# THE INFLUENCE OF DIGITAL LEADERSHIP AND ORGANIZATIONAL CLIMATE ON TEACHERS' INNOVATIVE WORK BEHAVIOR: A CASE STUDY OF SHANDONG WATER CONSERVANCY VOCATIONAL COLLEGE, SHANDONG, CHINA

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## ABSTRACT
This study examined the influence of digital leadership and organizational climate on teachers' innovative work behavior at Shandong Water Conservancy Vocational College, Shandong, China. A quantitative research approach was employed, involving 300 full-time teachers selected through convenience sampling. Data were collected using a structured questionnaire and analyzed using descriptive statistics and simultaneous multiple regression analysis. The integrated model incorporating all eight dimensions explained 96.3% of the variance in teachers' innovative work behavior ($R^2 = .963$, adjusted $R^2 = .962$; $F = 955.869$, $p < .001$). Among the organizational climate dimensions, recognition demonstrated the largest positive standardized coefficient ($\beta = .294$, $p < .001$), followed by responsibility ($\beta = .244$, $p < .001$), standards ($\beta = .163$, $p < .001$), and support ($\beta = .110$, $p < .001$). Among the digital leadership dimensions, digital-age learning culture exhibited the largest positive coefficient ($\beta = .130$, $p < .001$), followed by system improvement ($\beta = .087$, $p = .002$) and professional development ($\beta = .068$, $p = .022$). Technology vision demonstrated a significant negative association ($\beta = -.063$, $p = .002$) after controlling for the remaining dimensions. These findings highlight the relevance of recognition, professional responsibility, supportive organizational conditions, and digital learning opportunities to teachers' innovative work behavior, providing practical guidance for strengthening educational leadership and institutional development in vocational education.

**Keywords:** Digital Leadership, Organizational Climate, Innovative Work Behavior

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# INTRODUCTION

Rapid advances in the field of digital technologies, artificial intelligence, automation, plus big data are clearly transforming labor market demands along with the necessary competencies needed for the future workforce. These advancements are posing considerable challenges to the vocational education institutions. These institutions must consistently and effectively adjust their curricula, instructional methods, and relevant professional skills according to the evolving industrial needs. The World Economic Forum (2025) emphasized that technological transformation reshapes along with modifies occupational competencies. It raises the demand for workforce upskilling plus reskilling. Similarly, the OECD (2023) highlighted how flexible vocational education systems can incorporate digital technologies as well as respond effectively to the evolving labor market needs. As a result, vocational teachers are being increasingly expected to adopt various technological innovations in order to develop a range of new instructional approaches. They must also enhance their professional practices in order to adequately prepare students for swiftly changing occupational environments.

Nevertheless, the mere availability of technology alone does not by any means necessarily lead to the development of innovative teaching practices. The OECD (2021) identified that vocational teachers need to continue with the ongoing development of their professional skills, particularly when it comes to applying digital technologies effectively. Jeon (2025) further emphasized that vocational education must integrate emerging technologies through leaders' strategies, develop professionals, utilize institutions' resources, and implement systems that support operations effectively. These findings suggest that teachers' innovative work behavior relies not only upon individual technological skills but also on organizational conditions that support generating, promoting, along with implementing new ideas. Educational institutions must, therefore, create and establish supportive environments that effectively enable teachers to transform various technological opportunities into both significant and meaningful improvements in their teaching and professional practices.

Digital leaders plus organizational climate have become significant components that affect teachers in innovating within their roles. Digital leadership enables educational administrators to make decisions about technological directions. It also promotes digital learning cultures, supports professional development, while enhances institutional systems. Meanwhile, the organizational climate shows how teachers perceive institutional standards, accept responsibility, receive recognition, as well as obtain support, which may influence their willingness to experiment with alongside implement innovative practices. Wei et al. (2025) found that digital leadership and an innovation-supportive organizational climate positively influenced teachers in exhibiting innovative behavior in Chinese higher vocational colleges. Similarly, Siregar et al. (2026) identified a positive relationship that links digital transformation leadership to teachers' innovative work behavior, whereas Mokhlis and Abdullah (2024) along with Liu and Sun (2025) emphasized how supportive plus collaborative organizational environments foster innovative practices. Collectively, these various studies show that educational leaders and organizational working conditions significantly affect how numerous opportunities arise for teachers to develop and implement their innovative ideas.

