

Teachers' Readiness to Implement the Deep Learning Approach in Merdeka Curriculum: An Analysis Based on Psychopedagogical Characteristics

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Abstract

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This study aims to analyze the readiness of vocational high school (SMK) teachers to implement the deep learning approach within the Merdeka Curriculum, based on psychopedagogical characteristics, particularly self-efficacy and perceptions of the learning environment. Employing a quantitative correlational approach, data were collected through a closed-ended questionnaire administered to 285 teachers across three administrative regions in Central Java: Boyolali, Klaten, and Salatiga. The results reveal a significant positive correlation between self-efficacy and teacher readiness ($r = 0.319$; $p < 0.01$), as well as between the learning environment and teacher readiness ($r = 0.381$; $p < 0.01$). These findings highlight the critical role of teachers' confidence in using technology and the supportive digital learning environment in facilitating the successful adoption of deep learning pedagogy. Therefore, enhancing individual teacher capacity and fostering a conducive learning environment are key strategies to support effective pedagogical transformation in the era of the Merdeka Curriculum.

Keywords:

self-efficacy, learning environment, deep learning, Merdeka Curriculum, teacher readiness

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INTRODUCTION

In the context of the rapidly evolving digital era, educational transformation extends beyond infrastructure and curriculum reform to include fundamental shifts in pedagogical approaches. International reports and empirical studies have emphasized that teachers are required to adopt learner-centered, technology-integrated pedagogies to effectively support meaningful learning and digital competence development in classrooms (Mangkhang et al., 2022). Deep learning refers to a pedagogical approach that prioritizes meaningful understanding, critical reflection, and the ability to transfer knowledge to novel contexts, rather than surface-level memorization. This approach has gained international recognition, including in developing education systems such as Indonesia, as a key strategy for fostering higher-order thinking skills in digital-era learning (Biggs & Tang, 2011; Fullan, Quinn, & McEachen, 2018). This approach refers to learning strategies that encourage students to think critically, understand concepts deeply, solve problems

collaboratively, and develop 21st-century skills (Ravitz et al., 2012); (Santosa et al., 2020). The Indonesian government's latest policy encouraging deep learning-based pedagogical transformation presents both a challenge and an opportunity for teachers to develop more meaningful learning strategies.

In this context, teacher readiness is a crucial factor. Teachers are not only curriculum implementers but also agents of change in the quality learning process. Teacher readiness is shaped not only by access to technology and training, but also by teachers' self-efficacy and perceived competence in integrating new instructional approaches, which have been shown to significantly influence technology adoption in educational settings (Ertmer et al., 1994); (Pinochet-Quiroz et al., 2022). Beyond structural factors such as infrastructure and policy support, teacher readiness is shaped by multiple individual and psychopedagogical dimensions. Demographic variables (e.g., age, gender, education level, and teaching experience) influence teachers' familiarity with technology and attitudes toward innovation, while psychopedagogical factors, including internet self-efficacy and learning environment, determine their perceived capability and willingness to implement new pedagogical practices (Veintimilla, Cheme, Muñoz, Chavarría, & Vélez, 2024).

Previous studies have shown that the technological self-efficacy factor contributes significantly to teachers' readiness to adopt technology-based educational innovations (Kao & Chien, 2017);(Gupta & Bamel, 2023). In addition, learning environment variables, both in the physical context and organizational culture, have also been shown to influence the extent to which teachers are able to adopt new learning approaches (Guney & Al, 2012); (Veintimilla et al., 2024). Generational differences among Baby Boomers, Generation X, Generation Y, and Generation Z are associated with variations in digital literacy, self-efficacy, and attitudes toward pedagogical innovation, which in turn shape teachers' readiness to adopt new instructional approaches. Prior studies indicate that these generational characteristics influence how teachers perceive educational change, respond to technological integration, and engage in innovative teaching practices, making generational cohort a relevant variable in examining teacher readiness (Toma & Hudea, 2024); (Amanah et al., 2023). Based on this complexity, it is important to map teacher readiness based on their psychopedagogical characteristics.

Many researchers have revealed that teachers' internet self-efficacy determines the success of a digital technology-based learning model (Gupta & Bamel, 2023). Self-efficacy is a key component in successful digital-based learning (Shen, Cho, Tsai, & Marra, 2013). They further explained through factor analysis that there are five dimensions of self-efficacy in online learning, namely: (a) self-efficacy to complete online learning, (b) self-efficacy to interact socially with classmates, (c) self-efficacy to handle tools in online learning management systems, (d) self-efficacy to interact with instructors in online learning, and (e) self-efficacy to interact with classmates in the context of online learning.

A supportive learning environment is an essential factor in the development of digital-based learning designs. (Sukendro, Riyanto, Karwanto, & Hartono, 2023). The learning environment encompasses the physical, psychological, and pedagogical aspects that frame the learning process. In the context of digital pedagogy, this dimension extends to include technological infrastructure, access to

digital devices and platforms, and the technological culture within the school environment (Adler et al., 2025); (Liu et al., 2025). A study by (Baran et al., 2011) showed that a structured and supportive digital learning environment can increase teachers' confidence in implementing innovative pedagogical strategies, including deep learning approaches that emphasize interactivity, collaboration, and active student engagement. Furthermore, a conducive environment also plays a role in reducing psychological barriers such as anxiety in using technology, especially among teachers with limited digital experience.

