assessment design, digital resource, or collaborative routine. This definition prevents innovation from being reduced to novelty alone: an idea becomes educationally innovative when it is implemented and used to address a real pedagogical problem. Teachers' innovative behavior is consequently visible in the way they diagnose learning barriers, construct alternative solutions, gain support from students and colleagues, and sustain a promising practice.

Innovative work is extra-role and uncertain. It asks teachers to invest effort without a guaranteed outcome, expose their work to evaluation, and sometimes challenge routines embedded in school culture. Reviews identify both personal and organizational antecedents, including proactive personality, intrinsic motivation, self-efficacy, autonomy, knowledge sharing, psychological empowerment, leadership, and an innovation-supportive climate (Hariyanti & Izzati, 2024; Ismiantari & Mulyana, 2021; Jin

et al., 2022; Zainal & Matore, 2019). Innovative behavior therefore emerges from an interaction between a teacher's agency and the surrounding system. This interaction is especially important in public schools, where formal policy can encourage change while procedures, resource constraints, and accountability demands can limit experimentation.

The five behavioral indicators used in the dissertation preserve the full innovation cycle. Identifying a problem prevents novelty from becoming detached from instructional need. Developing and finding methods represent the creative and design stages, while promoting a method recognizes that implementation often depends on social acceptance and resource support. Applying the method captures conversion of intention into practice. This cycle is managerially important because a school may be strong at generating ideas but weak at sponsorship or implementation. Leadership, efficacy, and technology may also matter at different stages: leadership can legitimize and resource an idea, efficacy can sustain effort across setbacks, and ICT can make prototyping, sharing, and classroom application more feasible.

Transformational Leadership

Transformational leadership explains how leaders raise followers' aspirations and capabilities beyond routine exchange. Its core practices include idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Bass, 1985; Deng et al., 2023). A transformational principal connects change to a shared educational purpose, invites teachers to question ineffective routines, gives differentiated support, and recognizes professional growth. These practices can make experimentation legitimate and reduce the interpersonal risk of proposing unfamiliar ideas. They can also create an environment in which teachers interpret technological change as part of professional learning rather than administrative compliance.

Nevertheless, the leadership-innovation relationship is not necessarily direct. Leadership may affect creativity through team consolidation, learning motivation, organizational culture, change commitment, or perceived support (Ferdinan & Lindawati, 2021; Hermawan et al., 2022; Jun & Lee, 2023). Studies of digital change likewise emphasize that leaders create direction and enabling conditions, while followers still need the confidence and competence to use new technology (Bunjak et al., 2022; Philip, 2021). This reasoning predicts a positive effect of transformational leadership on innovative behavior, but also suggests that the effect may become stronger or only visible through mediating psychological and technological mechanisms.

Teacher Self-Efficacy

Self-efficacy is a task-relevant belief about capability, not a general statement of self-worth or an objective inventory of skill. Bandura (1977) identifies mastery experience, vicarious experience, verbal persuasion, and emotional or physiological states as major sources of efficacy. In schools, a successful trial of a new method, observation of a colleague's success, constructive principal feedback, and a supportive emotional climate can all strengthen a teacher's sense that change is manageable. Transformational leadership can activate these sources by providing challenging but attainable goals, models, coaching, recognition, and permission to learn from setbacks (Li & Liu, 2022).

High self-efficacy influences choice, effort, persistence, and recovery. It should make teachers more willing to seek new ideas and less likely to abandon an innovation after technical or instructional difficulty. Empirical work in educational and workplace settings associates self-efficacy with creativity, innovative behavior, academic engagement, and adaptive technology use (Adiebah & Pradana, 2022; Basileo et al., 2024; Hidayat & Patras, 2024; Putri & Rini, 2021). Efficacy may also have an indirect effect: confident

teachers are more likely to explore digital tools, and those tools provide a medium through which creative intentions become observable instructional changes.

Information and Communication Technology Use

ICT use in this study refers to the effective and responsible application of digital resources to manage information, communicate, create content, and advance educational work. It includes using appropriate technological resources, organizing relevant information, communicating through digital media, creating with technology, and exercising social and cultural judgment. This multidimensional view is broader than equipment access or basic operational skill. It focuses on the pedagogical and professional use of technology, which is the level at which digital capability can influence innovative behavior.

Technology can support innovation by expanding teachers' idea pools, lowering the cost of prototyping, and enabling rapid feedback. Online repositories expose teachers to diverse methods; learning platforms permit iterative changes to content and assessment; multimedia and simulations support alternative representations; and communication tools make collaboration easier (Faisal & Kisman, 2020; Mensah et al., 2023; Ramadass & Shah, 2022). Digital capability also matters outside education. AIBPM evidence shows that employee digital capability can support innovative work behavior, reinforcing the view of technology as an enabler rather than a passive resource (Sari & Arief, 2021).