Despite these findings, further empirical research continues to remain essential for exploring how digital leadership together with organizational climate influences teachers' engagement in innovative work behavior within specific vocational education environments. Vocational colleges differ from general educational institutions because they must incorporate technological knowledge, provide practical training, collaborate with industry, plus adapt to changing occupational competencies in curricula. This study emphasizes Shandong Water Conservancy Vocational College along with Shandong, China. It draws upon Zhong's (2017) digital leadership framework, which comprises Technology Vision, Digital-Age Learning Culture, and Professional Development, while also including System Improvement, as well as

utilizing Stringer's (2002) organizational climate framework, which includes Standards, Responsibility, Recognition, along with Support. Specifically, the study intends to explore how digital leadership affects and shapes organizational climate while influencing teachers' innovative work behaviors within the institution. The researchers anticipate that the findings will offer empirical evidence that reinforces educational leadership. They will enhance how organizations operate and promote innovative teaching methods that respond to the changing demands of vocational education in the digital era.

# LITERATURE REVIEWS

## Digital Leadership and Teachers' Innovative Work Behavior

Digital leadership may shape teachers' innovative work behavior by establishing a clear technological direction, enhancing professional competencies, and creating opportunities for experimentation along with instructional improvement. Administrators who convey a shared digital vision while actively supporting technological development can aid teachers in recognizing opportunities to enhance teaching practices and surmount barriers linked to adopting new technologies. Zhong (2017) emphasized that effective digital leadership includes envisioning technology, fostering a digital learning culture, developing professionals, plus improving systems, suggesting that educational leadership spans beyond providing digital equipment to cultivating institutional capabilities that support technological change.

Empirical research supports the relationship that exists between digital leadership and teachers' innovative behavior. Wei et al. (2025) examined digital leadership along with teacher innovation in Chinese higher vocational colleges and discovered that digital leadership positively predicted teachers' innovative behavior. Their findings show that educational administrators can foster innovative practices by promoting technological development. They can also establish institutional conditions that support innovation. Agustina et al. (2020) also examined how principals lead digitally and its relation to how vocational teachers reflect on their practices. They identified the relevance of that leadership to the development of teachers' professionalism and the engagement in their work. These findings suggest that digital leadership can help foster innovative behavior by providing teachers with strategic guidance, enabling professional learning opportunities, and offering organizational resources that support them in exploring and implementing new ideas.

In the context of Shandong Water Conservancy Vocational College, digital leadership may play a particularly important role as teachers must constantly adapt instructional content, conduct practical training activities, and apply technological tools to meet changing vocational requirements. Administrators who establish clear technological priorities and encourage digital learning cultures may create favorable conditions. They may also provide professional development and improve institutional systems for teachers to explore, generate, promote, and implement innovative approaches. Accordingly, the following hypothesis is proposed:

H1: Digital leadership significantly influences teachers' innovative work behavior in vocational colleges.

## Organizational Climate and Teachers' Innovative Work Behavior

Organizational climate can indeed considerably affect teachers' innovative work behavior by shaping, in turn, their general perceptions of institutional expectations, their professional autonomy, recognition, and the support that is available within the school. Generating as well as executing new ideas generally requires the act of facing uncertainty, conducting thorough experimentation, and collaborating closely with colleagues engaged in the project. Teachers who view their working environment as supportive may therefore be more willing to suggest alternative approaches, seek assistance, along with engaging in educational improvement. From Stringer's (2002) organizational climate perspective, it is clear that well-defined standards significantly characterize the essential conditions of various organizations.

Responsibility, recognition, and support can positively motivate employees while also affecting their work-related behavior.

Previous studies have identified links of significance. These connections exist within organizational settings plus innovative practices. Shanker et al. (2017) found that an organizational climate which supports innovation positively connects with innovative work behavior, indicating that workplace conditions can inspire employees to create and implement new ideas. Liu et al. (2022) also reported that implementing professional learning communities positively connects to promoting teacher innovation. The school's innovative climate significantly influenced how teachers engaged in professional collaboration to shape innovative outcomes. More recently, it was observed by Wei et al. (2025) that the organizational innovation climate serves as an important factor that is closely linked to teachers' innovative behavior in Chinese higher vocational colleges. These findings indicate that the innovative practices of teachers are influenced not only by their individual capabilities but also by the institutional environments that inherently foster professional collaboration, recognize valuable contributions, and support necessary experimentation for growth.

