Jurnal Kependidikan:
Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran
https://e-journal.undikma.ac.id/index.php/jurnalkependidikan/index

Vol. 11, No. 1 : March 2025
E-ISSN: 2442-7667
pp. 136-145
Email: jklppm@undikma.ac.id

Digital Learning Orientation and Innovative Behavior : Learning Culture's Role in Sustainable Development Readiness

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Abstract: This research examines the influence of digital learning orientation on innovative work behavior, with readiness for change as a mediating factor and organizational learning culture as a moderating factor, as well as its contribution to sustainable development in Indonesia's education sector. This research utilizes the job demand-resource model and the social exchange theory framework. With a quantitative approach and clause associative design, the study population includes all active students from various disciplines at state universities in Central Java Province. The sample was selected using a non-probability sampling method of 218 respondents. Data collection was conducted through a questionnaire utilizing an interval scale ranging from strongly agree (scale 7) to strongly disagree (scale 1). The data were analyzed using the Structural Equation Modeling Partial Least Square (SEM-PLS) approach through the WarpPLS 5.0 software. The findings indicate that digital learning orientation indirectly influences innovative work behavior through readiness for change. Moreover, this indirect effect, mediated by readiness for change, is moderated by organizational learning culture, mainly when the moderation level is low. At an optimal level of organizational learning culture, digital learning orientation significantly boosts innovative behavior by promoting greater readiness for change. However, at this level, organizational learning culture no longer plays a significant role in predicting outcomes. The novelty of this study lies in incorporating organizational learning culture as a moderating factor in the connection between digital learning orientation and readiness for change in the context of sustainable development within the education sector.

Article History
Received: 02-01-2025
Revised: 08-02-2025
Accepted: 24-02-2025
Published: 21-03-2025

Key Words:
Innovative Work Behavior; Digital Learning Orientation; Organizational Learning Culture; Readiness for Change; Sustainable Development.

How to Cite: Farliana, N., Hardianto, H., Rusdarti, R., & Sakitri, W. (2025). Digital Learning Orientation and Innovative Behavior : Learning Culture's Role in Sustainable Development Readiness. *Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran, 11*(1), 136-145. doi:https://doi.org/10.33394/jk.v11i1.14290

https://doi.org/10.33394/jk.v11i1.14290

Introduction

Over the last decade, policymakers and strategists have focused on sustainable development in the education sector, especially on integration and innovation (Bennett et al., 2018). Organizations can attain sustainability by continuously enhancing competitiveness through innovation in systems and services (Bos-Nehles et al., 2017; Gupta & Acharya, 2018). An institution's potential to sustain or achieve a competitive advantage can be hindered by the inability to innovate, as the capacity for innovation is closely linked to internal processes and structures that foster creativity (Shanker et al., 2017). The competence of an institution in remaining relevant and adapting to emerging changes, as well as in producing innovative ideas, is greatly influenced by the attitude of internal stakeholders, especially students, towards readiness to face change (Lyman & Daloisio, 2018; Palumbo & Manna, 2019). The readiness to adapt to change is referred to as "cognitive behaviors that

reflect either acceptance or resistance toward change initiatives," and the effectiveness of change interventions can be facilitated or harmed by these perceptions (Armenakis et al., 1993; Shiota et al., 2021; Verplanken & Orbell, 2022).

From the viewpoint of educational institutions, a learning environment that motivates students to participate in extra-role behaviors, such as innovative work behavior (IWB), must be created by lecturers, thereby enhancing the performance value and sustainability of the institution (Gupta & Acharya, 2018; Kampylis et al., 2015). It has been identified through research that individual and organizational factors, such as leadership style, supervisory support, self-efficacy, job characteristics, and organizational culture, have an impact on individual readiness to change (Srivastava & Dhar, 2019; Tayal et al., 2018). In this study, These concepts are explored within the educational context, and the relevance of digital learning orientation as a key factor in readiness for change is examined, a relationship that has not been previously investigated in the literature.