Adoption remains shaped by the user and the organization. Teachers with stronger efficacy and prior experience use technology more consistently, whereas access barriers and anxiety can restrict adoption (Afzal et al., 2023; Paetsch et al., 2023). Leadership matters by articulating a digital vision, allocating resources, supporting peer learning, and connecting technology to instruction (Bunjak et al., 2022; Philip, 2021). These mechanisms imply that ICT use can transmit both leadership support and teacher confidence into innovative practice.

The distinction between digitization and digital transformation further clarifies the model. Digitization changes the form of an existing resource, whereas transformation redesigns how work is organized and value is created. In a classroom, scanning a worksheet is digitization; using formative data to adapt tasks, connect learners, or create interactive representations approaches pedagogical transformation. Leadership can establish the purpose and norms for this redesign, but teachers need efficacy and professional judgment to carry it out. Studies of transformational leadership in digital change emphasize this complementary relationship between strategic direction and employee adoption capability (Philip, 2021), while teacher research shows that technology use evolves through the joint influence of confidence, literacy, and experience (Paetsch et al., 2023).

Hypotheses Development

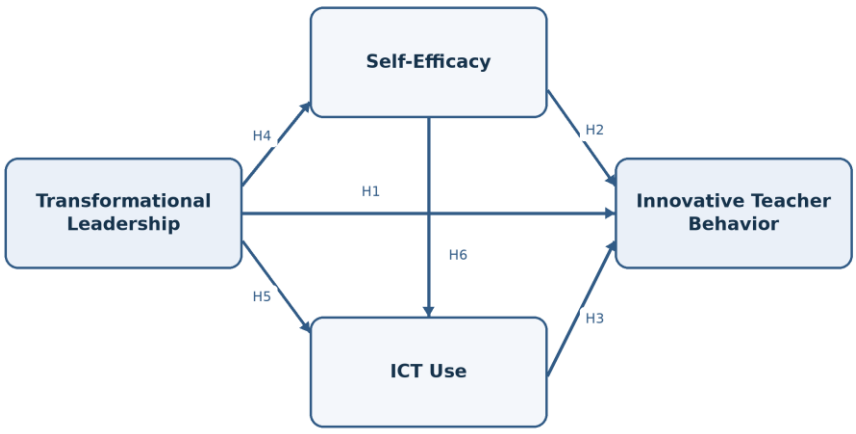
Transformational principals encourage intellectual stimulation, professional autonomy, and a shared commitment to improvement. These conditions should increase teachers' willingness to generate and implement new ideas, although the mixed evidence suggests that the direct effect may depend on intervening resources (Bogar, 2019; Ferdinan & Lindawati, 2021). Self-efficacy should exert a positive direct influence because confident teachers persist in uncertain tasks and recover from unsuccessful trials. ICT use should also exert a positive effect by supplying resources, channels, and design possibilities for pedagogical experimentation.

H1: Transformational leadership positively affects teachers' innovative behavior.
H2: Self-efficacy positively affects teachers' innovative behavior.
H3: ICT use positively affects teachers' innovative behavior.

Transformational leadership should strengthen self-efficacy because inspiring goals, individualized support, modeling, and constructive feedback supply social and experiential sources of efficacy (Dongxiao et al., 2023; Li & Liu, 2022). Leadership should also encourage ICT use through a coherent digital vision, resource support, and the legitimation of experimentation. Self-efficacy, in turn, should increase ICT use because teachers who believe they can learn and overcome difficulty are more likely to explore unfamiliar applications and persist through technical problems (Paetsch et al., 2023; Waloszek, 2024).
H4: Transformational leadership positively affects teacher self-efficacy.
H5: Transformational leadership positively affects ICT use.
H6: Self-efficacy positively affects ICT use.

The mediation argument follows from the division of roles in the model. Leadership provides direction and enabling conditions, self-efficacy provides psychological readiness, and ICT use supplies a concrete means of designing and implementing change. Consequently, leadership and self-efficacy may influence innovation partly through technology use. A serial mechanism is also plausible: transformational leadership strengthens efficacy, efficacy encourages ICT use, and ICT use enables innovative behavior. This mechanism is consistent with evidence that leadership effects on creativity and innovation can be fully mediated by collaborative or capability-building processes (Hermawan et al., 2022).
H7: ICT use mediates the effect of transformational leadership on teachers' innovative behavior.
H8: ICT use mediates the effect of self-efficacy on teachers' innovative behavior.