At vocational colleges, a relevant organizational climate matters because innovative teaching needs teachers, administrators, technical personnel, plus external industry partners to coordinate effectively. Clear performance standards can inspire teachers to identify opportunities for improvement, while accepting responsibility and embracing professional autonomy can empower them to experiment with alternative instructional methods. Recognizing could amplify their desire to devise innovative ideas. Meanwhile, organizational support can promote cooperation by providing access to resources needed for implementing those ideas. When these conditions exist, teachers may display a greater readiness to engage in innovative activities that improve teaching quality while providing support for vocational training. Therefore, the following hypothesis is proposed:

H2: Organizational climate significantly influences teachers' innovative work behavior in vocational colleges.

**Research Gap and Conceptual Framework**

Existing literature demonstrates that digital leadership and organizational climate significantly affect how teachers engage in professional practices and inspire innovative behavior. Zhong (2017) offered a framework for understanding educational digital leadership, while Stringer (2002) described how organizational climate impacts employee attitudes plus behaviors. Shahid et al. (2022) further established a comprehensive multidimensional perspective on the innovative work behavior. This perspective encompasses the detailed exploration, thoughtful generation, active promotion, along with careful implementation of various ideas. Empirical findings from Wei et al. (2025) demonstrate that digital leadership and an organizational innovation climate significantly foster teacher innovation in Chinese higher vocational colleges. Nevertheless, the applicability of these relationships to the specific institutional environment of Shandong Water Conservancy Vocational College, within which further investigation is required, particularly when the organizational climate is examined through standards, responsibility, recognition, along with support rather than an innovation-specific climate construct.

Thus, the current study examines Digital Leadership along with Organizational Climate as separate factors influencing Teachers' Innovative Work Behavior. Digital Leadership requires leaders to create a Vision for Technology. It fosters a Digital-Age Learning Culture, promotes Professional Development, and improves Systems in accordance with Zhong (2017). Organizational Climate includes defining Standards, taking Responsibility, providing Recognition, together with offering Support according to Stringer (2002), while Teachers' Innovative Work Behavior comprises exploring Ideas, generating Ideas, promoting Ideas, in addition to implementing Ideas according to Shahid et al. (2022). The conceptual framework

suggests direct connections among all independent variables and teachers' innovative work behavior, as illustrated in Figure 1.