The effectiveness of implementing digital pedagogy oriented towards deep learning is greatly influenced by the extent to which the learning environment provides support for professional autonomy and collaboration between educators (Prihatin, Sukmawati, Santosa, Cahyono, & Juwita, 2025). A learning environment that facilitates continuous professional development, peer collaboration, and access to high-quality digital resources significantly contributes to improving teachers' digital pedagogical competencies (Worku, 2025); (Durmuş, 2016). Within the framework of the Independent Curriculum, which demands project-based, exploratory, and contextual learning, the availability of a flexible and adaptive learning environment is a primary requirement for the successful implementation of the deep learning approach (Sumarmi et al., 2022); (Purwanta, 2023). Without such environmental support, the desired pedagogical transformation will be difficult to achieve optimally. Therefore, investing in strengthening digital learning environments is a strategic element in 21st-century education reform. (Liu et al., 2025).

One relevant quantitative approach to assessing teacher readiness based on their psychopedagogical profiles is correlational analysis. This analysis has been widely used in educational research to identify teacher performance in facing new policies, particularly the implementation of curriculum changes. Although deep learning has been increasingly promoted in educational policy, empirical studies in Indonesia have rarely examined teacher readiness using an integrated psychopedagogical perspective. Most prior research has focused on isolated factors, such as technology use or training. Responding to this gap, this study aims to analyze teacher readiness for implementing deep learning-based policies within the Merdeka Curriculum by incorporating multiple psychopedagogical variables into a unified analytical model.

This research is expected to provide theoretical contributions in developing a teacher readiness model in the era of technology-based pedagogical transformation, as well as provide practical contributions for policymakers and teacher training program developers to design more personalized and contextual interventions according to teacher characteristics. Because teachers' failure to prepare for learning with a deep learning approach impacts the failure to prepare the next generation.

METHODS

This study used a quantitative approach with a correlational design to examine the relationship between self-efficacy and the learning environment on teachers' perceptions of implementing the deep learning approach in the

Independent Curriculum. A correlational design was chosen because it is appropriate for determining the degree of relationship between variables without manipulating the conditions or treatment of the subjects. The primary focus of this study is to identify the extent to which teachers' psychopedagogical characteristics—particularly self-efficacy and perceptions of the learning environment—contribute to their readiness and perceptions in implementing the deep learning approach characteristic of the Independent Curriculum.

The study population comprised all teachers from public vocational high schools (SMK negeri) in Boyolali Regency and its surrounding areas that have implemented the Independent (Merdeka) Curriculum. According to administrative records from the Boyolali Education Office, the population included all registered SMK negeri in the region implementing the Merdeka Curriculum and their teaching staff. Precise counts of schools and teachers were obtained from official Dapodik and regional education data to ensure accurate population coverage for sampling purposes. The sampling technique used was stratified random sampling, taking into account the proportion of teachers based on administrative region and school type. The sample of 285 teachers was determined through proportional stratified random sampling, with regions serving as strata. Sample size estimation followed standard sample determination procedures for survey research, calculated using the Slovin formula at a 5% margin of error. Respondents from Boyolali Regency, Klaten Regency, and Salatiga City were selected proportionally based on the number of eligible teachers in each region to ensure adequate representation and minimize regional sampling bias. This technique was chosen to ensure proportional representation across regions and reduce sampling bias.

Data collection was conducted using a closed questionnaire developed based on theoretical indicators of each variable. Self-efficacy was operationalized through indicators including teachers' confidence in using technology, integrating innovative pedagogies, managing technology-supported learning, and addressing instructional challenges, adapted from Kim and Glassman (Kim & Glassman, 2013). The learning environment variable was measured through indicators of institutional support, access to technological resources, administrative support, and collaborative school climate, following Fraser's learning environment framework (Fraser, Tobin, & McRobbie, 2012). Meanwhile, perceptions of the deep learning approach are measured based on cognitive, affective, and metacognitive dimensions that are relevant to the principles of deep learning in the Independent Curriculum (Prihatin et al., 2025).

RESULTS & DISCUSSION

The results of the Spearman correlation analysis revealed a significant relationship between variables at a significance level of 0.01 (two-tailed test). More specifically, these findings highlight several important points. The results reveal a statistically significant, moderate positive correlation between self-efficacy and teachers' readiness to implement the deep learning approach ($r = 0.319$, $p < 0.001$). This finding indicates that self-efficacy plays an important, though not exclusive, role in shaping readiness, reinforcing the need to consider additional

psychopedagogical and contextual variables. This indicates that the higher the level of self-efficacy, the greater their readiness to face the Merdeka curriculum policy with a deep learning approach. Second, a significant positive correlation was also identified between the environment and readiness to implement learning with a deep learning approach, indicated by a correlation coefficient of 0.381 with a significance value of 0.000. This indicates that environmental factors play an important role and are positively correlated with teacher readiness to implement learning policies with a deep learning approach.