Conceptual Framework
Figure 1 summarizes the hypothesized structural relationships. Transformational leadership is modeled as the principal contextual antecedent, self-efficacy as a psychological mechanism, ICT use as a technological and operational mechanism, and innovative teacher behavior as the focal outcome.
Figure 1. Conceptual Framework



Note. ICT = information and communication technology. Source: Developed from the dissertation model (2025).

RESEARCH METHOD

The study used a quantitative, cross-sectional survey design to estimate direct and indirect relationships among four latent constructs. The population comprised 392 civil-service teachers employed in 27 public senior high schools in Sukabumi Regency, Indonesia. Proportional random sampling was used so that teachers from the participating schools had representation aligned with school size. Although the initial sampling plan in the dissertation specified a minimum of 196 participants, data screening yielded 246 valid cases for the final analysis.

Data were collected in 2025 using a structured questionnaire distributed through an online form. Responses used a five-point Likert scale ranging from strongly disagree to strongly agree, with negatively worded items reverse coded before analysis. The data preparation process included completeness checks, coding, treatment of missing responses, and verification of reverse-coded items. The unit of analysis was the individual teacher, and all reported descriptive statistics and model estimates are based on the 246 valid responses.

Innovative teacher behavior was operationalized as teachers' perceptions of their activities in identifying problems and challenges, developing ideas, finding new methods, promoting solutions, and implementing new approaches. Transformational leadership captured teachers' perceptions that principals encouraged novelty, demonstrated charismatic influence, provided inspiration, and exercised considered judgment. Self-efficacy represented resilience after failure, confidence in overcoming barriers, willingness to set challenging goals, belief in achieving success, and readiness to learn new ways of handling difficulty. ICT use covered resource use, appropriate application, information organization, digital communication, creative technology use, and social-cultural responsibility. Each construct was initially represented by 40 questionnaire items.

The structural specification treated transformational leadership as the exogenous construct. Self-efficacy and ICT use were both endogenous predictors and mediators, while innovative behavior was the final endogenous outcome. This ordering followed the dissertation's theoretical argument that school leadership shapes professional beliefs and the conditions for technology use, whereas teacher beliefs influence whether technology is explored and sustained. The model also retained direct paths to innovative behavior so that mediation could be distinguished from a simple omission of leadership or efficacy effects.

Partial least squares structural equation modeling (PLS-SEM) was applied because the study tested several dependent constructs, multiple simultaneous paths, and mediated effects. The measurement model was evaluated through indicator loadings, Cronbach's alpha, rho_A, composite reliability, and average variance extracted (AVE). The dissertation specified loading values above .50, composite reliability above .70, and AVE above .50 as the principal acceptance criteria. Discriminant validity was examined with the Fornell-Larcker comparison of square roots of AVE with inter-construct correlations. The structural model was evaluated through standardized path coefficients, bootstrap t statistics, p values, confidence intervals, coefficients of determination (R squared), effect sizes (f squared), and specific indirect effects. A two-tailed critical t value of 1.96 and $p < .05$ were used to identify statistically significant paths. The analysis estimated six direct relationships, the two hypothesized mediation paths through ICT use, and additional indirect and serial paths needed to explain how transformational leadership was transmitted through self-efficacy and technology use

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RESULTS

The four constructs were rated highly on the five-point scale. Transformational leadership had the highest mean (M = 4.29, SD = 0.36), followed by self-efficacy (M = 4.21, SD = 0.32), innovative behavior (M = 4.19, SD = 0.32), and ICT use (M = 4.14, SD = 0.33). The distributions nevertheless retained meaningful variation. In the dissertation's categorical results, 84.96% of respondents rated transformational leadership high or very high, 79.68% reported high or very high self-efficacy, 83.33% reported high or very high ICT use, and 78.86% reported high or very high innovative behavior. Table 1 presents the construct-level descriptive statistics.

Table 1. Descriptive Statistics (N = 246)

Construct	N	M	SD	Min.	Max.
Innovative behavior	246	4.19	0.32	3.31	4.56
Transformational leadership	246	4.29	0.36	2.27	4.64
Self-efficacy	246	4.21	0.32	3.00	4.56
ICT use	246	4.14	0.33	3.00	4.48

Note. M = mean; SD = standard deviation; ICT = information and communication technology. Source: Processed dissertation data (2025).

Internal consistency and convergent validity met the stated thresholds. Cronbach's alpha ranged from .964 to .977, composite reliability ranged from .971 to .981, and AVE ranged from .502 to .598. These values indicate strong consistency and that each construct explained more than half of the variance in its indicators. The very high reliability values also suggest that some items may be closely similar, an issue considered in the limitations. Table 2 summarizes the measurement-model coefficients.

