p-ISSN: 2809-7122
e-ISSN: 2809-7343
tadbiruna
Jurnal Manajemen Pendidikan Islam
Volume 5 Nomor 1 Februari 2026 http://jurnal.iuqibogor.ac.id

STRATEGIES FOR ENHANCING TEACHER INNOVATION THROUGH DIGITAL LEADERSHIP, PROFESSIONAL LEARNING COMMUNITY, PROACTIVE PERSONALITY, KNOWLEDGE SHARING, AND CREATIVE SELF-EFFICACY

Ade Setiadi Aulia[1], Soewarto Hardhienata[2], Herfina[3]
Universitas Pakuan, Bogor, Indonesia[123]
adesetiadiaulia@gmail.com

ABSTRACT

Teacher innovation is essential for improving educational quality in vocational high schools (SMK), particularly in responding to rapid industrial and technological changes. This study investigates the direct and indirect effects of digital leadership, professional learning community (PLC), proactive personality, knowledge sharing, and creative self-efficacy on teacher innovation among civil servant teachers in public vocational schools in Depok City, Indonesia. Using a quantitative approach, data were collected from 158 teachers selected through proportional random sampling and analyzed through path analysis and SITOREM (Scientific Identification Theory to Conduct Operation Research in Education Management). The findings indicate that all variables positively contribute to teacher innovation, with knowledge sharing emerging as the strongest predictor, followed by proactive personality and creative self-efficacy. In addition, knowledge sharing and creative self-efficacy serve as important mediating mechanisms that strengthen the relationships between organizational and individual factors and teacher innovation. The SITOREM analysis further identified priority areas requiring improvement and indicators that should be maintained. These findings underscore the importance of integrating organizational, social, and psychological dimensions to enhance teacher innovation. The study provides both theoretical contributions through an integrated model and practical implications for educational policymakers, school leaders, and teacher professional development initiatives.

Keywords: *teacher innovation, digital leadership, professional learning community, proactive personality, knowledge sharing, creative self-efficacy, vocational education, SITOREM*

INTRODUCTION

Vocational high schools (*Sekolah Menengah Kejuruan*/SMK) occupy a strategically significant position within Indonesia's educational system, tasked with preparing human resources equipped with competencies aligned with the demands of industry, business, and the workforce. Unlike general education, which emphasizes academic mastery, vocational education prioritizes competency development, work skills, and readiness to enter the labor market. Rapid technological changes, digital transformation across industrial sectors, and the emergence of new occupations require SMK to continuously enhance educational quality to produce adaptive, productive, and competitive graduates. UNESCO (2023) emphasized that vocational education must transform toward flexible, technology-based learning capable of responding to changing future skill requirements. Consequently, improving SMK education quality constitutes a critical agenda in national educational development and human resource enhancement.

Despite various government initiatives, Indonesia's educational outcomes remain concerning. The Programme for International Student Assessment (PISA) 2022 results

revealed that Indonesian students scored significantly below OECD averages across all domains: mathematics (366 vs. OECD average 472), reading (359 vs. OECD average 476), and science (383 vs. OECD average 485) (OECD, 2023a). Only 18% of Indonesian students attained at least Level 2 proficiency in mathematics compared to the OECD average of 69%, and almost no students reached Level 5 or 6 in mathematics, while countries like Singapore (41%), Taiwan (32%), and Japan (23%) had substantial proportions of top performers (OECD, 2023a). Furthermore, Indonesian students scored significantly lower than the OECD average in creative thinking (19 vs. 33 out of 60 possible points), with only 5% reaching top performance levels compared to the OECD average of 27% (OECD, 2023b). These findings indicate that learning processes have not fully developed higher-order thinking skills, creativity, and problem-solving abilities—the core focus of 21st-century education.

In the SMK context, teachers represent the primary determinant of learning process quality and student competency achievement. Teachers not only deliver instructional materials but also serve as facilitators, guides, curriculum developers, and change agents bridging industry needs with school learning processes. This role has grown increasingly complex alongside developments in digital technology, artificial intelligence, automation, and various industrial innovations. Lambriex-Schmitz et al. (2020) emphasized that understanding when innovation in education works requires stimulating teachers' innovative work behavior through supportive organizational conditions. The characteristics of today's students, a generation growing up in digital environments with extensive and rapid information access, present additional challenges, requiring more interactive, contextual, collaborative, and technology-based learning approaches.

