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Critical Thinking as a Mediator in The Relationship Between Self-Efficacy and Innovative Behavior of Lecturers

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Abstract

In the context of rapid technological change and global transformation in higher education, innovative behavior among lecturers has become increasingly important. This study aims to examine the mediating role of critical thinking in the relationship between self-efficacy and innovative behavior among Indonesian university lecturers. Using a quantitative research design, data were collected from 200 active lecturers employed at higher education institutions in Bekasi and Jakarta and analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). The analysis involved measurement model evaluation and structural model testing to ensure construct reliability and validity. The results indicate that self-efficacy has a significant positive effect on both innovative behavior and critical thinking. Furthermore, critical thinking exerts a significant positive influence on innovative behavior and partially mediates the relationship between self-efficacy and innovative behavior. These findings highlight the importance of integrating motivational and cognitive factors to foster innovation in academic contexts. From an educational psychology perspective, this study contributes to a deeper understanding of the psychological mechanisms through which self-efficacy translates into innovative behavior, particularly through critical thinking. The findings offer theoretical contributions to social cognitive and innovation theories and provide practical implications for higher education institutions in designing professional development programs that strengthen lecturers' self-efficacy and critical thinking skills to support sustainable innovation.

INTRODUCTION

Digitalization, globalization, and industrial transformation have significantly reshaped universities in Indonesia. The government has introduced policies aimed at fostering innovation in higher education, particularly through the Independent Campus (Independent Learning–Independent Campus/MBKM) initiative, which seeks to better prepare graduates to face workforce challenges (Ministry of Education and Culture, 2020). Furthermore, the pursuit of World Class University (WCU) status and the implementation of the national accreditation system (BAN-PT) require universities to continuously innovate and improve educational quality, with lecturers playing a central

role in these efforts. Lecturers are employees within the education sector whose primary responsibility is to provide educational services to students. Although teaching, research, and community service are routine academic activities, positioning lecturers as key agents of change in higher education remains a substantial challenge, as institutions increasingly expect them to innovate not only in pedagogy but also in research productivity and community engagement (Janssen, 2000; 2004; Scott & Bruce, 1994).

In the context of globalization and rapid technological advancement, lecturers are required to adapt to and adopt more engaging, flexible, and contextually appropriate teaching methods (Kumar et al., 2021). Innovative lecturers frequently employ technology-enhanced instructional approaches, such as e-learning, blended learning, and flipped classrooms, which have been shown to enhance student engagement and participation in the learning process (Bozkurt & Sharma, 2020). Empirical evidence from Rahman et al. (2021) further indicates that innovative educational practices contribute to the development of students' critical thinking skills, thereby supporting the preparation of graduates capable of navigating the increasing complexity of the labor market.

Beyond teaching, lecturers' professional responsibilities also encompass research and community engagement. Consequently, lecturers are increasingly encouraged to develop innovative, research-oriented, and technology-based community empowerment programs (Santos-Gago et al., 2019). For instance, Astuti and Setiawan (2023) reported that lecturers who adopt innovative approaches in community service are more effective in generating sustainable solutions for local communities. However, despite these expectations, innovative behavior among lecturers remains inconsistent in practice. Not all lecturers demonstrate the level of innovation anticipated by institutional policies, suggesting the presence of underlying psychological and cognitive factors that influence innovative behavior.

Previous studies have identified several determinants of innovative behavior. Tierney and Farmer (2011) argue that individuals with high self-efficacy are more confident in experimenting with new approaches and are therefore more motivated to innovate in teaching and research. Self-efficacy refers to an individual's belief in their ability to organize and execute actions required to achieve desired outcomes (Bandura & Wessels, 1997). Empirical findings indicate that lecturers' self-efficacy in higher education positively influences risk-taking, adaptability, and innovation in dynamic academic environments (Yuan & Woodman, 2010). Similarly, Wang et al. (2022) demonstrated that lecturers with high self-efficacy are more effective in overcoming obstacles associated with the implementation of new instructional methods, including e-learning and blended learning. Runhaar et al. (2013) further emphasized that lecturers with strong self-efficacy actively engage in professional development and continuously refine their instructional strategies. In contrast, lecturers with low self-efficacy may

possess creative ideas but lack the confidence required to implement them effectively

Nevertheless, self-efficacy alone may be insufficient to explain innovative behavior. Abbas and Sağsan (2019) found that high self-efficacy does not automatically translate into innovation without the presence of complementary cognitive factors. In this regard, critical thinking plays a crucial role in transforming confidence into actionable innovation. Critical thinking is a cognitive skill that enables individuals to analyze situations, evaluate information, and generate effective solutions (Facione, 2011). Through critical thinking, lecturers can direct their self-efficacy toward purposeful and contextually appropriate innovative behaviors, positioning critical thinking as a potential mediating mechanism.