Discriminant validity was less conclusive. The square roots of AVE were .752 for self-efficacy, .773 for transformational leadership, .708 for ICT use, and .718 for innovative behavior. Several correlations exceeded the corresponding diagonal values, including self-efficacy with ICT use (.884), ICT use with innovative behavior (.843), self-efficacy with innovative behavior (.836), and transformational leadership with self-efficacy (.801). The constructs were therefore reliable and convergently valid, but the Fornell-Larcker results indicate conceptual overlap. The structural coefficients should be interpreted as relationships among closely related dimensions of a shared school-innovation system rather than completely independent phenomena.

Table 2. Construct Reliability and Convergent Validity

Construct	Cronbach's alpha	rho_A	CR	AVE
Self-efficacy	.968	.985	.976	.565
Transformational leadership	.977	.986	.981	.598
ICT use	.964	.979	.971	.502
Innovative behavior	.964	.979	.971	.515

Note. CR = composite reliability; AVE = average variance extracted. Source: Processed dissertation data (2025).

Five of the six direct paths were positive and statistically significant. Transformational leadership strongly predicted self-efficacy (beta = .801, t = 24.579, p < .001) and also predicted ICT use (beta = .302, t = 4.722, p < .001). Self-efficacy predicted ICT use (beta = .642, t = 10.202, p < .001) and innovative behavior (beta = .362, t = 2.901, p = .004). ICT use predicted innovative behavior (beta = .399, t = 2.359, p = .019). By contrast, the direct path from transformational leadership to innovative behavior was not significant (beta = .152, t = 1.401, p = .162), and its 95% confidence interval crossed zero. Consequently, H2 through H6 were supported, whereas H1 was not supported.

Table 3. Direct Structural Effects

Structural path	beta	SD	t	p	Decision
Self-efficacy -> ICT use	.642	.063	10.202	< .001	Supported
Self-efficacy -> Innovative behavior	.362	.125	2.901	.004	Supported
Transformational leadership -> Self-efficacy	.801	.033	24.579	< .001	Supported
Transformational leadership -> ICT use	.302	.064	4.722	< .001	Supported
Transformational leadership -> Innovative behavior	.152	.109	1.401	.162	Not supported
ICT use -> Innovative behavior	.399	.169	2.359	.019	Supported

Note. beta = standardized path coefficient; SD = bootstrap standard deviation. Source: Processed dissertation data (2025).

The indirect-effect results clarified the nonsignificant direct leadership path. Transformational leadership influenced innovative behavior through ICT use (beta = .120, t = 2.116, p = .035), supporting H7. Self-efficacy also influenced innovative behavior through ICT use (beta = .256, t = 2.217, p = .027), supporting H8. Additional analysis showed a significant indirect effect of leadership on innovative behavior through self-efficacy (beta = .290, p = .004) and a significant serial path from leadership through self-efficacy and ICT use to innovative behavior (beta = .205, p = .030). Leadership also influenced ICT use through self-efficacy (beta = .514, p < .001).

Table 4. Specific Indirect Effects

Specific indirect path	beta	t	p	Interpretation
Transformational leadership -> Self-efficacy -> ICT use	.514	9.488	< .001	Significant
Transformational leadership -> Self-	.290	2.900	.004	Significant

Specific indirect path	beta	t	p	Interpretation
efficacy -> Innovative behavior				
Self-efficacy -> ICT use -> Innovative behavior	.256	2.217	.027	Significant
Transformational leadership -> Self-efficacy -> ICT use -> Innovative behavior	.205	2.179	.030	Significant
Transformational leadership -> ICT use -> Innovative behavior	.120	2.116	.035	Significant

Note. All indirect effects shown are statistically significant at p < .05. Source: Processed dissertation data (2025).

The model had substantial explanatory power. Transformational leadership explained 64.2% of the variance in self-efficacy (adjusted R squared = .640). Leadership and self-efficacy jointly explained 81.4% of the variance in ICT use (adjusted R squared = .812). Leadership, self-efficacy, and ICT use explained 75.6% of the variance in innovative behavior (adjusted R squared = .753). Effect-size results were consistent with the path pattern: leadership had a very large effect on self-efficacy (f squared = 1.790), self-efficacy had a large effect on ICT use (f squared = .794), and the direct leadership effect on innovative behavior was very small (f squared = .029). The total effect of leadership on innovative behavior was nevertheless .768 because most of its influence traveled through the mediators

DISCUSSION

Leadership Works Through Teacher Capacity

The central finding is that transformational leadership did not directly predict innovative behavior, even though its total effect was large. This distinction resolves an apparent paradox. A principal can articulate an inspiring vision and create a supportive climate, but innovation still requires teachers to believe they can act and to possess a practical channel for experimentation. The nonsignificant direct path is consistent with evidence that leadership effects vary by culture, context, and mediation structure (Ferdinan & Lindawati, 2021). It also supports the argument that leadership should be understood as an enabling condition rather than a direct substitute for teacher agency.