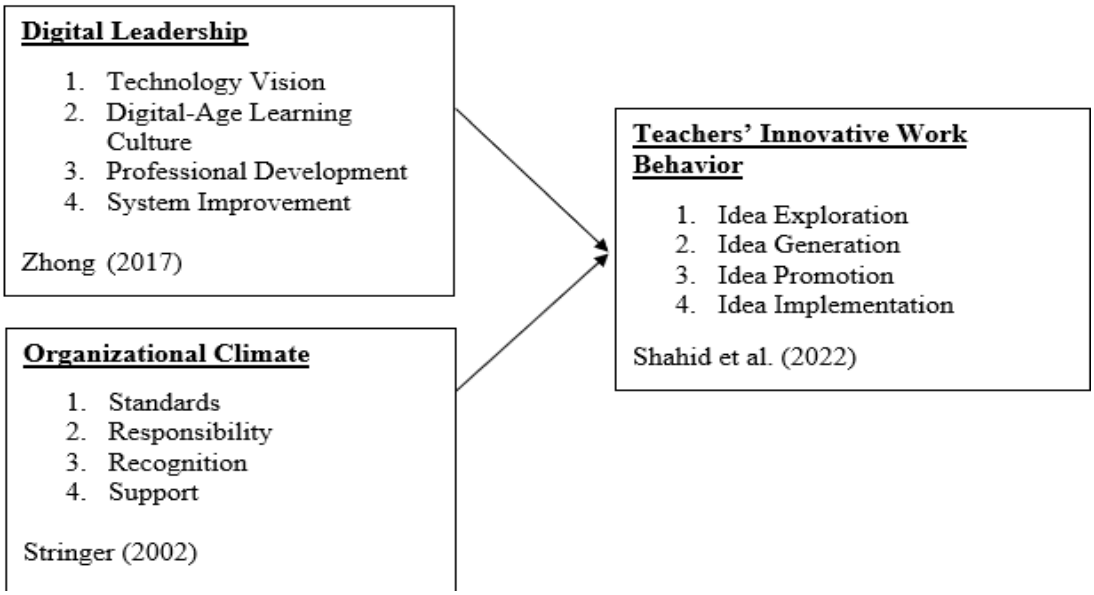


**Figure 1** The conceptional framework adapted from adapted from Shahid(2022).

## RESEARCH METHODOLOGY

This study specifically employed a quantitative research approach in a detailed examination of the significant influence of Digital Leadership and Organizational Climate on the Teachers' Innovative Work Behavior at Shandong Water Conservancy Vocational College, located in Shandong, China. The population included 882 teachers who worked full-time. This count excluded administrative personnel together with other non-teaching staff. The researchers determined the minimum sample size by utilizing Yamane's (1973) formula. This evaluation took place at a 95% confidence level and included a 5% margin of error, which resulted in approximately 275 teachers. To account for potential nonresponses and for incomplete questionnaires, approximately 300 teachers were targeted for questionnaire distribution. Convenience sampling was employed to recruit from available full-time teachers who were willing to participate in the study.

Data were collected using a structured questionnaire created from relevant theories, prior research, and along with the conceptual framework. The questionnaire included five sections: demographic information, Digital Leadership, Organizational Climate, Teachers' Innovative Work Behavior, along with additional comments and suggestions for improvement. Digital Leadership assessed 16 aspects connected to Technology Vision, Digital-Age Learning Culture, Professional Development, along with System Improvement, relying on Zhong (2017). Organizational Climate was assessed using 16 items that included Standards, Responsibility, Recognition, and Support. This is grounded in the study by Stringer (2002). Teachers' Innovative Work Behavior was assessed with 16 items related to Idea Exploration, Idea Generation, Idea Promotion, and Idea Implementation, based on Shahid et al. (2022). The questionnaire contained 48 measurement items across the three constructs, rated on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) for the purpose of its assessment.

The questionnaire was thoroughly reviewed by the research advisor along with relevant experts in order to assess the content's appropriateness, clarity, and consistency with the established research objectives. After the team made revisions, a pilot study involved 30 respondents who exhibited characteristics similar to those of the target population yet were distinctly excluded

from the main study. The team assessed internal consistency reliability using Cronbach's alpha, which produced values of 0.950 for Digital Leadership, 0.964 for Organizational Climate, in addition to 0.972 for Teachers' Innovative Work Behavior. The overall Cronbach's alpha coefficient reached a value of 0.987. This value exceeded the acceptable threshold of 0.70 and also indicated satisfactory internal consistency within the assessment. Before questionnaire distribution, respondents were informed of the research objectives along with the voluntary nature of their participation in the study. The returned questionnaires were examined for confirming their completeness. Usable responses were coded for analysis plus then prepared for statistical analysis.

Data analysis included both descriptive statistics along with other key elements. It also employed Multiple Regression Analysis (MRA) in its study. Frequencies and percentages were applied in order to characterize respondents' demographic traits. In addition, means plus standard deviations were employed to summarize Digital Leadership, Organizational Climate, along with Teachers' Innovative Work Behavior. Multiple Regression Analysis was conducted to examine the influence of Digital Leadership as well as Organizational Climate on Teachers' Innovative Work Behavior. Before regression analysis, the assumptions of linearity, normality of residuals, homoscedasticity, independence of errors, and absence of multicollinearity were assessed, including the examination of Tolerance and Variance Inflation Factor (VIF) values. The regression results were evaluated using the multiple correlation coefficient (R), coefficient of determination ($R^2$), adjusted $R^2$, unstandardized regression coefficients (B), standardized regression coefficients (β), t-values, F-values, and p-values. The F-test was employed to assess the overall significance of the regression model, while t-tests were used to examine the individual influence of Digital Leadership and Organizational Climate on Teachers' Innovative Work Behavior. Statistical significance was established at $p < .05$.