Facione et al. (2021) noted that critical thinking equips lecturers with the ability to make well-reasoned decisions, remain open to novel ideas, and implement innovative instructional strategies. Similarly, Chinedu and Ile (2022) reported that lecturers with strong critical thinking skills are more adaptive to changes in academic policies, institutional demands, and technological developments. Such adaptability enables lecturers to evaluate alternative problem-solving approaches and engage in creative instructional design, which is essential for fostering innovation in educational practice (Lee et al., 2019).

Self-efficacy theory, which has been widely discussed since the 1980s, emphasizes individuals' beliefs in their capacity to achieve specific goals and has received substantial attention in education, healthcare, and human resource management. Vieira et al. (2024) demonstrated that self-efficacy significantly influences innovative thinking across genders. For lecturers, self-efficacy constitutes a foundational psychological resource that supports initiative-taking and resilience when facing professional challenges.

From an organizational perspective, Gorelik et al. (2023) showed that higher self-efficacy is associated with increased innovative thinking and problem-solving behaviors in the workplace. Similarly, Arifin et al. (2024) found that employees with high creative self-efficacy are more likely to generate novel ideas, improve existing solutions, and persist in implementing their ideas. These findings collectively suggest that self-efficacy is a critical antecedent of innovative behavior, although its effects may depend on additional cognitive processes.

Despite growing evidence linking self-efficacy, critical thinking, and innovation, existing studies have often examined these constructs independently or within non-academic contexts. Moreover, empirical research that explicitly investigates critical thinking as a mediating mechanism between self-efficacy and innovative behavior among university lecturers—particularly within the Indonesian higher education context shaped by digital transformation and MBKM policies—remains limited. Consequently, the psychological processes through which lecturers' confidence translates into innovative academic behavior are still insufficiently understood.

Based on the theoretical arguments and empirical findings discussed above, this study proposes the following hypothesis:

H1: Self-efficacy positively affects innovative behavior.

Critical thinking involves the objective evaluation of information and decision-making based on rational reasoning, which lies at the core of innovation. Sacristán-Díaz et al. (2018) suggested that critical thinking can function as an intervening variable in the relationship between self-efficacy and innovative thinking. Lecturers with high self-efficacy who also possess strong critical thinking skills are more likely to translate confidence into innovation. Accordingly, critical thinking is expected to explain variation in the relationship between self-efficacy and innovative behavior.

Prior studies have shown that cognitive and emotional factors often mediate the relationship between self-efficacy and innovation. Sancoko et al. (2019), although focusing on emotional intelligence, demonstrated that psychological factors mediate the influence of self-efficacy on innovative thinking. Similarly, Li et al. (2023) found that individuals with higher self-efficacy tend to exhibit stronger critical thinking skills, particularly when exposed to educational interventions emphasizing analytical reasoning. These findings imply that educational initiatives targeting lecturers may simultaneously enhance self-efficacy, critical thinking, and innovation.

Lecturers with well-developed critical thinking skills tend to systematically analyze new ideas and identify optimal solutions. As a mediating mechanism, critical thinking enables individuals to convert confidence into deliberate, creative action. Shamdas (2023) supported this view by demonstrating that individuals with strong self-efficacy engage more deeply in critical reasoning, thereby increasing their likelihood of experimenting with innovative solutions in professional contexts.

Accordingly, the following hypotheses are proposed:

H2: Self-efficacy is positively related to critical thinking.

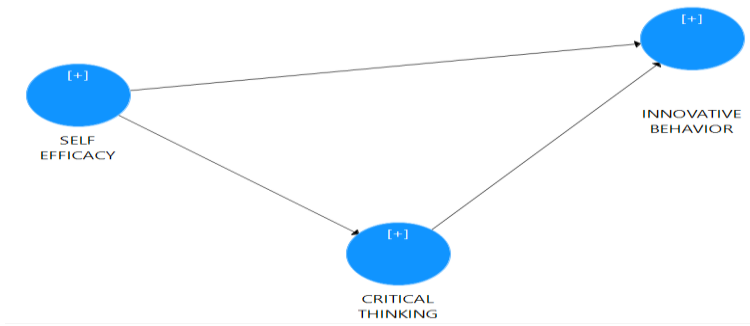
H3: Critical thinking is positively related to innovative behavior.

H4: Critical thinking mediates the relationship between self-efficacy and innovative behavior.

Figure 1 presents the proposed theoretical model of the study.

Figure 1

Model Theory



This study offers a unique perspective on the ways in which lecturers' self-confidence influences innovative behavior through the mediating role of critical thinking, situated within the ongoing transformation of Indonesian higher education driven by digitalization and MBKM policies. Furthermore, this conceptual model has not yet been empirically tested within the Indonesian academic context, and therefore the findings are expected to broaden theoretical understanding and generate practical contributions to human resource development in higher education.