The strongest coefficient in the model connected transformational leadership to self-efficacy. Vision, intellectual stimulation, individual consideration, and recognition can provide efficacy information through persuasion, modeling, and supported mastery experience. When principals frame challenges as attainable and allow teachers to learn from imperfect trials, they change the meaning of risk. The result accords with studies linking principal leadership to teacher efficacy and innovative behavior (Dongxiao et al., 2023; Li & Liu, 2022). It also explains why leadership development focused only on communication or charisma may disappoint: the relevant outcome is whether teachers acquire stronger professional confidence and capacity.

This interpretation is reinforced by the total-effect estimates. Leadership's total effect on innovative behavior was .768 even though its direct effect was only .152 and nonsignificant. The difference is not a statistical footnote; it identifies the work that school management must perform between intention and outcome. A principal's message becomes innovative practice only when teachers gain confidence, access, skill, and a usable pathway for acting on that message. Evaluations that look only for immediate direct behavioral change may therefore underestimate leadership while also encouraging overly performative initiatives. Capacity indicators, such as supported experimentation, collaborative problem solving, and confident pedagogical technology use, provide more informative intermediate evidence.

The significant leadership-to-ICT path indicates a second mechanism. Transformational principals can make technology meaningful by connecting it to learning goals, prioritizing resources, encouraging peer support, and recognizing careful experimentation. Research on digital transformation emphasizes precisely this alignment between leadership and follower capability (Bunjak et al., 2022; Philip, 2021). The smaller direct coefficient relative to the indirect route through self-efficacy suggests that providing devices or issuing a digital mandate is insufficient. Teachers are more likely to use technology when leadership support also strengthens their belief that they can master it. Self-Efficacy as the Psychological Engine of Innovation

Self-efficacy directly predicted innovative behavior and strongly predicted ICT use. These paths are consistent with social cognitive reasoning: beliefs about capability shape which tasks people choose, how much effort they invest, and how long they persist after difficulty (Bandura, 1977). Innovation is inherently uncertain, so teachers need resilience and confidence to move from recognizing a problem to implementing an untested response. This result reinforces recent findings that self-efficacy and related psychological resources are important antecedents of educator creativity and innovative behavior (Adiebah & Pradana, 2022; Hidayat & Patras, 2024; Putri & Rini, 2021).

The mediated path through ICT use adds an important qualification. Confidence does not remain an internal disposition; it changes behavior by increasing teachers' willingness to explore digital tools and overcome technical barriers. Once used pedagogically, technology expands the range of possible instructional designs. This interpretation aligns with studies showing that teacher efficacy, ICT literacy, and prior experience influence changes in technology use (Paetsch et al., 2023) and that digital competence is linked to educators' innovative orientation (Waloszek, 2024). Professional development should consequently design for repeated mastery, not merely transmit software procedures.

Mastery-oriented development has practical features. Teachers need short design challenges tied to their own lessons, time to practice, feedback based on observable instructional goals, and opportunities to see peers succeed in comparable conditions. Coaching and professional learning communities can provide verbal persuasion and vicarious experience, while staged implementation reduces anxiety. The model suggests that these arrangements will affect innovation twice: directly by strengthening the confidence to propose and implement ideas, and indirectly by increasing the meaningful use of ICT.

ICT Use as the Operational Mediator

ICT use had the largest direct coefficient on innovative behavior among its immediate predictors. Technology provides access to information, design tools, communication networks, multimedia, and simulations that enable teachers to test and refine ideas (Faisal & Kisman, 2020; Mensah et al., 2023; Ramadass & Shah, 2022). This does not

mean that any technology use is innovative. Routine substitution, such as replacing a printed worksheet with an identical digital file, may change the medium without changing learning. The construct used here includes appropriate application, information organization, creative production, and responsible judgment, making it more closely aligned with pedagogical transformation.

The two significant mediation paths show why ICT strategy should not be separated from leadership and teacher development. Leadership can encourage ICT use directly, while self-efficacy determines whether teachers confidently engage with the available tools. Technology then becomes the operational bridge that converts support and confidence into changed classroom practice. The serial path provides the most complete account: transformational leadership strengthens self-efficacy, self-efficacy increases ICT use, and ICT use supports innovative behavior. Comparable AIBPM research finds that leadership can influence creative performance fully through an enabling team process, which supports the broader principle that leadership often requires a capability mechanism (Hermawan et al., 2022).