# RESEARCH RESULTS

## Respondent Demographic Characteristics

A total of 300 teachers from Shandong Water Conservancy Vocational College participated in this study. Of the respondents, 152 (50.67%) were female and 148 (49.33%) were male, indicating a relatively balanced gender distribution. The largest age group consisted of teachers aged 40-49 years (36.00%). Regarding educational qualifications, 39.33% held bachelor's degrees, followed by master's degrees (40.00%) and doctoral degrees (20.67%). In terms of teaching experience, the largest proportion of respondents had 11-15 years of professional experience (28.33%). Most respondents held teaching positions (97.00%), while Industrial/Technical Education represented the largest academic field (33.00%).

## Descriptive Statistical Analysis

Descriptive statistics were employed to examine respondents' perceptions of Digital Leadership, Organizational Climate, and Teachers' Innovative Work Behavior. The results indicated that all three variables were rated at a high level. Digital Leadership had an overall mean of 3.78 (SD = 0.65), with Technology Vision receiving the highest mean score (M = 3.81, SD = 0.63), followed by System Improvement (M = 3.78, SD = 0.71), Professional Development (M = 3.77, SD = 0.72), and Digital-Age Learning Culture (M = 3.76, SD = 0.73). Organizational Climate was also rated at a high level (M = 3.73, SD = 0.71). Standards received the highest mean score (M = 3.77, SD = 0.74), followed by Responsibility (M = 3.71, SD = 0.74), while Recognition and Support recorded the lowest mean scores (M = 3.71, SD = 0.77). Similarly, Teachers' Innovative Work Behavior was rated at a high level (M = 3.70, SD = 0.77). Idea Generation and Idea Implementation received the highest mean scores (M = 3.70), followed by Idea Exploration (M = 3.69, SD = 0.79), while Idea Promotion had the lowest mean score (M = 3.68, SD = 0.81).

**Hypothesis Testing**

**Table 1** Multiple Regression Analysis of Digital Leadership and Organizational Climate on Teachers' Innovative Work Behavior

| | **b** | **Std. Error** | **β** | **t** | **Sig.** | **Tolerance** | **VIF** |
|---|---|---|---|---|---|---|---|
| (Constant) | -.260 | .055 | | -4.710 | .000 | | |
| Technology Vision | -.078 | .025 | -.063 | -3.092 | .002 | .304 | 3.291 |
| Digital-Age Learning Culture | .137 | .030 | .130 | 4.544 | .000 | .154 | 6.487 |
| Professional Development | .073 | .032 | .068 | 2.296 | .022 | .144 | 6.925 |
| System Improvement | .095 | .030 | .087 | 3.188 | .002 | .171 | 5.851 |
| Standards | .172 | .029 | .163 | 6.018 | .000 | .171 | 5.856 |
| Responsibility | .256 | .029 | .244 | 8.925 | .000 | .169 | 5.926 |
| Recognition | .294 | .031 | .294 | 9.490 | .000 | .131 | 7.627 |
| Support | .111 | .029 | .110 | 3.801 | .000 | .149 | 6.707 |
| $R = .981$, $R^2 = .963$, Adjusted $R^2 = .962$, $SE_{EST} = .150$, $F = 955.869$***, Sig. = .000 | | | | | | | |

Multiple regression analysis was conducted to examine the associations of digital leadership and organizational climate dimensions with teachers' innovative work behavior. All eight dimensions were entered into a single regression model to estimate their unique contributions while controlling for the other dimensions. As presented in Table 1, the overall regression model was statistically significant ($F = 955.869$, $p < .001$), with a multiple correlation coefficient of .981. The model explained 96.3% of the variance in teachers' innovative work behavior ($R^2 = .963$), with an adjusted $R^2$ of .962 and a standard error of the estimate of .150.

Among the organizational climate dimensions, Recognition had the largest positive standardized regression coefficient ($\beta = .294$, $t = 9.490$, $p < .001$), followed by Responsibility ($\beta = .244$, $t = 8.925$, $p < .001$), Standards ($\beta = .163$, $t = 6.018$, $p < .001$), and Support ($\beta = .110$, $t = 3.801$, $p < .001$).