Therefore, this study is expected to contribute theoretically to the field of educational psychology by integrating self-efficacy and critical thinking as explanatory mechanisms of innovative behavior among university lecturers. In addition, it can extend existing theories of innovation and social cognition within the context of higher education. By positioning critical thinking as a mediating psychological mechanism, this study enriches understanding of how individual belief systems are translated into innovative work behavior in academic environments. From a practical perspective, the findings provide important implications for academic staff development and human resource management in higher education, particularly in the design of professional development programs that strengthen lecturers' self-confidence and critical thinking skills to support innovation in teaching, research, and community engagement. These insights are especially relevant for institutions responding to digital transformation, implementing MBKM policies, and meeting quality assurance demands, thereby supporting the sustainable development of higher education in Indonesia.

Therefore, this study examines whether critical thinking mediates the relationship between lecturers' self-efficacy and innovative behavior. Structural Equation Modeling–Partial Least Squares (SEM-PLS) is employed to test and analyze the proposed research model.

METHOD

The research location was selected based on theoretical relevance and empirical considerations. Bekasi and Jakarta are metropolitan cities with a wide range of public and private universities and lecturers with diverse academic backgrounds and professional experiences. This diversity provides an appropriate empirical context for examining the relationships among self-efficacy, critical thinking skills, and innovative behavior among lecturers.

From a theoretical perspective, lecturers in metropolitan academic environments are required to continuously adapt to rapid changes in the higher education system, including curriculum reform, digital transformation, increasing research productivity demands, and innovation-driven teaching practices. These conditions render Bekasi and Jakarta highly relevant research settings for investigating the psychological and cognitive factors that influence innovative behavior. In addition, lecturers in these regions are exposed to a competitive academic climate that demands high levels of self-confidence,

analytical reasoning, and innovation, all of which align with the conceptual framework of this study.

Population and Samples

The approach adopted in this study is quantitative, descriptive, and inferential. The sample comprised 200 lecturers from various universities in Bekasi and Jakarta, selected using purposive sampling. The respondents were active lecturers employed at higher education institutions in the selected regions.

Research Instrument

The researchers employed a five-point Likert scale as the measurement instrument, ranging from 1 (strongly disagree) to 5 (strongly agree). The study variables were measured using high-reliability instruments, with reliability coefficients exceeding 0.90.

Self-efficacy was measured using the Self-Efficacy Questionnaire, adapted from the General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995), which consists of 10 items assessing individuals' confidence in their ability to achieve specific goals. Critical thinking was assessed using the Critical Thinking Ability Questionnaire, adapted from Scheffer and Rubenfeld's (2000) Consensus Dimensions of Critical Thinking, which measures the ability to analyze, evaluate, and synthesize information and consists of 17 items. Innovative behavior was measured using a modified version of the nine-item Innovative Work Behavior Scale developed by Janssen (2000), which assesses the extent to which employees engage in innovative behavior in the workplace.

This study employed purposive sampling to select respondents whose characteristics were directly aligned with the research objectives. This approach was appropriate because the study examined psychological and cognitive constructs within the specific context of higher education. Therefore, only permanent lecturers were included, as their sustained involvement in teaching, research, and community service allows for more stable and observable patterns of innovative behavior compared with non-permanent or adjunct staff. In addition, permanent lecturers are subject to institutional performance standards and evaluation systems, making them a relevant population for examining innovation-related behaviors.

Demographic characteristics such as gender, educational level, and age were included to provide a comprehensive respondent profile and to account for potential variations in psychological and behavioral tendencies. This purposive sampling strategy enhanced the internal validity of the study by ensuring that all participants possessed sufficient professional experience and institutional engagement to meaningfully respond to the research instruments.

Data Collection

Data were collected over a four-month period, from August to December 2024, to ensure that respondents held active lecturer status during the study. This timeframe was chosen to ensure that the questionnaire items were relevant to respondents' current professional conditions. The data collection method employed in this study was a self-

administered questionnaire designed to measure lecturers' levels of self-efficacy, critical thinking, and innovative behavior.

The collected data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) to examine the relationships among self-efficacy, critical thinking, and innovative behavior. SEM-PLS was selected because of its capacity to analyze complex models with multiple constructs and relationships, particularly when data do not fully meet normal distribution assumptions (Hair Jr., Babin, et al., 2017). This analytical approach enabled the researchers to test the mediating role of critical thinking in the relationship between self-efficacy and innovative behavior while accounting for the simultaneous effects among variables.

Data Analysis

SEM-PLS was employed because it enables the estimation of both measurement and structural models, allowing for the examination of complex relationships among latent variables. This method is also flexible with respect to sample size and data distribution (Hair et al., 2019). Data analysis was conducted using SmartPLS software version 3.2.7, which was utilized as the primary model estimation tool (Holland, 2001).