For Sukabumi schools, this mechanism argues against isolated interventions. Purchasing technology without building confidence can leave tools underused, while motivational leadership without infrastructure can leave ideas unrealized. A coherent school strategy should connect the principal's instructional and digital vision, differentiated professional learning, reliable access, peer assistance, and opportunities to demonstrate innovations. The needs of teachers with lower readiness should be addressed without slowing those prepared for advanced experimentation. This differentiated approach is important where infrastructure and experience vary across schools.

Theoretical and Managerial Implications

Theoretically, the model integrates educational leadership, social cognitive theory, and technology-enabled innovation. It shows that the same leadership practice can have a small direct effect yet a large total effect when psychological and technological mechanisms are modeled. This finding cautions against evaluating leadership solely by a direct coefficient. It also refines the antecedent literature reviewed by Zainal and Matore (2019): leadership, self-efficacy, and digital capability should not be treated as parallel predictors only, because they form an ordered process. The result complements work linking transformational leadership to change commitment and organizational support for creativity (Jun & Lee, 2023).

Managerially, principal development should be evaluated by the capacities it builds. Programs should train principals to set a clear digital-learning direction, identify teacher readiness, provide individualized coaching, organize collaborative inquiry, and protect reasonable experimentation. Recognition systems should value evidence of learning and iteration, not only polished final products. These practices translate transformational leadership into the mastery experiences and support conditions that build efficacy. The positive relationship between transformational leadership and creativity found by Bogar (2019) is therefore most useful when interpreted as a design responsibility: leaders must create conditions in which creative effort is possible.

Teacher development should integrate pedagogy, technology, and reflective confidence. Stand-alone application training can increase procedural knowledge but may not change instructional design. A stronger format begins with a learning problem, asks teachers to select an appropriate tool, supports development of a small prototype, collects student or peer feedback, and guides revision. Communities of practice can then spread successful designs and normalize discussion of failed trials. This combination addresses

the personal and social determinants of innovative behavior identified in recent teacher studies (Hariyanti & Izzati, 2024; Ismiantari & Mulyana, 2021; Ilmi & Gistituati, 2024). At the system level, district policy should pair infrastructure standards with capacity and usage indicators. Reliable connectivity, device access, technical assistance, and data protection remain necessary, particularly where the digital divide constrains opportunity (Afzal et al., 2023). However, monitoring should examine whether technology supports inquiry, differentiation, feedback, collaboration, and original resource creation rather than counting logins or devices. The model's 75.6% explained variance indicates that the integrated strategy is consequential, but it should not obscure other influences such as school culture, workload, autonomy, well-being, and policy support.

The measurement findings add a methodological implication. Strong reliability and AVE support the internal quality of each scale, yet the Fornell-Larcker comparison shows substantial overlap among self-efficacy, ICT use, innovative behavior, and perceptions of leadership. The overlap is theoretically understandable because confident teachers tend to use technology and report more innovation in supportive schools, but it limits claims that the constructs are empirically distinct. Subsequent studies should shorten repetitive items, separate general efficacy from technology-specific efficacy, and measure ICT use with behavioral evidence such as lesson artifacts or platform activity. Multilevel data could also distinguish individual beliefs from shared school climate and principal practice. These refinements would test whether the mediated sequence remains robust when common-source covariance is reduced

CONCLUSION

This study demonstrates that innovative teacher behavior in public high schools is produced by an enabling chain rather than a single managerial input. Transformational leadership did not have a statistically significant direct effect on innovation, but it strongly strengthened self-efficacy and positively supported ICT use. Self-efficacy increased both ICT use and innovative behavior, while ICT use provided the most immediate operational pathway to innovation. The significant indirect and serial effects show that leadership becomes consequential when it builds teachers' confidence and helps them use technology meaningfully.

The findings imply that school improvement should coordinate three actions: transformational principal practice, mastery-oriented teacher development, and pedagogically grounded digital support. Principals should create a credible improvement vision and psychologically safe conditions for experimentation. Professional development should give teachers repeated opportunities to succeed with authentic instructional challenges. Technology investment should be accompanied by access, coaching, peer learning, and evaluation of educational use. For Sukabumi Regency and comparable school systems, the priority is not technology or leadership in isolation, but an ecosystem in which leadership builds agency and agency turns digital capability into sustained instructional innovation.