Previous research has examined various factors influencing teacher innovation. Afsar (2020) found that transformational leadership significantly influences innovative work behavior through motivation to learn and innovation climate. Akram (2020) demonstrated that organizational justice affects employee innovative work behavior through the mediating role of knowledge sharing. Khan (2020) showed the interplay of leadership styles, innovative work behavior, organizational culture, and organizational citizenship behavior. Erhan et al. (2022) explored the digitalization of leadership and its relationship with innovative work behavior. Kmieciak (2021) provided empirical evidence on trust, knowledge sharing, and innovative work behavior in Poland. Montani et al. (2020) examined the inverted U-shaped relationship between workload and innovative work behavior, highlighting the roles of work engagement and mindfulness.

Liu (2022) investigated how professional learning communities can promote teacher innovation through multilevel moderated mediation analysis. Suseno et al. (2020) examined innovative work behavior in the public sector, focusing on task characteristics, social support, and proactivity. Hosseini (2021) developed a conceptual model towards teacher innovative work behavior. Gkontelos et al. (2023) demonstrated that teachers' innovative work behavior functions as a result of self-efficacy, burnout, and irrational beliefs. Lambriex-Schmitz et al. (2020) developed and validated a multi-dimensional Innovative Work Behaviour Instrument for educational contexts. AlEssa (2022) provided a systematic review of innovative work behavior concepts and contributions.

However, existing research has not comprehensively examined the integrated influence of digital leadership, professional learning community, proactive personality,

knowledge sharing, and creative self-efficacy on teacher innovation within the Indonesian vocational education context. Furthermore, preliminary survey findings indicate significant gaps in teacher innovation capacities that require systematic investigation. The novelty of this research lies in: (a) developing an integrated theoretical model examining both direct and indirect effects of these five variables on teacher innovation; (b) constructing measurement instruments for teacher innovation; (c) identifying priority indicators requiring improvement through SITOREM analysis; and (d) formulating systematic and contextual strategies for enhancing teacher innovation.

This study addresses three primary research questions: (1) What strategies can enhance teacher innovation? (2) How can these strategies be implemented? (3) What constitutes the optimal solution for improving teacher innovation? Operationally, the study examines thirteen specific hypotheses regarding direct and indirect effects among the five independent variables and teacher innovation. The findings aim to contribute theoretically through an integrated innovation model and practically by providing evidence-based recommendations for educational policymakers, school principals, and teacher professional development programs.

RESEARCH METHODOLOGY

Research Design and Approach

This study employed a quantitative approach with verification or causal research type, aiming to identify causal relationships among variables. The research design combined path analysis with SITOREM (Scientific Identification Theory to Conduct Operation Research in Education Management) analysis. Path analysis examined direct and indirect effects among variables, while SITOREM analysis provided detailed indicator-level recommendations for improvement and maintenance.

The research was conducted at public Vocational High Schools (SMK Negeri) in Depok City, West Java, Indonesia, over six months from January to June 2025. The population comprised 261 civil servant teachers across four public SMK in Depok City: SMK Negeri 1 (72 teachers), SMK Negeri 2 (83 teachers), SMK Negeri 3 (71 teachers), and SMK Negeri 4 (35 teachers). Using the Yamane formula with 5% error tolerance, the sample size was calculated as 158 teachers:

Proportional random sampling was employed to determine sample distribution across schools: SMK Negeri 1 (44 teachers), SMK Negeri 2 (50 teachers), SMK Negeri 3 (43 teachers), and SMK Negeri 4 (21 teachers). Six variables were examined: teacher innovation (Y) as the dependent variable, digital leadership (X_1), professional learning community (X_2), and proactive personality (X_3) as exogenous variables, with knowledge sharing (X_4) and creative self-efficacy (X_5) as intervening variables.