Amid the ongoing digital transformation in the education system, various studies have highlighted the significance of digital competence, ethical considerations, and online learning in establishing sustainable organization (Aboobaker & KA, 2020; Bayerlein & Jeske, 2018). Meanwhile, among students, research has found that digital orientation is not solely about enhancing learning and work outcomes but also influences peripheral aspects, such as serving as a support system for academic activities (Henderson et al., 2017; Kondakci et al., 2019).

Considering the mixed findings in the literature, this study explores whether students' digital learning orientation affects their readiness for change and innovative work behavior within the broader framework of the job demand-resource model (Bakker et al., 2014) and social exchange theory (SET) (Blau, 1964), drawing on existing studies in the literature, it is suggested that organizational learning culture serves as a vital institutional resource that fosters extra-role behaviors, particularly readiness for change and innovative work behavior among college students. However, a lack of identifiable literature is observed investigating the underlying mechanisms through which digital learning orientation impacts innovative work behavior.

The contribution of this study has two main aspects. Although there has been significant academic research on innovative work behavior, the literature is still fragmented and inconsistent in its antecedents and results. This research examines the influence of digital learning orientation (DLO), readiness for change (RC) (individual-level factors), and organizational learning culture (OLC) as key determinants of innovative work behavior among college students. While prior studies have demonstrated that digital learning orientation enhances learning outcomes, its impact on innovative work behavior remains less explored (Bayerlein & Jeske, 2018; Dhawan, 2020); a gap in the literature concerning the underlying psychological mechanisms is observed.

To address this gap, instead of merely examining the relationships Among individual variables separately, we aim to uncover how DLO, OLC, RC, and IWB interact simultaneously. Thus, we employ a moderated mediation approach to explore the conditional indirect effects. Moreover, analyzing these conditional indirect effects represents a significant methodological contribution. The findings of this study are particularly relevant in an era where learning processes are increasingly facilitated through online digital platforms.

IWB is regarded as the cornerstone of growth and organizational performance, defined as "any personal action aimed at generating, processing, and implementing new ideas about how to do things, including new product ideas, technologies, procedures, or work processes to improve organizational performance and effectiveness." (Bos-Nehles et al., 2017). This research examined three key constructs to assess innovative work behavior:

DLO, OLC, and RC. A moderated mediation analysis was conducted to explore the conditional indirect effects within this framework.

This cutting-edge research focuses on innovation in work behavior, as reflected in digital learning orientation, learning culture, and readiness for change. While digital learning orientation and readiness for change are present, innovative work behavior does not always emerge, as it can be influenced by organizational learning culture. The novelty of this research is reflected in the inclusion of organizational learning culture as a moderating factor in the relationship between digital learning orientation and readiness for change in the sustainable development of the education sector.

This study seeks to analyze (1) the role of digital learning orientation on innovative work behavior, with mediation of readiness for change and moderation of organizational learning culture, and (2) the contribution of this research to sustainable development in the Indonesian education sector. This study offers theoretical and practical insights into how digital learning orientation, readiness for change, and organizational learning culture interact to foster innovative work behavior among students. Contributing to developing a sustainable education system in Indonesia by emphasizing the importance of digitalization of learning in improving the competitiveness of educational institutions.

Research Method

This study employs a quantitative approach with a clause-associative design to analyze the relationships between variables and their mutual influence. The location of this study was a university in Central Java Province, with a population involving all active students from various disciplines. Sample selection was made using the nonprobability sampling method, with a target sample of 218 respondents, considering the sufficiency of data in structural analysis (A. Ferdinand, 2014).

Data was gathered through a questionnaire method using an interval scale ranging from strongly agree (scale 7) to strongly disagree (scale 1). The questionnaire was distributed online to respondents via Google Forms. Once the data was collected, the next phase involved initial processing, including data editing and conversion, to refine and structure the information within the questionnaire items. Data analysis was conducted using the Structural Equation Modeling Partial Least Square (SEM-PLS) approach, supported by the WarpPLS 5.0 software.