LIMITATION

The cross-sectional, self-report design limits causal inference and may be affected by common perceptual and social-desirability bias. The sample is confined to civil-service teachers in public senior high schools in one regency, so generalization to other employment categories, school levels, and regions requires caution. Several inter-construct correlations exceeded the square roots of AVE, indicating imperfect discriminant validity, while very high reliability coefficients may reflect item redundancy. Future research should refine the measures, include behavioral or observational indicators, compare school and regional contexts, and use longitudinal or mixed-method

designs. School culture, innovation climate, workload, teacher well-being, autonomy, and policy support may also be tested as additional mediators or moderators.

ACKNOWLEDGMENT
The authors gratefully acknowledge the principals, school administrators, and teachers of the participating public high schools in Sukabumi Regency for supporting the data-collection process.

DECLARATION OF CONFLICTING INTERESTS
The authors have declared no potential conflicts of interest concerning the study, authorship, and/or publication of this article.

REFERENCES

Adiebah, N., & Pradana, H. A. (2022). Transformational leadership and creative self-efficacy on educators' creativity: Can innovation climate be the mediating? JBTI: Jurnal Bisnis: Teori dan Implementasi, 13(2), 96-111. https://doi.org/10.18196/jbti.v13i2.14391

Afzal, A., Khan, S., Daud, S., Ahmad, Z., & Butt, A. (2023). Addressing the digital divide: Access and use of technology in education. Journal of Social Sciences Review, 3(2), 883-895. https://doi.org/10.54183/jssr.v3i2.326

Amabile, T. M. (2017). In pursuit of everyday creativity. Journal of Creative Behavior, 51(4), 335-337. https://doi.org/10.1002/jocb.200

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84(2), 191-215. https://doi.org/10.1037/0033-295X.84.2.191

Basileo, L. D., Otto, B., Lyons, M., Vannini, N., & Toth, M. D. (2024). The role of self-efficacy, motivation, and perceived support of students' basic psychological needs in academic achievement. Frontiers in Education, 9, 1385442. https://doi.org/10.3389/feduc.2024.1385442

Bass, B. M. (1985). Leadership and performance beyond expectations. Free Press.

Bhati, K., & Sethy, T. P. (2022). Self-efficacy: Theory to educational practice. International Journal of Indian Psychology, 10(1). https://doi.org/10.25215/1001.112

Bogar, W. (2019). The effect of transactional leadership and transformational leadership on employees creativity. Asia Pacific Journal of Management and Education, 2(1), 1-7. https://doi.org/10.32535/apjme.v2i1.371

Bos-Nehles, A., Renkema, M., & Janssen, M. (2017). HRM and innovative work behaviour: A systematic literature review. Personnel Review, 46(7), 1228-1253. https://doi.org/10.1108/PR-09-2016-0257

Bunjak, A., Bruch, H., & Cerne, M. (2022). Context is key: The joint roles of transformational and shared leadership and management innovation in predicting employee IT innovation adoption. International Journal of Information Management, 66, 102516. https://doi.org/10.1016/j.ijinfomgt.2022.102516

Choi, W. S., Kang, S. W., & Choi, S. B. (2021). Innovative behavior in the workplace: An empirical study of a moderated mediation model of self-efficacy, perceived organizational support, and leader-member exchange. Behavioral Sciences, 11(12), 182. https://doi.org/10.3390/bs11120182

Deng, C., Gulseren, D., Isola, C., Grocutt, K., & Turner, N. (2023). Transformational leadership effectiveness: An evidence-based primer. Human Resource Development International, 26(5), 627-641. https://doi.org/10.1080/13678868.2022.2135938

Dongxiao, M., Abdul Kadir, S., Sufian Kang, E. K. M., & Hassan, R. (2023). The influence of principal inclusive leadership and teacher efficacy on teachers' innovative

behaviour. International Journal of Academic Research in Progressive Education and Development, 12(4). https://doi.org/10.6007/IJARPED/v12-i4/19657

Ferdinan, B. A., & Lindawati, T. (2021). The effect of transformational leadership and organizational culture on lecturer performance through innovative work behavior at Catholic universities in Surabaya. International Journal of Applied Business and International Management, 6(2), 113-123. https://doi.org/10.32535/ijabim.v6i2.1106

Faisal, P., & Kisman, Z. (2020). Information and communication technology utilization effectiveness in distance education systems. International Journal of Engineering Business Management, 12. https://doi.org/10.1177/1847979020911872

Hariyanti, Y. D., & Izzati, U. A. (2024). Hubungan antara knowledge sharing dan pemberdayaan psikologis dengan perilaku inovatif pada guru sekolah menengah kejuruan negeri. Character Jurnal Penelitian Psikologi. https://ejournal.unesa.ac.id/index.php/character/article/view/61359

Hermawan, I., Suharnomo, S., Sartono, S., & Hindrawati, G. (2022). Determining the role of leadership on creative performance by implementing synergized-team consolidation. International Journal of Applied Business and International Management, 7(2), 14-29. https://doi.org/10.32535/ijabim.v7i2.1545