Teacher innovation was conceptualized as teacher behavior in generating, developing, implementing, and disseminating new ideas, methods, media, or learning practices that add value to learning effectiveness. Six indicators were measured: idea generation, creative teaching methods, innovative learning media development, technology-based innovation, idea implementation, and innovation diffusion.

Digital leadership was defined as leader behavior in utilizing digital technology, data, information systems, and digital transformation strategies to direct school organizations, enhance decision-making quality, strengthen professional collaboration,

empower teachers, develop innovation culture, and encourage sustainable learning transformation. Six indicators were measured: digital vision communication, data-driven decision making, digital communication and collaboration, digital capacity building, technology integration support, and innovation leadership.

Professional learning community was conceptualized as collaborative teacher behavior in sharing practices, building shared knowledge, conducting professional reflection, collectively solving learning problems, and continuously developing competencies to improve learning quality. Five indicators were measured: continuous professional learning, active participation, collective capacity building, collaborative culture, and continuous improvement.

Proactive personality was defined as individual tendency to actively seek opportunities, take initiative, anticipate problems, influence the environment, and create positive change to achieve desired goals. Six indicators were measured: opportunity seeking, initiative taking, problem anticipation, change orientation, persistence, and future orientation.

Knowledge sharing was conceptualized as individual behavior in sharing, exchanging, obtaining, and utilizing knowledge, experience, information, skills, and best practices to support learning, competency development, problem-solving, and collaborative performance improvement. Five indicators were measured: knowledge donating, experience sharing, knowledge contribution, knowledge collecting, and collaborative knowledge exchange.

Creative self-efficacy was defined as individual belief in their ability to generate, develop, and implement creative ideas or solutions in effectively completing tasks and problems. Five indicators were measured: creative confidence, idea development confidence, creative problem solving, innovation implementation confidence, and creative achievement.

Instruments were developed using Behavior Rating Scale (5-point scale: Always, Often, Sometimes, Ever, Never) for all variables except creative self-efficacy which used Likert Scale (5-point: Strongly Agree to Strongly Disagree). Instrument calibration involved validity testing using Product Moment correlation ($r > 0.7$ criterion) and reliability testing using Cronbach's Alpha ($\alpha > 0.7$ criterion) with 30 respondents.

Data Collection and Analysis

Data were collected through questionnaire administration to 158 teacher respondents. Quantitative data analysis employed descriptive statistics and Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4. The analysis followed eight systematic stages: (1) determining the structural model, (2) determining the measurement model, (3) data collection and examination, (4) PLS path model estimation, (5) assessing reflective/formative measurement model results, (6) assessing structural model results, (7) advanced PLS-SEM analysis, and (8) interpretation and conclusion drawing.

Measurement model evaluation for reflective indicators included convergent validity (loading factor > 0.7, AVE > 0.5), discriminant validity (Fornell-Larcker criterion, HTMT < 0.90), and composite reliability (CR > 0.7). Structural model evaluation included VIF collinearity assessment (< 3.3), path coefficient significance testing (t-statistic > 1.96, p

< 0.05), coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and goodness-of-fit (SRMR < 0.10).

SITOREM analysis was subsequently conducted to identify priority indicators requiring improvement and indicators to be maintained or developed, based on three analyses: (a) strength of influence between variables, (b) indicator score values from research findings, and (c) indicator weighting based on cost, benefit, urgency, and importance criteria.

RESULTS AND DISCUSSION

Descriptive Statistics

Analysis of 158 respondents revealed the following descriptive statistics for each variable. Teacher Innovation (Y) had a mean of 137.93 (theoretical range 34-170), median of 142, mode of 142, standard deviation of 16.85, and range of 87-162. Distribution showed negative skewness (-1.11) indicating scores concentrated at higher values, with kurtosis of 0.82 indicating slightly leptokurtic distribution. Indicator means ranged from 3.94 to 4.17, with idea generation highest (4.17) and innovative learning media development lowest (3.94).

Digital Leadership (X_1) had a mean of 139.24, median of 142, mode of 158, standard deviation of 21.47, and range of 83-173. Negative skewness (-0.56) and platykurtic distribution (kurtosis -0.58). Indicator means ranged from 3.80 to 4.35, with innovation leadership highest (4.35) and technology integration support lowest (3.80).