The research employed data analysis techniques, including validity and reliability assessments, to ensure instrument accuracy and reliability, with convergent validity (CFA load factor > 0.6), discriminant validity (AVE > 0.5), and composite reliability (> 0.7) (A. Ferdinand, 2014). Inferential analysis used SEM-PLS, including steps such as model conceptualization, selection of algorithms and resampling methods, path diagram development, Goodness of Fit evaluation (data normality, outlier, multicollinearity, singularity checks), and inner/outer model estimation to analyze t-statistics and Q^2 values.

Results and Discussion

Evaluation of Measurement Model (Outer Model)

1) Convergent Validity

Convergent validity is assessed based on the construct loading value observed through the combined cross-loading output. A construct is considered to meet the requirements for convergent validity if its loading value exceeds 0.6. However, if the value falls below 0.6, the construct must be excluded from the analysis model. Additionally, significance is determined when the p-value is less than 0.5.

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Table 1. Variable Construct Loadings

Variables	Indicator	Loading Value	P-Value
Digital Learning Orientation (DLO)	DLO1	(0.803)	<0.001
	DLO2	(0.887)	<0.001
	DLO3	(0.676)	<0.001
	DLO4	(0.624)	<0.001
	DLO5	(0.672)	<0.001
	DLO6	(0.745)	<0.001
	DLO7	(0.779)	<0.001
	DLO8	(0.807)	<0.001
	DLO9	(0.698)	<0.001
	DLO10	(0.660)	<0.001
	DLO11	(0.734)	<0.001
	DLO12	(0.850)	<0.001
	DLO13	(0.782)	<0.001
	DLO14	(0.874)	<0.001
	DLO15	(0.889)	<0.001
	DLO16	(0.803)	<0.001
Org. Learning Culture (OLC)	OLC1	(0.743)	<0.001
	OLC2	(0.720)	<0.001
	OLC3	(0.754)	<0.001
	OLC4	(0.741)	<0.001
	OLC5	(0.760)	<0.001
	OLC6	(0.803)	<0.001
Readiness for Change (RC)	RC1	(0.913)	<0.001
	RC2	(0.912)	<0.001
	RC3	(0.877)	<0.001
Innovative Work Behavior (IWB)	IWB1	(0.834)	<0.001
	IWB2	(0.885)	<0.001
	IWB3	(0.760)	<0.001
	IWB4	(0.805)	<0.001
	IWB5	(0.721)	<0.001
	IWB6	(0.693)	<0.001
	IWB7	(0.717)	<0.001
	IWB8	(0.884)	<0.001
	IWB9	(0.763)	<0.001
Moderation Interaction of Variables *Org. Learning Culture* and *Digital Learning Orientation*	OLC*DLO	(1,000)	<0.001

As shown in Table 1, all indicators used for each research variable, including DLO< OLC, RC, and IWB, and the interaction between OLC and DLO as a moderating variable have loading values greater than 0.6. Therefore, all data meet the criteria for convergent validity. In addition to the loading factor, convergent validity is assessed by ensuring that the Average Variance Extracted (AVE) value meets the required criteria, specifically AVE > 0.50. The AVE values are in Table 2.

Table 2. Latent Variable Coefficient Output

	DLO	OLC	RC	IWB	OLC*DLO
Avg. Var. Extrac	0.595	0.568	0.811	0.620	1,000

Table 2 shows DLO, OLC, RC, IWB, and the interaction of the moderating variables Org. Learning Culture and Digital Learning Orientation (OLC*DLO) each have an AVE value of

0.595, 0.568, 0.811, 0.620, and 1.0000. All five values exceed 0.5, indicating that the five variables fulfill the criteria for convergent validity.

2) Discriminant Validity

To determine discriminant validity, researchers examine the square root of the AVE values in the diagonal column, indicated by brackets. This value must exceed the correlation between latent variables within the same column. Table 3 presents the results of the AVE square root calculation.