The analysis was conducted in two phases. Phase one involved assessing the measurement model, during which the reliability and validity of the indicators were evaluated. Specifically, the researchers examined internal consistency reliability and construct validity to ensure that the questionnaire items consistently and accurately represented the latent constructs. Phase two involved testing the structural model, in which the strength and significance of the relationships among the constructs were assessed. In this phase, R^2 values were used to determine the explanatory power of the model, f^2 values to assess effect sizes, Q^2 values to evaluate predictive relevance, and path coefficients to test the significance of hypothesized relationships.

In addition, the researchers employed Importance–Performance Map Analysis (IPMA) as a complementary analytical technique. IPMA enables the identification of constructs that exert the greatest influence on the target variables while simultaneously evaluating their performance levels. Through IPMA, the researchers were able to identify priority areas for improvement that warrant focused attention.

Furthermore, Multi-Group Analysis (MGA) was conducted to examine potential differences in the structural relationships across demographic groups, such as gender, educational level, and professional experience (Henseler et al., 2016). This technique is essential for determining whether the proposed model operates consistently across different respondent groups. Overall, this analytical strategy ensured that the findings were statistically robust and practically meaningful, providing insights into the psychological mechanisms underlying innovative behavior among lecturers.

RESULTS

Measurement model

The measurement model was first evaluated to ensure that each construct was accurately represented by its respective indicators. Several items were removed due to insufficient factor loadings, after which all remaining indicators demonstrated strong associations with their respective constructs. This indicates that the retained items adequately capture the psychological dimensions under investigation, thereby ensuring conceptual clarity and construct purity (Hair et al., 2019).

Construct reliability was evaluated using composite reliability and Dijkstra–Henseler's rho, with the results demonstrating strong internal consistency across all constructs (Nunnally & Bernstein, 1994; Hair et al., 2019). This finding indicates that the measurement items consistently reflect stable psychological attributes, suggesting that respondents' beliefs, reasoning processes, and behavioral tendencies were reliably captured rather than influenced by random measurement error. The detailed reliability results are presented in Table 1.

Convergent validity was subsequently confirmed, as each construct accounted for a substantial proportion of variance in its indicators, as reflected by acceptable Average Variance Extracted (AVE) values (Fornell & Larcker, 1981). From a psychological perspective, this result suggests that the indicators within each construct converge to represent coherent and integrated mental processes, thereby reinforcing the conceptual integrity of self-efficacy, critical thinking, and innovative behavior. The significance of all retained indicators was further supported by bootstrap resampling procedures, which indicated that each item contributed meaningfully to its respective construct (Hair et al., 2017).

Discriminant validity was assessed using the heterotrait–monotrait ratio (HTMT), and the results confirmed that all constructs were empirically distinct (Henseler et al., 2015; Hair et al., 2019) (see Table 2). Additional support from cross-loadings and the Fornell–Larcker criterion indicated adequate construct separation and the absence of multicollinearity. From a psychological standpoint, these findings indicate that motivational beliefs, cognitive processes, and innovative behavior represent distinct yet theoretically related constructs, thereby providing a robust foundation for subsequent structural model analysis.

Structural Model

Collinearity diagnostics were first conducted to ensure unbiased estimation of the structural relationships, and the results indicated that multicollinearity was not a concern, as all Variance Inflation Factor (VIF) values were within acceptable thresholds (Hair et al., 2019) (see Table 3). This finding suggests that each predictor construct contributes unique explanatory value, allowing the psychological effects of motivational beliefs and cognitive processes to be interpreted independently.

The structural model was subsequently evaluated using a bootstrap resampling procedure to assess the significance of the hypothesized path relationships (Chin et al., 2016). Model quality indicators demonstrated that the endogenous constructs were explained to a moderate-to-high extent by their respective predictors (Hair et al., 2019). From a psychological perspective, this result indicates that critical thinking and innovative behavior are meaningfully shaped by antecedent motivational and cognitive factors, thereby supporting the theoretical assumption that individual beliefs and reasoning processes play a substantial role in driving innovative actions.

Effect size analysis using f^2 values further revealed that the structural relationships exhibited moderate to strong practical significance, indicating that the predictor constructs substantively contribute to explaining psychological and behavioral outcomes, rather than reflecting trivial statistical associations (Hair et al., 2019).

The findings confirmed that critical thinking exerts a positive and significant influence on innovative behavior. Psychologically, individuals who engage in analytical reflection, consider multiple perspectives, and systematically evaluate problems are better positioned to translate ideas into innovative practices. Thus, critical thinking functions as a central cognitive mechanism underlying innovative behavior.