Professional Learning Community (X_2) had a mean of 138.90, median of 143.5, mode of 159, standard deviation of 21.29, and range of 66-173. Negative skewness (-0.75) and near-normal kurtosis (0.05). Indicator means ranged from 3.86 to 4.05, with continuous improvement highest (4.05) and active participation lowest (3.86).

Proactive Personality (X_3) had a mean of 137.84, median of 143, mode of 158, standard deviation of 20.35, and range of 76-167. Negative skewness (-0.76) and near-normal kurtosis (-0.07). Indicator means ranged from 3.99 to 4.06, with persistence highest (4.06) and change orientation lowest (3.99).

Knowledge Sharing (X_4) had a mean of 137.09, median of 140, mode of 152, standard deviation of 17.39, and range of 58-164. Negative skewness (-1.18) and leptokurtic distribution (2.08). Indicator means ranged from 4.05 to 4.24, with experience sharing highest (4.24) and knowledge collecting lowest (4.05).

Creative Self-Efficacy (X_5) had a mean of 127.79, median of 129, mode of 142, standard deviation of 18.28, and range of 66-159. Negative skewness (-0.75) and slightly leptokurtic distribution (0.33). Indicator means ranged from 3.93 to 4.05, with idea development confidence highest (4.05) and creative problem solving lowest (3.93).

Measurement Model Evaluation

First-order confirmatory factor analysis demonstrated all indicators met validity and reliability criteria. Loading factors ranged from 0.719 to 0.933, exceeding the 0.7 threshold. Average Variance Extracted (AVE) values ranged from 0.601 to 0.791, exceeding 0.5. Composite Reliability (CR) values ranged from 0.900 to 0.950, exceeding 0.7. Fornell-Larcker criterion confirmed discriminant validity with each construct's AVE square root exceeding correlations with other constructs.

Structural Model Evaluation

Collinearity assessment via inner VIF values ranged from 1.093 to 1.376, well below the 3.3 threshold, indicating no multicollinearity issues.

Table 1. Direct Effects of Exogenous Variables on Teacher Innovation

Path	Coefficient (β)	T-Statistic	p-Value	Significance
Digital Leadership → Teacher Innovation	0.175	2.938	0.003	p < 0.01
PLC → Teacher Innovation	0.135	2.355	0.019	p < 0.05
Proactive Personality → Teacher Innovation	0.212	3.747	<0.001	p < 0.001
Knowledge Sharing → Teacher Innovation	0.229	3.533	<0.001	p < 0.001
Creative Self-Efficacy → Teacher Innovation	0.205	3.104	0.002	p < 0.01

Table 2. Direct Effects on Mediating Variables

Path	Coefficient (β)	T-Statistic	p-Value	Significance
Digital Leadership → Knowledge Sharing	0.237	3.352	0.001	p < 0.01
PLC → Knowledge Sharing	0.192	2.528	0.012	p < 0.05
PLC → Creative Self-Efficacy	0.218	3.350	0.001	p < 0.01
Proactive Personality → Creative Self-Efficacy	0.201	2.983	0.003	p < 0.01

Table 3. Indirect Effects Through Mediating Variables

Path	Coefficient (β)	T-Statistic	p-Value	Significance
Digital Leadership → Knowledge Sharing → Teacher Innovation	0.054	2.296	0.022	p < 0.05

Path	Coefficient (β)	T-Statistic	p-Value	Significance
PLC → Knowledge Sharing → Teacher Innovation	0.044	1.999	0.046	$p < 0.05$
PLC → Creative Self-Efficacy → Teacher Innovation	0.045	2.152	0.031	$p < 0.05$
Proactive Personality → Creative Self-Efficacy → Teacher Innovation	0.041	2.211	0.027	$p < 0.05$

Knowledge sharing and creative self-efficacy demonstrated partial mediation as direct effects remained larger than indirect effects.