Table 3. Correlations Among Latent Variables

	DLO	OLC	RC	IWB	OLC*DLO
DLO	(0.771)	0.568	0.154	0.311	-0.421
OLC	0.568	(0.754)	0.250	0.289	-0.260
RC	0.154	0.250	(0.901)	0.739	-0.144
IWB	0.311	0.289	0.739	(0.787)	-0.223
OLC*DLO	-0.421	-0.260	-0.144	-0.223	(1,000)

Table 3 indicates that the criteria for discriminant validity have been met, as evidenced by the square root of the AVE for each variable being more significant than the correlation coefficients between constructs. The values for DLO, OLC, RC, IWB, and the interaction between OLC*DLO are 0.771, 0.754, 0.901, 0.787, and 1.000, respectively. Since all five values exceed the correlations between latent variables within the same column, the model is confirmed to meet the requirements for discriminant validity.

3) Composite Reliability

This test is assessed using two criteria: composite reliability and Cronbach's alpha. A variable is considered reliable if its composite reliability value exceeds 0.70. The results from the output latent variable coefficients are presented in Table 4, where the composite reliability values for DLO, OLC, RC, IWB, and the interaction between Organizational Learning Culture and Digital Learning Orientation (OLC*DLO) are 0.959, 0.888, 0.928, 0.936, and 1.000, respectively. Since all five values are greater than 0.70, it can be concluded that all variables meet the composite reliability criteria.

Table 4. Output Latent Variable Coefficients

	DLO	OLC	RC	IWB	OLC*DLO
Composite Reliab.	0.959	0.888	0.928	0.936	1,000

Structural Model Evaluation (Inner Model)

The inner structural model is evaluated by examining the model fit and quality indices, R-squared, and Q-squared values. After processing the data using the multiple mediation effects model, the model fit indices and p-values are obtained, as shown in Table 5.

Table 5. Model Fitness and Quality Indicators

Model Fit & Quality Indices	***Index***	***p-value***	***Criteria***	**Information**
Average path coefficient APC	0.320	P=0.001	P<0.05	*acceptable*
Average Rsquared ARS	0.293	P=0.001	P<0.05	*acceptable*
Average adjusted Rsquared AARS	0.287	P=0.001	P<0.05	*acceptable*
Average block VIF AVIF	1,339	*acceptable if* <= 5, *ideally* <=*3.3*		*Ideally*
Average full collinearity VIF AFVIF	1,845	*acceptable if* <= 5, *ideally* <=*3.3*		*Ideally*
GoF *Tenenhaus*	0.459	*small* >= 0.1, *medium* >= 0.25, *large* >= 0.36		*Large*
Sympson's paradox ratio SPR	1,000	*acceptable if* >= 0.7, *ideally* = 1		*ideally*
R-squared contribution ratio RSCR	1,000	*acceptable if* >= 0.9, *ideally* = 1		*ideally*

Statistical suppression ratio SSR	1,000	*acceptable if* >= 0.7	*acceptable*
Nonlinear bivariate causality direction ratio NLBCDR	0.833	*acceptable if* >= 0.7	*acceptable*

All ten criteria have been satisfied in the fit and quality indices model, indicating that the model meets the fit model requirements. The estimated results of the indirect effect model are presented in Figure 1.