Among the digital leadership dimensions, Digital-Age Learning Culture demonstrated a significant positive association with teachers' innovative work behavior ($\beta = .130$, $t = 4.544$, $p < .001$), followed by System Improvement ($\beta = .087$, $t = 3.188$, $p = .002$) and Professional Development ($\beta = .068$, $t = 2.296$, $p = .022$). However, Technology Vision demonstrated a significant negative association ($\beta = -.063$, $t = -3.092$, $p = .002$).

Tolerance values ranged from .131 to .304, while VIF values ranged from 3.291 to 7.627. These values remained within the conventional thresholds of tolerance > .10 and VIF < 10.

## DISCUSSION & CONCLUSION

This study examined the relationships of Digital Leadership and Organizational Climate with Teachers' Innovative Work Behavior at Shandong Water Conservancy Vocational College, Shandong, China, using an integrated regression model that included all eight predictor dimensions simultaneously. The overall model was statistically significant ($F = 955.869$, $p < .001$) and explained 96.3% of the variance in Teachers' Innovative Work Behavior ($R^2 = .963$; adjusted $R^2 = .962$). Seven dimensions demonstrated significant positive associations, whereas Technology Vision exhibited a significant negative association after controlling for the remaining predictors. These findings indicate that leadership practices and organizational conditions should be considered jointly when examining teachers' innovative behavior, because the association of each dimension depends on the other dimensions included in the model.

Within Digital Leadership, Digital-Age Learning Culture demonstrated the largest positive standardized regression coefficient ($\beta = .130$, $p < .001$), followed by System Improvement ($\beta$

= .087, p = .002) and Professional Development (β = .068, p = .022). These findings suggest that teachers who perceive stronger opportunities for digital learning, more effective institutional systems, and greater professional development also tend to report higher innovative work behavior when organizational climate and the other leadership dimensions are held constant. This interpretation is consistent with Zhong's (2017) emphasis on digital leadership as a combination of technological direction, learning culture, professional development, and institutional improvement. The positive associations also broadly correspond with Wei et al. (2025), who identified a relationship between digital leadership and teacher innovation in Chinese higher vocational colleges.

The positive association of Digital-Age Learning Culture suggests that the everyday learning environment may be particularly relevant to translating digital leadership into innovative professional practices. Opportunities to exchange digital teaching experiences, discuss instructional challenges, and experiment with alternative approaches may help teachers move beyond the routine use of technology toward the development and implementation of new ideas. System Improvement also remained positively associated with innovative work behavior, indicating the relevance of institutional processes and resources that facilitate the application of these ideas. Professional Development contributed a further positive association, suggesting that opportunities to strengthen professional knowledge and instructional capabilities remain relevant even after accounting for other organizational conditions. These interpretations are compatible with Agustina et al. (2020), whose research connected principals' digital leadership with vocational teachers' reflective practices and examined the roles of trust, self-efficacy, and work engagement.

Technology Vision, however, demonstrated a significant negative association with Teachers' Innovative Work Behavior in the integrated model (β = −.063, p = .002). This result differs from the nonsignificant association reported in the separate digital leadership model and requires a conditional interpretation. Specifically, among teachers with comparable scores on the other seven predictor dimensions, higher Technology Vision scores were associated with slightly lower innovative work behavior scores. The finding does not establish that technological vision itself discourages innovation. One possible interpretation is that strategic expectations concerning technology may not always be accompanied by sufficient opportunities for teachers to exercise professional judgment and translate those expectations into practice. This explanation remains tentative because the study did not directly test the mechanisms underlying the negative coefficient. The result should also be considered alongside the correlations among the predictors, since the coefficient represents the portion of Technology Vision that is statistically distinct from the other dimensions.

All four Organizational Climate dimensions demonstrated significant positive associations with Teachers' Innovative Work Behavior. Recognition had the largest standardized regression coefficient in the integrated model (β = .294, p < .001), followed by Responsibility (β = .244, p < .001), Standards (β = .163, p < .001), and Support (β = .110, p < .001). These findings suggest that teachers who perceive greater acknowledgment of their contributions, stronger professional responsibility, clearer performance expectations, and more accessible support tend to report higher innovative work behavior after accounting for digital leadership and the other climate dimensions. This interpretation is consistent with Stringer's (2002) organizational climate framework, which emphasizes the relevance of organizational conditions to employee motivation and behavior.