Table 4. Model Quality Indicators

Indicator	Value	Criterion	Evaluation
R^2 (Knowledge Sharing)	0.216	> 0.25 (weak)	Weak
R^2 (Creative Self-Efficacy)	0.224	> 0.25 (weak)	Weak
R^2 (Teacher Innovation)	0.432	> 0.25 (weak)	Weak
SRMR	0.063	< 0.10	Good Fit
Q^2 (Teacher Innovation)	0.246	> 0	Predictive Relevance

SITOREM Analysis Results

SITOREM analysis identified twelve priority indicators requiring improvement and twenty indicators to be maintained or developed.

Table 5. Priority Indicators Requiring Improvement (Ranked)

Rank	Indicator	Variable	Score
1	Change Orientation	Proactive Personality	3.99
2	Creative Problem Solving	Creative Self-Efficacy	3.97
3	Creative Confidence	Creative Self-Efficacy	3.91
4	Data-Driven Decision Making	Digital Leadership	3.96
5	Digital Communication and	Digital Leadership	3.98

Rank	Indicator	Variable	Score
	Collaboration		
6	Digital Vision Communication	Digital Leadership	3.91
7	Technology Integration Support	Digital Leadership	3.86
8	Active Participation	PLC	3.91
9	Collective Capacity Building	PLC	3.97
10	Collaborative Culture	PLC	3.84
11	Idea Implementation	Teacher Innovation	3.94
12	Innovative Learning Media Development	Teacher Innovation	3.94

Table 6. Indicators to Maintain or Develop

Indicator	Variable	Score
Knowledge Collecting	Knowledge Sharing	4.03
Knowledge Donating	Knowledge Sharing	4.11
Knowledge Contribution	Knowledge Sharing	4.13
Experience Sharing	Knowledge Sharing	4.21
Collaborative Knowledge Exchange	Knowledge Sharing	4.16
Persistence	Proactive Personality	4.06
Opportunity Seeking	Proactive Personality	4.04
Initiative Taking	Proactive Personality	4.03
Problem Anticipation	Proactive Personality	4.00
Idea Development Confidence	Creative Self-Efficacy	4.06
Creative Achievement	Creative Self-Efficacy	4.04
Innovation Implementation	Creative Self-Efficacy	4.00

Indicator	Variable	Score
Confidence		
Digital Capacity Building	Digital Leadership	4.09
Innovation Leadership	Digital Leadership	4.17
Continuous Professional Learning	PLC	4.05
Continuous Improvement	PLC	4.03
Technology-Based Innovation	Teacher Innovation	4.03
Idea Generation	Teacher Innovation	4.13
Innovation Diffusion	Teacher Innovation	4.11
Creative Teaching Methods	Teacher Innovation	4.00

DISCUSSION

The findings of this study provide robust empirical evidence that teacher innovation in vocational high schools is significantly influenced by an integrated network of organizational, social, and psychological factors. The results demonstrate that all five examined variables, digital leadership, professional learning community, proactive personality, knowledge sharing, and creative self-efficacy, exert significant positive direct effects on teacher innovation, with knowledge sharing emerging as the strongest predictor. These findings extend previous research by presenting a comprehensive model that captures the multifaceted nature of teacher innovation within the Indonesian vocational education context.

Digital Leadership and Teacher Innovation

The significant positive direct effect of digital leadership on teacher innovation ($\beta = 0.175$, $p < 0.01$) confirms that school principals' capacity to leverage digital technology, data, and information systems substantially enhances teachers' innovative behavior. This finding aligns with Erhan et al. (2022) who found that digitalization of leadership significantly influences innovative work behavior, demonstrating that leaders who embrace digital transformation create environments conducive to innovation. Ahmed et al. (2024) similarly found that digital leadership significantly impacts innovative work behavior through learning orientation and innovation capabilities. Zia et al. (2025) demonstrated that digital leadership, along with digital job resources and digital engagement, forms a serial mediation model influencing innovative work behavior. Hadi et al. (2024) confirmed that digital leadership significantly affects innovative work behavior with emotional intelligence serving as a mediating variable. Abbas et al. (2024) showed

that digital leadership influences innovative work behavior through digital entrepreneurial orientation and digital organizational culture.