Self-efficacy also demonstrated a strong positive effect on critical thinking, suggesting that confidence in one's capabilities facilitates deeper cognitive engagement. Individuals with higher self-efficacy are more likely to persist in demanding reasoning tasks, actively process information, and engage in complex problem-solving, thereby strengthening their critical thinking capacity.

Moreover, self-efficacy was found to directly and positively predict innovative behavior. This result indicates that efficacy beliefs independently promote proactive, exploratory, and risk-tolerant behaviors that support innovation, even in the absence of explicit cognitive mediation

Mediation analysis further revealed that critical thinking partially transmits the effect of self-efficacy on innovative behavior, indicating the presence of two complementary psychological pathways: a motivational pathway driven by efficacy beliefs and a cognitive pathway operating through critical thinking. This dual-process explanation is consistent with social cognitive theory, which emphasizes the interaction between belief systems and cognitive self-regulation in shaping behavior (Hair et al., 2019).

Collectively, these findings suggest that interventions aimed at fostering innovative behavior should simultaneously target self-efficacy enhancement and the development of critical thinking skills, as innovation emerges from the combined influence of motivational and cognitive mechanisms.

Table 1
Measurement Model Results

Variabel	Benda	Loading	Cronbach Alfa	Dijkstra-Henseler's Rho	CR	AVE
Critical thinking	CT1	0,770	0,930	0.933	0.941	0.614
	CT11	0,778				
	CT12	0,738				
	CT13	0,782				
	CT17	0,756				
	CT2	0,819				
	CT3	0,857				
	CT4	0,806				
	CT5	0,772				
Innovative Behavior	IB1	0,736	0,934	0.939	0.945	0.685
	1B3	0,814				
	1B4	0,849				
	1B5	0,818				
	IB6	0,801				
	IB7	0,815				
Self-Efficacy	SE1	0,866	0,892	0.893	0.918	0.650
	SE2	0,788				
	SE3	0,806				
	SE4	0,860				
	SE5	0,866				
	SE6	0,839				
	SE7	0,751				
	SE8	0,835				

Source: SEM-PLS Data Processing Results

Table 1 presents the results of the measurement model evaluation, including factor loadings, reliability coefficients, and convergent validity indicators for each construct. All retained indicators demonstrate satisfactory loading values exceeding the recommended threshold, indicating that each item adequately represents its respective latent construct. Furthermore, Cronbach's alpha, composite reliability, and Dijkstra–Henseler's rho values for self-efficacy, critical thinking, and innovative behavior exceed the minimum acceptable criteria, confirming strong internal consistency and construct reliability. The Average Variance Extracted (AVE) values also surpass the recommended cut-off, indicating adequate convergent validity. Collectively, these results confirm that the measurement model is psychometrically sound and suitable for subsequent structural model analysis.

Table 2
Discriminatory Validity

	Critical Thinking	Self-Efficacy	Innovative behavior
Kriteria Fornell-Larcker	0.784		
	0.756	0.828	
	0.826	0.731	0.806
Rasio Heterotrait-Monotrait (HTMT)	0,789		
	0,891	0,781	

Source: SEM-PLS Data Processing Results

Table 2 reports the results of discriminant validity assessment using both the Fornell–Larcker criterion and the heterotrait–monotrait ratio (HTMT). The square roots of the AVE values for each construct exceed their corresponding inter-construct correlations, satisfying the Fornell–Larcker criterion and indicating sufficient construct separation. In addition, all HTMT values fall below the recommended threshold, further confirming that self-efficacy, critical thinking, and innovative behavior are empirically distinct constructs. These findings demonstrate that each construct captures a unique psychological dimension, supporting the conceptual clarity of the proposed research model and indicating the absence of multicollinearity concerns.

Table 3
Structural Model Evaluation

Hubungan	Variance explained. (R2)	R2 customized	Predictive relevance (Q2)	Effect Size (f2)	BRIGHT
Critical Thinking_ behavior -innovative >	0.571	0.569	0.372	0.599	2.330
Self-Efficacy - > Critical Thinking				1.330	1.000
Self-efficacy -> Innovative behavior	0.709	0.706	0.423	0.091	2.330

Source: SEM-PLS Data Processing Results

Table 3 summarizes the evaluation of the structural model, including explained variance (R^2), predictive relevance (Q^2), and effect size (f^2) values. The R^2 values indicate that the model explains a substantial proportion of variance in both critical thinking and innovative behavior, reflecting strong explanatory power. Positive Q^2 values further confirm the model's predictive relevance, suggesting that the proposed relationships demonstrate adequate out-of-sample predictive capability. Moreover, the f^2 values indicate that self-efficacy and critical thinking contribute meaningfully to the explained

variance of the endogenous constructs, rather than reflecting trivial statistical effects. Overall, these indicators confirm that the structural model is robust, predictive, and theoretically meaningful.