Table 1. Spearman Correlation Analysis between Variables

Variable	1	2	3
1. Teacher Readiness	1		
2. Self-Efficacy	.319**	1	
3. Learning Environment	.381**	.287**	1

**Note: ** Correlation is significant at the 0.01 level (2-tailed).

The results of the analysis above show a significant positive correlation between self-efficacy and teacher readiness to implement the deep learning approach in the independent curriculum, with a coefficient of $r = 0.319$ ($p = 0.000$). This finding is consistent with a study by (Rivandi & Pahlevi, 2025) that examined the influence of digital competence on teaching readiness, finding that self-efficacy played a significant moderating role in strengthening the relationship between digital competence and teacher readiness ($p < 0.01$). The results also align with previous research showing that teachers with high self-confidence in using technology tend to be more prepared to adopt and implement digital pedagogical innovations. (Dinh & Nguyen, 2022). Self Efficacy is a teacher's gateway to learning new things (Yeşilyurt et al., 2016); (Dinh & Nguyen, 2022). Thus, the higher teachers' self-confidence in their abilities, both in designing and implementing technology-based learning, the greater their readiness to adopt a deep learning approach, as mandated by the Merdeka Curriculum.

The correlation coefficient of $r = 0.381$ ($p = 0.000$) indicates that perception of the digital learning environment is the strongest predictor compared to self-efficacy. This is in line with previous research that found that technology support and a collaborative culture in schools directly influence teachers' teaching readiness (Zhang et al., 2020); (Adler et al., 2025). In addition, other research shows that environmental support such as training, technological facilities, and the willingness of colleagues and institutions can significantly improve teacher performance in technology integration (Worku, 2025). This is also in line with the findings of other researchers who show that teacher readiness for digital learning is not only a matter of individual competence, but is also driven by a conducive supporting ecosystem (Gambo & Shakir, 2023).

Based on the significant correlation identified in this study, the findings suggest that educational institutions particularly vocational high schools (SMK) in

Central Java need to address teacher readiness through a dual focus on individual capacity development and the quality of the digital learning environment. Consistent with social cognitive theory, strengthening individual capacity through continuous professional development can enhance teachers' self-efficacy, which has been shown to influence their willingness to adopt innovative pedagogical practices, including deep learning-oriented instruction (Bandura, 1997; Tondeur et al., 2017;). Training programs that emphasize authentic deep learning practices, reflective teaching, and constructive feedback may therefore play a critical role in increasing teachers' confidence to implement the Independent (Merdeka) Curriculum effectively.

At the same time, the learning environment functions as an enabling condition that shapes whether enhanced self-efficacy can be translated into actual instructional change. Previous studies highlight that access to adequate technological infrastructure, supportive leadership, and collaborative professional communities significantly facilitates teachers' adoption of innovative and technology-integrated pedagogies (Fraser et al., 2012; Scherer et al., 2019). A positive digital learning environment characterized by reliable technology, peer learning communities, and a school culture that encourages experimentation can reduce perceived risks associated with pedagogical innovation and reinforce teachers' readiness for change.

When implemented simultaneously, the interaction between high teacher self-efficacy and a supportive learning environment is likely to produce a synergistic effect. This interaction not only enhances teacher readiness but also improves the consistency and quality of deep learning implementation in classroom practice. Prior research indicates that such alignment between individual and contextual factors is associated with improved instructional quality and, ultimately, better student learning outcomes (OECD, 2019; Fullan et al., 2018). Thus, policy efforts aimed at advancing deep learning within the Independent Curriculum should consider integrated strategies that address both psychological and environmental dimensions of teacher readiness.

If implemented simultaneously, the combination of strengthening teacher self-efficacy and a positive learning environment is believed to increase teacher readiness and effectiveness in implementing deep learning approaches, which impacts the quality of learning and student learning outcomes.

CONCLUSION

This study concludes that both individual capacity and the quality of the digital learning environment are positively and significantly associated with teacher readiness to implement deep learning within the Independent (Merdeka) Curriculum. The findings directly address the research objective by demonstrating that teacher readiness is not determined by a single factor, but by the combined contribution of psychopedagogical variables. These results provide empirical evidence from the vocational high school context in Central Java, confirming that strengthening teacher self-efficacy and improving the digital learning environment are both essential components in supporting the effective adoption of deep learning-oriented instructional practices.

This study is subject to several limitations, including its correlational design, reliance on self-report data, and focus on SMK teachers in three regions of Central Java, which may limit causal interpretation and generalizability. In addition, other potentially influential variables, such as leadership style, advanced digital competence, and epistemological beliefs, were not examined. Future research should employ longitudinal or mixed-methods approaches to explore causal mechanisms, expand the scope to diverse educational contexts and regions, and investigate mediating or moderating variables. Further studies are also encouraged to develop and test intervention models based on integrated individual–environmental strategies to evaluate their impact on teacher readiness and student learning outcomes.

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