The mechanism operates through principals creating adaptive work environments, communicating clear digital visions, facilitating technology integration, and fostering innovation cultures. When principals model digital competence and provide necessary support, teachers develop greater confidence and capability to experiment with new pedagogical approaches. Carvalho et al. (2023) found that digital competence of public university employees significantly predicts innovative work behavior, reinforcing the importance of digital capacity building in educational organizations.

However, SITOREM analysis revealed that four digital leadership indicators require improvement: data-driven decision making (3.96), digital communication and collaboration (3.98), digital vision communication (3.91), and technology integration support (3.86). These relatively low scores suggest that while principals may demonstrate innovation leadership (4.35) and digital capacity building (4.09), they need strengthening in systematically using data for decisions, effectively communicating digital visions, and practically supporting technology integration in classrooms.

Professional Learning Community and Teacher Innovation

The significant positive effect of PLC on teacher innovation ($\beta = 0.135$, $p < 0.05$) confirms that collaborative professional communities substantially enhance innovative teaching practices. This result corroborates Liu (2022) who found that professional learning communities promote teacher innovation through multilevel moderated mediation analysis, with organizational learning and teacher efficacy serving as important mediators. Lambriex-Schmitz et al. (2020) demonstrated that stimulating teachers' innovative work behavior requires understanding the organizational conditions that support innovation in education, including collaborative professional learning structures.

PLC facilitates innovation through shared vision, collective learning, collaborative practice, professional reflection, and student learning focus. When teachers regularly engage in professional dialogue, peer observation, and collaborative problem-solving, they develop shared pedagogical knowledge and confidence to implement new approaches. This aligns with Lambriex-Schmitz et al. (2020) who developed and validated a multi-dimensional Innovative Work Behaviour Instrument specifically for educational contexts, emphasizing that professional collaboration is a key driver of teacher innovation.

Nevertheless, three PLC indicators scored below optimal levels: active participation (3.91), collective capacity building (3.97), and collaborative culture (3.84). These findings suggest that while teachers demonstrate commitment to continuous professional learning (4.05) and continuous improvement (4.05), they require strengthening in active community engagement, systematic capacity development, and building genuinely collaborative cultures.

Proactive Personality and Teacher Innovation

The significant positive effect of proactive personality on teacher innovation ($\beta = 0.212$, $p < 0.001$) confirms that teachers' disposition toward initiative-taking, opportunity-seeking, and change-orientation substantially enhances innovative behavior. This finding aligns with Suseno et al. (2020) who found that proactivity significantly contributes to

innovative work behavior in the public sector through task characteristics and social support. Ullah et al. (2024) demonstrated that proactive personality significantly influences innovative work behavior through psychological capital. Mubarak et al. (2021) showed that proactive personality impacts innovative work behavior through work engagement and transformational leadership. Bai et al. (2022) found that proactive personality mediates the relationship between authentic leadership and innovative work behavior alongside employee engagement.

Proactive teachers actively identify improvement opportunities, anticipate problems, persist through challenges, and maintain future orientation—characteristics that directly enable innovation generation and implementation. Hosseini (2021) developed a conceptual model toward teacher innovative work behavior, identifying proactive personality as a key individual-level antecedent. Gkontelos et al. (2023) demonstrated that teachers' innovative work behavior functions as a result of self-efficacy, burnout, and irrational beliefs, suggesting that proactive individuals with positive psychological resources are more likely to engage in innovative behavior.

The SITOREM analysis identified change orientation (3.99) as the sole proactive personality indicator requiring improvement, while persistence (4.06), opportunity seeking (4.04), initiative taking (4.03), and problem anticipation (4.00) should be maintained. This pattern suggests that while teachers demonstrate proactive behaviors in their immediate work, they may need strengthening in actively driving and supporting broader positive change.