Table 4

Hypothesis Testing Results (Direct Effect)

	Original Sample (O)	Statistics T (|O/STDEV|)	P value	Result
Critical Thinking_ behavior - innovative >	0,638	9,730	0,000	Yes
Self-efficacy - critical > Thinking_	0,756	15,963	0,000	Yes
Self-efficacy -> Innovative behavior	0,249	3,579	0,000	Yes

Source: SEM-PLS Data Processing Results

Table 4 presents the results of hypothesis testing for the direct relationships among the study constructs. All proposed direct paths exhibit statistically significant effects, as indicated by high t-values and p-values below the 0.05 threshold, providing strong empirical support for the hypothesized relationships. Specifically, self-efficacy significantly predicts critical thinking and innovative behavior, while critical thinking also demonstrates a strong positive influence on innovative behavior. These findings indicate that both motivational beliefs and cognitive capabilities independently contribute to lecturers' innovative behavior, which is consistent with theoretical expectations derived from social cognitive theory.

Table 5

Hypothesis Testing Results (Indirect Effect)

	Original Sample (O)	Statistics T	P value	Result
Self-Efficacy -critical > Thinking_ -> Innovative behavior	0,482	8,478	0,000	Yes

Table 5 reports the results of the mediation analysis examining the indirect effect of self-efficacy on innovative behavior through critical thinking. The results show that the indirect path is statistically significant, indicating that critical thinking partially mediates the relationship between self-efficacy and innovative behavior. This finding suggests that lecturers' confidence in their abilities enhances innovative behavior not only directly but also indirectly by fostering deeper cognitive processing and analytical reasoning. Accordingly, critical thinking functions as a key psychological mechanism that translates self-efficacy into innovative action, thereby reinforcing the proposed mediation model.

Figure 2
Result Model

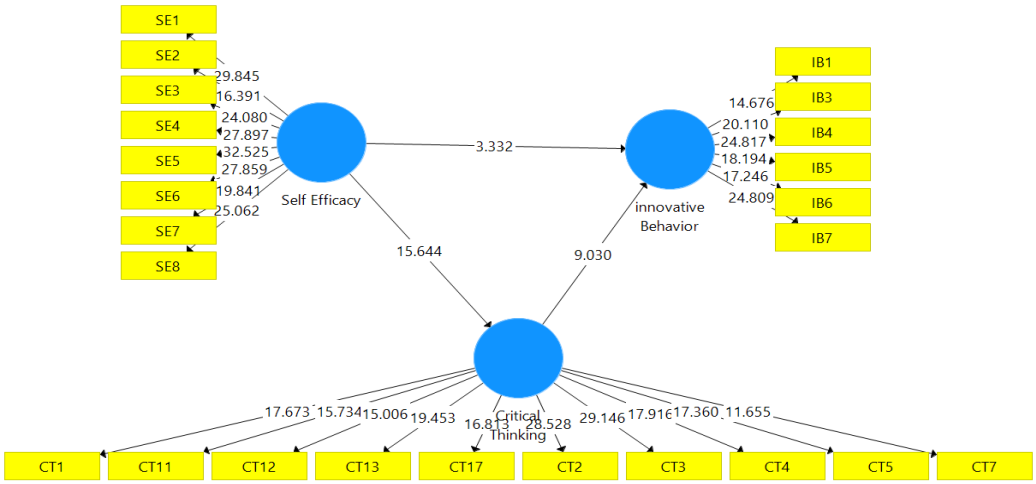
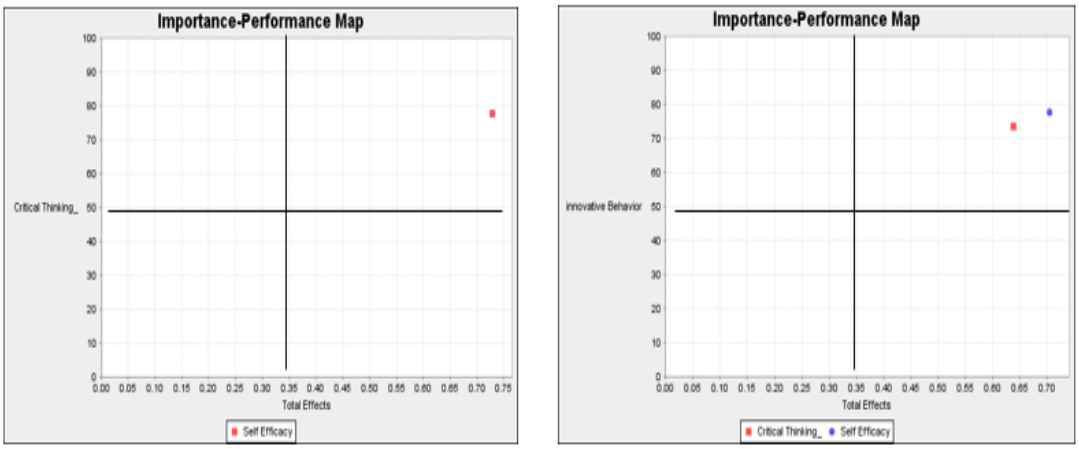