Recognition's relatively large positive coefficient suggests that acknowledgment of teachers' contributions may be particularly relevant within the institutional context examined. Innovative teaching can require additional preparation, experimentation, and coordination beyond established teaching routines, and teachers may be more willing to undertake these activities when their contributions receive appropriate recognition. This interpretation corresponds with

Shanker et al. (2017), who identified a relationship between organizational climate for innovation and innovative work behavior. It also broadly aligns with Wei et al. (2025), who highlighted the relevance of organizational innovation climate to teacher innovation in Chinese higher vocational colleges. Nevertheless, the larger coefficient for Recognition should not be interpreted as evidence that its association is statistically stronger than every other predictor without a direct comparison of coefficients.

Responsibility and Standards also provided meaningful insights into the organizational conditions associated with innovative work behavior. Responsibility may reflect teachers' willingness and perceived autonomy to exercise professional judgment, address instructional challenges, and take ownership of improvement activities. Standards may provide a clearer understanding of expected teaching quality and professional performance, helping teachers identify areas in which new approaches could be useful. Support complements these conditions by providing assistance, collegial cooperation, and access to resources needed to develop and implement ideas. Considered together, these findings suggest that innovative professional behavior is associated with an environment that combines acknowledgment, responsibility, clear expectations, and practical assistance, rather than relying on any single organizational practice.

The integrated analysis provides a more coherent interpretation than the separate models because it estimates the association of each dimension while controlling for both groups of predictors. The changes in coefficient magnitude and the negative coefficient for Technology Vision illustrate why findings from separate models should not be treated as equivalent to unique contributions in a combined model. At the dimensional level, the results show positive associations for three digital leadership dimensions and all four organizational climate dimensions, alongside a negative association for Technology Vision. Conclusions about the contribution of Digital Leadership and Organizational Climate as predictor groups should be distinguished from these individual coefficient tests and supported by corresponding joint tests.

The diagnostic results also require consideration when interpreting the model. Tolerance values ranged from .131 to .304, and VIF values ranged from 3.291 to 7.627. Although these values did not cross the selected screening thresholds of tolerance below .10 or VIF above 10, seven predictors exceeded a VIF of 5. Consequently, the model should not be described as entirely free from multicollinearity concerns, and the interpretation of individual coefficients and their relative ranking requires caution. Similarly, the high $R^2$ represents explanatory power within the observed sample and does not, by itself, establish causal relationships or predictive performance in other settings. Verification of score construction, measurement overlap, and coefficient stability remains relevant to evaluating the findings.

The descriptive and regression results further demonstrate that favorable perceptions of a practice do not necessarily correspond to a larger positive conditional association with innovation. Technology Vision received the highest descriptive rating among the digital leadership dimensions but exhibited a negative coefficient in the integrated model. Digital-Age Learning Culture, despite its comparatively lower descriptive rating, had the largest positive coefficient within Digital Leadership. Recognition likewise did not receive the highest descriptive rating within Organizational Climate but had the largest positive standardized coefficient in the combined model. These differences indicate that administrators should distinguish between the perceived prevalence of institutional practices and their statistical relationships with innovative work behavior.

The findings offer practical guidance for administrators at Shandong Water Conservancy Vocational College. Recognition practices should acknowledge teachers' contributions to instructional experimentation, collaborative problem-solving, and the implementation of useful ideas. Administrators should also provide professional responsibility alongside clear expectations and accessible support, enabling teachers to pursue improvement within an

understandable institutional framework. Digital leadership initiatives should connect technological priorities with collaborative learning, usable institutional systems, and relevant professional development. The negative conditional association for Technology Vision warrants examination of how strategic expectations are communicated and supported in practice, rather than a recommendation to reduce technological ambition.

The study contributes evidence that teachers' innovative work behavior is associated with a combination of digital leadership practices and organizational climate conditions. Recognition had the largest positive standardized coefficient in the integrated model, while Digital-Age Learning Culture had the largest positive coefficient among the digital leadership dimensions. Technology Vision showed a small but significant negative conditional association, emphasizing the need to distinguish strategic direction from the organizational conditions through which teachers apply it. These findings support a coordinated approach to institutional development that connects digital learning opportunities and professional capabilities with recognition, responsibility, clear standards, and practical support.

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