Knowledge Sharing and Teacher Innovation

The strongest direct effect observed was knowledge sharing on teacher innovation ($\beta = 0.229$, $p < 0.001$), confirming that exchanging knowledge, experience, and best practices among teachers most powerfully predicts innovative behavior. This finding corroborates Akram (2020) who found that knowledge sharing mediates the relationship between organizational justice and innovative work behavior. Kmieciak (2021) demonstrated that trust and knowledge sharing significantly influence innovative work behavior. Aldabbas et al. (2021) showed that psychological empowerment mediates the relationship between knowledge sharing and innovative work behavior. Arsawan et al. (2022) found that knowledge sharing, along with organizational commitment, sequentially mediates the relationship between organizational culture and innovative work behavior.

Furthermore, Anser et al. (2020) demonstrated that knowledge sharing, through functional flexibility, influences innovative work behavior. Usmanova et al. (2020) showed that knowledge sharing significantly impacts job satisfaction and innovative work behavior. Liu et al. (2024) found that collaborative atmosphere significantly influences innovative work behavior through knowledge sharing. Liu (2024) provided a comprehensive review of teacher innovation conceptualizations, methodologies, and theoretical frameworks, emphasizing knowledge sharing as a critical mechanism.

Notably, all five knowledge sharing indicators scored above 4.0 (experience sharing 4.24, collaborative knowledge exchange 4.16, knowledge donating 4.15, knowledge contribution 4.15, knowledge collecting 4.05), suggesting generally strong knowledge sharing culture. However, knowledge collecting (4.05), while adequate, was the lowest

among these indicators, indicating teachers may need encouragement to actively seek and utilize knowledge from colleagues.

Creative Self-Efficacy and Teacher Innovation

The significant positive effect of creative self-efficacy on teacher innovation ($\beta = 0.205$, $p < 0.01$) confirms that teachers' belief in their creative capabilities substantially enhances innovative behavior. This finding aligns with Javed et al. (2021) who found that inclusive leadership influences innovative work behavior through creative self-efficacy. Gelaidan et al. (2024) demonstrated that servant and authentic leadership drive innovative work behavior with creative self-efficacy serving as a moderating variable. Jan et al. (2021) showed that servant leadership enhances innovative work behavior through creative self-efficacy.

Khan et al. (2023) found that knowledge sharing and creative self-efficacy play crucial roles in the relationship between self-leadership and innovative work behavior. Dar et al. (2022) demonstrated that creative self-confidence mediates the relationship between overqualification and innovative work behavior. Afsar et al. (2020) showed that work engagement and interpersonal trust mediate the relationship between cultural intelligence and innovative work behavior, with creative self-efficacy serving as an important psychological resource.

Teachers with strong creative self-efficacy confidently generate new ideas, develop innovative solutions, persist through challenges, and implement creative approaches. Gkontelos et al. (2023) found that self-efficacy is a significant predictor of teachers' innovative work behavior, confirming the importance of creative confidence in educational contexts.

SITOREM analysis identified creative problem solving (3.97) and creative confidence (3.91) as requiring improvement, while idea development confidence (4.06), creative achievement (4.04), and innovation implementation confidence (4.00) should be maintained. This pattern suggests that while teachers believe in their ability to develop and implement creative ideas, they may need strengthening in initial idea generation and creative problem-solving.

Mediating Roles of Knowledge Sharing and Creative Self-Efficacy

The significant indirect effects demonstrate that knowledge sharing and creative self-efficacy function as partial mediators, transmitting influences from organizational and personality factors to teacher innovation. Digital leadership influences teacher innovation through knowledge sharing ($\beta = 0.054$, $p < 0.05$), confirming that principals' digital leadership fosters knowledge sharing cultures that subsequently enable innovation. This finding aligns with Erhan et al. (2022) who demonstrated that digital leadership influences innovative work behavior through organizational mechanisms.

PLC influences teacher innovation through knowledge sharing ($\beta = 0.044$, $p < 0.05$), confirming that professional learning communities operate partly through enhancing knowledge exchange. This finding corroborates Liu (2022) who found that PLCs promote teacher innovation through multilevel moderated mediation mechanisms. PLC creates structured opportunities for teachers to share experiences, reflect on practice, and develop collective solutions—processes that generate the knowledge base for innovation.

PLC also influences teacher innovation through creative self-efficacy (β = 0.045, p < 0.05), confirming that professional learning communities enhance teachers' creative confidence. This finding aligns with Lambriex-Schmitz et al. (2020) who emphasized that stimulating teachers' innovative work behavior requires understanding the conditions that support professional learning and creativity development.