Figure 2 depicts the results of the structural model estimation using SEM-PLS, including standardized path coefficients and explained variance values. All hypothesized paths are statistically significant, confirming the robustness of the proposed research model. The magnitude of the path coefficients indicates that self-efficacy exerts a strong influence on critical thinking, which in turn significantly predicts innovative behavior. In addition, self-efficacy directly influences innovative behavior, thereby confirming partial mediation. Overall, this model visualization provides clear empirical support for the theoretical assumptions underlying the study.

Figures 3
IPMA Results



Figures 3 presents the results of the Importance–Performance Map Analysis (IPMA), illustrating the relative importance and performance levels of self-efficacy and critical thinking in predicting innovative behavior. The findings indicate that self-efficacy demonstrates both high importance and strong performance, suggesting that it functions as a key driver of lecturers' innovative behavior. This result implies that lecturers'

confidence in their abilities plays a central role in fostering innovation within academic settings.

Critical thinking also exhibits substantial importance in influencing innovative behavior; however, its performance level is comparatively lower than that of self-efficacy. This discrepancy indicates that critical thinking represents a strategic area for further development, as improvements in this construct are likely to yield meaningful gains in innovative behavior. From a practical perspective, these IPMA results provide valuable guidance for higher education institutions by identifying priority areas for targeted intervention, particularly in the design of professional development programs aimed at enhancing lecturers' critical thinking skills alongside self-efficacy.

Table 6

PLS-MGA Results

	Path-diff coefficient (Male - Female)	Original p-Value 1-tailed (Male vs Female)	New p-Value (Male vs Female)
Critical Thinking_ behavior -innovative >	0,102	0,232	0,465
Self-efficacy - critical > Thinking_	0,205	0,010	0,019
Self-efficacy -> Innovative behavior	-0,068	0,684	0,633

Source: Data Analysis SEM_PLS

Table 6 summarizes the results of the Partial Least Squares–Multi-Group Analysis (PLS-MGA), which examines potential differences in the structural relationships across gender groups. The findings indicate no statistically significant gender differences in the relationships between self-efficacy and innovative behavior or between critical thinking and innovative behavior, suggesting that the mechanisms driving innovative behavior operate similarly for male and female lecturers.

However, a statistically significant difference is observed in the relationship between self-efficacy and critical thinking, indicating that the influence of self-efficacy on cognitive processing varies across gender groups. This finding suggests that, although male and female lecturers exhibit comparable levels of innovative behavior, the psychological pathways through which confidence enhances critical thinking may differ. From a practical standpoint, these results highlight the importance of considering gender-sensitive approaches in professional development initiatives, particularly when designing interventions aimed at strengthening lecturers' self-efficacy and critical thinking skills.

DISCUSSION

This study empirically demonstrates that critical thinking partially mediates the relationship between self-efficacy and innovative behavior among university lecturers in Bekasi and Jakarta. Using SEM-PLS analysis, the findings confirm that self-efficacy not only directly influences innovative behavior but also exerts an indirect effect through critical

thinking. This result contributes theoretically by clarifying that self-efficacy translates into innovation most effectively when supported by lecturers' higher-order cognitive capacities.

These findings are consistent with those of Sacristán et al. (2018), who demonstrated that critical thinking significantly mediates the relationship between confidence and innovative behavior, suggesting that innovative action requires not only belief in one's capability but also the cognitive ability to evaluate and implement new ideas effectively. Similarly, Kankam et al. (2024) reported that self-efficacy and critical thinking jointly enhance lecturers' innovative behavior. Collectively, these findings reinforce the view that innovation in academic settings emerges from the interaction between motivational beliefs and higher-order cognitive processes.

From a theoretical standpoint, the results extend Bandura's (1994) self-efficacy theory by highlighting critical thinking as a key cognitive mechanism through which efficacy beliefs are translated into innovative behavior. While Bandura emphasized the role of belief in shaping action, the present study demonstrates that this effect is strengthened when individuals engage in systematic reasoning and evaluative thinking, thereby refining theoretical understanding of how self-efficacy operates in complex academic contexts. This interpretation aligns with the findings of Liang and Fung (2021), who showed that educational environments fostering self-efficacy simultaneously promote critical thinking and, in turn, innovative behavior.