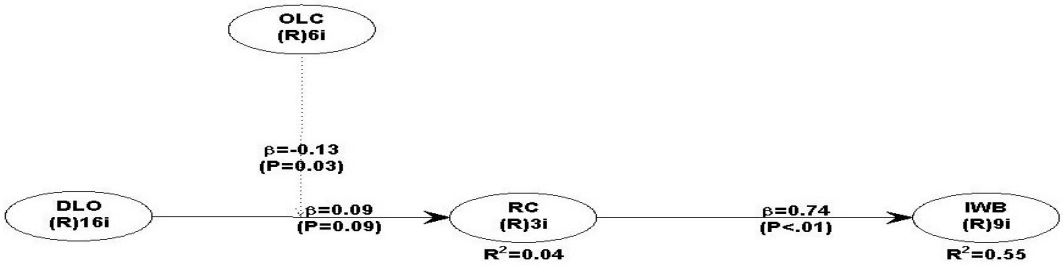

Figure 1. Results of testing the Indirect Effect IWB Model

Testing the structural model using the indirect effect model is conducted by examining the R-squared value, a goodness-of-fit test. The results indicate that the R-squared value for Digital Learning Orientation (DLO), Organizational Learning Culture (OLC), and Readiness for Change (RC) on Innovative Work Behavior (IWB) is 0.55. This implies that the exogenous latent variables in this study explain 55% of the variance in Innovative Work Behavior (IWB). Furthermore, Q-squared is used to evaluate the predictive validity or relevance of a set of latent predictor variables on the criterion variable. A model is considered to have predictive validity if the Q-squared value is greater than 0. As shown in Table 6, the Q-squared value for Innovative Work Behavior (IWB) is 0.549, indicating that the research model possesses predictive relevance, as it exceeds zero.

Table 6. Q-squared Description of Latent Variable Coefficient Output

	DLO	OLC	RC	IWB	OLC*DLO
Q-Squared			0.044	0.549	

Hypothesis Test Results

Researchers examine the path coefficient and its significance level to measure the correlation between constructs. This study uses a significance level of 0.05 or 5%. Table 7 presents the results of the hypothesis test.

Table 7. Hypothesis Test Results

No	Hypothesis	Hypothesis Test Results			
		Coefficient	Signification	α	Information
1.	DLO has a significant positive effect on RC	-0.026	0.087	0.05	Rejected
2.	RC has a significant positive effect on IWB	0.002	<0.001	0.05	Accepted
3.	OLC positively and significantly moderates the influence of DLO on IWB	0.569	0.026	0.05	Accepted
4.	RC positively and significantly mediates the influence of DLO on IWB	0.067	0.078	0.05	Rejected
5.	RC positively and significantly mediates the influence of DLO on IWB with OLC as a moderating variable.	-0.096	0.022	0.05	Accepted

Discussion

At the heart of any innovation, Their attitudes and behaviors are crucial to an organization's capacity for innovative adaptation. However, research on innovative work behavior, its determinants, and its outcomes remains fragmentary and inconsistent. This paper seeks to identify the factors that shape IWB among college students. It proposes that Digital learning mindset positively impacts students' Preparedness for transformation and indirectly influences IWB through readiness for change.

The primary contribution of this research is to explore the potential conditional indirect impact of organizational learning culture on the mediating relationship. Additionally, prior research has demonstrated that digital learning orientation impacts learning outcomes (Bullen et al., 2011; Erhel & Jamet, 2013). Digital learning has profoundly influenced students' intellectual openness, work ethic, conscientiousness, positive self-perception, cognitive processes and strategies, knowledge acquisition, and creativity (Clark et al., 2016; Lin et al., 2017). As suggested, our findings confirm that digital learning orientation positively correlates with enhanced readiness for change and innovative behavior among students, contributing to and expanding existing knowledge.

A key theoretical contribution of this study is its effort to explore the implications of concepts such as readiness for change and Innovative Work Behavior (IWB) within the context of education undergoing digital transformation. While extensive research has examined readiness for change and IWB in business organizations, this study is the first to investigate these concepts within educational institutions. Building upon previous empirical findings, the results highlight that institutional learning culture plays a crucial role in shaping students' readiness for change, reinforcing existing evidence on the significance of fostering a learning culture in educational settings (De Clercq et al., 2016). The study results also indicate that a conditional indirect effect of organizational learning culture on the mediation relationship between digital learning orientation, readiness for change, and innovative behavior among students is observed. More specifically, this conditional indirect effect is significant at lower levels of organizational learning culture, suggesting that when OLC is low, the effective translation of students' digital learning orientation into readiness for change is not achieved.