Hidayat, R., & Patras, Y. E. (2024). Teacher innovativeness: The effect of self-efficacy, transformational leadership, and school climate. Journal of Pedagogical Research, 8(1), 208-222. https://doi.org/10.33902/JPR.202424547

Ilmi, F., & Gistituati, N. (2024). Perilaku inovatif guru dalam pembelajaran di SMK Negeri Kota Padang. Journal of Practice Learning and Educational Development, 4(1), 7-11. https://doi.org/10.58737/jpled.v4i1.247

Ismiantari, F. D., & Mulyana, O. P. (2021). Differences in innovative work behavior of teachers in view of school characteristics. Character: Journal of Psychological Research, 8. https://ejournal.unesa.ac.id/index.php/character/article/view/41530

Jin, X., Qing, C., & Jin, S. (2022). Ethical leadership and innovative behavior: Mediating role of voice behavior and moderated mediation role of psychological safety. Sustainability, 14(9), 5125. https://doi.org/10.3390/su14095125

Jun, K., & Lee, J. (2023). Transformational leadership and followers' innovative behavior: Roles of commitment to change and organizational support for creativity. Behavioral Sciences, 13(4), 320. https://doi.org/10.3390/bs13040320

Li, L., & Liu, Y. (2022). An integrated model of principal transformational leadership and teacher leadership that is related to teacher self-efficacy and student academic performance. Asia Pacific Journal of Education, 42(4), 661-678. https://doi.org/10.1080/02188791.2020.1806036

Mensah, R. O., Quansah, C., Oteng, B., & Nii Akai Nettey, J. (2023). Assessing the effect of information and communication technology usage on high school students' academic performance in a developing country. Cogent Education, 10(1), 2188809. https://doi.org/10.1080/2331186X.2023.2188809

Paetsch, J., Franz, S., & Wolter, I. (2023). Changes in early career teachers' technology use for teaching: The roles of teacher self-efficacy, ICT literacy, and experience during COVID-19 school closure. Teaching and Teacher Education, 135, 104318. https://doi.org/10.1016/j.tate.2023.104318

Philip, J. (2021). Viewing digital transformation through the lens of transformational leadership. Journal of Organizational Computing and Electronic Commerce, 31(2), 114-129. https://doi.org/10.1080/10919392.2021.1911573

Pujana, D. G. P., Padmadewi, N. N., & Artini, L. P. (2023). Private and public English teachers' readiness in implementing 21st century skills at primary schools. International Journal of Language and Literature, 6(4), 149-157. https://doi.org/10.23887/ijll.v6i4.29235

Putri, N. H., & Rini, Q. K. (2021). Efikasi diri, keterlibatan kerja, dan perilaku kerja inovatif pada guru SMK. Jurnal Psikologi. https://ejournal.gunadarma.ac.id/index.php/psiko/article/view/3919

Ramadass, D. D., & Shah, P. M. (2022). Knowledge, attitude and use of information communication technology among English language teachers. Creative Education, 13(2), 658-674. https://doi.org/10.4236/ce.2022.132041

Rigopouli, K., Kotsifakos, D., & Psaromiligkos, Y. (2025). Vygotsky's creativity options and ideas in 21st-century technology-enhanced learning design. Education Sciences, 15(2), 257. https://doi.org/10.3390/educsci15020257

Rugaiyah, R., Rahmawati, D., & Kustandi, C. (2022). The implementation of teacher competence on 21st century in Indonesia elementary school. Elementary School Journal PGSD FIP Unimed, 12(1), 8-19. https://doi.org/10.24114/esjpgsd.v12i1.30551

Sari, R. E., & Arief, M. (2021). Factors affecting innovative work behavior and health worker performance: The role of employee engagement as a moderating variable. Journal of International Conference Proceedings, 4(3), 272-288. https://doi.org/10.32535/jicp.v4i3.1320

Trevallion, D., & Cusanelli, L. N. (2021). The creativity revolution and 21st century learning. International Journal of Innovation, Creativity and Change, 15(8). https://www.ijicc.net/images/Vol_15/Iss_8/15833_Trevallion_2021_E1_R.pdf

Waloszek, B. (2024). Teacher educators' innovativeness and their self-reported professional digital competence. Nordic Journal of Digital Literacy, 19(3), 144-156. https://doi.org/10.18261/njdl.19.3.3

Zainal, M. A., & Matore, M. E. E. M. (2019). Factors influencing teachers' innovative behaviour: A systematic review. Creative Education, 10(12), 2869-2886. https://doi.org/10.4236/ce.2019.1012213

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