Proactive personality influences teacher innovation through creative self-efficacy (β = 0.041, p < 0.05), confirming that proactive teachers develop stronger creative confidence that subsequently enables innovation. This finding corroborates Ullah et al. (2024) who found that proactive personality influences innovative work behavior through psychological capital, and Bai et al. (2022) who demonstrated that proactive personality mediates the relationship between authentic leadership and innovative work behavior.

Theoretical and Practical Implications

Theoretically, this study contributes an integrated model explaining teacher innovation through the interplay of organizational (digital leadership, PLC), social (knowledge sharing), personal (proactive personality), and psychological (creative self-efficacy) factors. The model extends Colquitt's organizational behavior framework by demonstrating how individual characteristics and organizational mechanisms interact to produce innovative outcomes. The finding that knowledge sharing exerts the strongest effect suggests that social learning processes may be more powerful than organizational support or personality traits alone in driving teacher innovation. This aligns with social cognitive theory, which emphasizes the reciprocal interactions between personal factors, behavioral patterns, and environmental influences.

Practically, the findings offer clear guidance for enhancing teacher innovation. First, school principals should strengthen digital leadership by improving data-driven decision making, digital communication, vision communication, and technology integration support. Second, schools should strengthen PLCs by enhancing active participation, collective capacity building, and collaborative culture. Third, teacher professional development should address creative problem-solving and creative confidence. Fourth, knowledge sharing should be systematically facilitated through structured collaboration, communities of practice, and digital platforms. Fifth, proactive personality development should target change orientation while maintaining existing strengths in persistence, initiative, and opportunity seeking.

Limitations

Several limitations should be acknowledged. First, the cross-sectional design prevents causal inference despite theoretical causal modeling. Second, data relied on self-report measures, potentially introducing common method bias. Third, the study focused on public SMK teachers in one Indonesian city, limiting generalizability to other contexts. Fourth, the R^2 value for teacher innovation (0.432) indicates substantial unexplained variance, suggesting additional variables influence teacher innovation. Fifth, the relatively small effect sizes suggest practical significance should be interpreted cautiously. Sixth, the study did not examine potential moderating variables that might influence the relationships observed.

CONCLUSION

This study demonstrates that teacher innovation in vocational high schools is significantly enhanced through an integrated approach addressing digital leadership, professional learning community, proactive personality, knowledge sharing, and creative self-efficacy. All five variables exert significant positive direct effects on teacher innovation, with knowledge sharing showing the strongest influence. Additionally, knowledge sharing and creative self-efficacy function as partial mediators, transmitting influences from organizational and personality factors to teacher innovation.

The SITOREM analysis identified twelve priority indicators requiring improvement, primarily in digital leadership (data-driven decision making, digital communication, vision communication, technology support), PLC (active participation, capacity building, collaborative culture), proactive personality (change orientation), creative self-efficacy (creative problem solving, creative confidence), and teacher innovation (idea implementation, innovative media development). Twenty indicators should be maintained or developed, particularly in knowledge sharing (all five indicators), proactive personality (four indicators), creative self-efficacy (three indicators), digital leadership (two indicators), PLC (two indicators), and teacher innovation (four indicators).

These findings offer practical strategies for educational stakeholders. School principals should prioritize strengthening digital leadership competencies in data use, communication, vision, and technology support. Schools should enhance PLC quality through structured collaboration, collective learning, and collaborative culture development. Teacher professional development should target creative confidence and creative problem-solving. Knowledge sharing should be systematically facilitated through communities of practice and digital platforms. Teacher recruitment and development should consider proactive personality characteristics.

Future research should employ longitudinal designs to establish causal relationships, include objective measures of teacher innovation, examine additional variables explaining remaining variance (e.g., transformational leadership, emotional intelligence, professional competence), and investigate contextual moderators. Cross-cultural comparisons would also illuminate how cultural factors influence the relationships observed. Additionally, intervention studies testing the effectiveness of the recommended strategies would provide stronger evidence for practical implementation.

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