The main practical implication is the confirmation that organizational learning culture moderates the mediated relationship between digital learning orientation and innovative work behavior through readiness for change. As a contextual factor tied to the institution, OLC underscores the importance of institutional efforts in shaping a learning culture that fosters IWB among stakeholders. Given that teachers are facilitators of OLC in educational settings, these findings emphasize their critical role in establishing and sustaining a learning environment that encourages students' growth. This outcome represents a key contribution of the study, as it expands on previous research suggesting that online learning does not necessarily directly translate into inner attitudes and expected behavior outcomes (Henderson & Trede, 2017). Institutional culture and climate have been proven to significantly influence students' attitudes and learning outcomes, and this study further reinforces this proposition.

Innovation is a crucial determinant of an institution's success, with personal creativity and innovation serving as fundamental drivers of organizational innovation (DiLiello & Houghton, 2006; Janssen, 2000). IWB or innovative workplace behavior is considered as “discretionary behavior” that often goes beyond formal roles and is not recognized in the formal reward system of the organization (Janssen, 2000). At the educational level, students' innovative work behavior serves as a strategic basis for enhancing institutional performance, with sustainability and the role of educators being crucial in fostering this through a

supportive culture. Educators must guarantee that the institutional culture and environment promote, sustain, and nurture student creativity (DiLiello & Houghton, 2006). Strong institutional support enhances students' inner motivation, engagement, and extra-role behavior. To drive change effectively, work processes, systems, structures, and culture must be aligned with both students and the institution's perspectives (Lyman & Daloisio, 2018). Deliberate institutional change requires educators and academic leaders to design and align initiatives that set the institution apart from competitors while enhancing Competitive edge at the individual, team, and organizational levels.

The findings are particularly relevant in the context of ongoing online learning. To promote sustainable online education, institutions—especially in developing countries—should cultivate a supportive organizational culture that enhances students' digital orientation. Effective integration of e-learning technologies can foster substantial digital innovation and advancement, strengthening students' problem-solving abilities, critical thinking skills, and adaptability (Dhawan, 2020). Curriculum and pedagogical adjustments must be made to accommodate learning pathways increasingly shaped by digital media. This includes incorporating interactive and adaptive learning technologies, strengthening digital literacy skills, and aligning instructional methods with students' evolving learning preferences. Additionally, educators should receive proper training and resources to effectively integrate digital tools, creating an engaging and inclusive learning environment. These revisions should also prioritize critical thinking, problem-solving, and collaborative learning to equip students with the skills to navigate the digital landscape while fostering creativity and innovation.

Conclusion

Digital learning orientation through readiness for change significantly and indirectly affects innovative work behavior. In addition, this indirect effect, mediated by readiness for change, is influenced by organizational learning culture as a moderator, mainly when the level of moderation is low. At the optimal level of an organizational learning culture, a significant impact of digital learning orientation on innovative behavior is observed through higher readiness for change. However, organizational learning culture no longer plays a significant role in predicting outcomes. The novelty of this study is highlighted by the incorporation of organizational learning culture as a moderating variable in the relationship between digital learning orientation and readiness for change, particularly in the context of sustainable development within the education sector.

Recommendation

The recommendations provided by the researcher are: (1) Strengthening the Learning Culture in Institutions, which emphasizes the importance of OLC in strengthening students' readiness to change and increasing innovative behavior. Educational institutions need to encourage a learning culture that supports innovation and adaptation. (2) Although DLO plays an important role, its effect on readiness to change is not always immediately visible. Therefore, digital learning programs must be optimized with adequate support from a strong organizational culture. (3) Because RC has been shown to affect IWB significantly, educational institutions must focus on increasing students' readiness to adapt to change, both in technology and the learning environment. (4) Given that most respondents come from economic education study programs, further research needs to include more diverse samples to identify differences in innovative behavior between fields of study. This study provides valuable insights for developing educational policies that support innovation and readiness

for change, especially in the digital transformation era. (5) Lecturers must integrate digital technology into learning to improve students' digital learning orientation. This can be done through online learning platforms, interactive simulations, and project-based teaching methods that encourage digital exploration.

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