Moreover, this study advances theories of gendered cognition by revealing that critical thinking plays a differential mediating role in the self-efficacy–innovation relationship across gender groups. Although innovation-related behaviors were found to be generally consistent between male and female lecturers, the influence of self-efficacy on critical thinking varied significantly by gender. This result supports Vachova et al. (2023), who emphasized that critical thinking enhances innovative behavior across genders, while also suggesting that the motivational mechanisms activating cognitive engagement may differ, thereby underscoring the need for gender-sensitive and inclusive faculty development strategies (Azanza et al., 2024).

An important methodological aspect of this study concerns the measurement model refinement, in which several indicators associated with innovative behavior, self-efficacy, and critical thinking did not meet the minimum factor loading threshold of 0.708 (Hair Jr. et al., 2019). This outcome is consistent with Bozkurt and Sharma (2020), who argued that cultural and contextual factors influence how lecturers interpret survey items, particularly within non-Western educational settings. Items lacking contextual relevance may fail to capture valid psychological constructs and should be excluded to preserve measurement integrity (Rahman & Alam, 2022).

Previous research has similarly emphasized that measurement instruments developed in Western contexts often require cultural adaptation to maintain validity in different sociocultural environments (Cheung & Rensvold, 2009; Van de Vijver & Leung, 2021). Supporting this view, Darmayanti et al. (2021) confirmed the reliability of an Indonesian

version of an academic self-efficacy scale, while Ifdil et al. (2019) demonstrated the validity of the Indonesian adaptation of the College Academic Self-Efficacy Scale (CASES). These findings collectively underscore the importance of culturally sensitive measurement in psychological research, particularly when examining innovation-related constructs.

By refining the measurement model and retaining only valid indicators, this study ensured that the remaining items more accurately represented the intended conceptual domains, thereby enhancing internal consistency and explanatory power. This approach is supported by Santos-Gago et al. (2019), who emphasized that improving construct validity strengthens the robustness of empirical models. Abbas and Sağsan (2019) similarly cautioned that poorly functioning self-efficacy indicators may bias interpretations of innovation outcomes, highlighting the necessity of rigorous measurement validation. Furthermore, Nielsen et al. (2017) stressed that insufficient construct validity can lead to inaccurate theoretical inferences, particularly when linking self-efficacy to innovative behavior.

The findings further indicate that lecturers with high self-efficacy are more inclined to adopt novel teaching practices and pedagogical innovations (Alshuhumi et al., 2025; Kundu & Roy, 2023). However, confidence alone does not guarantee innovation, as critical thinking enables lecturers to analyze complex problems, evaluate alternative solutions, and implement the most appropriate strategies, thereby transforming intention into actionable innovation (Kola & Molise, 2023). This interpretation aligns with Rahman et al. (2022), who demonstrated that innovative teaching practices and critical thinking mutually reinforce one another, suggesting a dynamic interplay between cognition and innovation.

Consistent with Liang and Fung (2021), this study confirms that supportive educational environments are essential for simultaneously cultivating self-efficacy, critical thinking, and innovative behavior. Institutions that fail to foster these psychological and cognitive capacities among academic staff risk stagnation in innovative output, particularly in rapidly transforming higher education contexts.

Theoretically, this study extends the self-efficacy framework within educational psychology by positioning critical thinking as a central mediating cognitive skill. The findings highlight that innovative behavior in academic settings is shaped not only by belief in one's capabilities but also by the capacity to evaluate, regulate, and apply innovative practices through higher-order thinking. This perspective reinforces and elaborates Bandura's social cognitive theory by identifying critical reasoning as a key cognitive pathway through which self-efficacy translates into innovative action (Bandura, 1994).

From an educational psychology perspective, the integration of motivational beliefs and cognitive skills underscores the importance of balanced professional development initiatives. Moreover, the observed gender differences in the relationship between self-efficacy and critical thinking offer a meaningful contribution to theories of gendered cognition and professional learning, suggesting that educational environments may differentially shape confidence–cognition dynamics across genders (Vachova et al., 2023). Overall, the results demonstrate that innovation in higher education is underpinned by the dynamic interaction

between belief systems and cognitive capacities, providing a comprehensive explanation of lecturers' innovative behavior.

CONCLUSION

This study concludes that self-efficacy plays a central role in shaping innovative behavior among university lecturers, both directly and indirectly through critical thinking. Lecturers with strong self-efficacy demonstrate greater confidence in adopting and implementing innovative practices in teaching, research, and academic decision-making. The findings further indicate that critical thinking functions as a partial mediator, suggesting that innovative behavior is most effectively realized when motivational beliefs are supported by strong analytical and evaluative cognitive skills. These results confirm that innovation in higher education is driven not solely by confidence, but also by the capacity to critically assess and apply new ideas.

The results also reveal gender differences in the relationship between self-efficacy and critical thinking, although no significant gender differences were observed in innovative behavior itself. This suggests that while male and female lecturers demonstrate comparable levels of innovation, the psychological mechanisms through which confidence enhances cognitive processing may differ. In addition, this study identifies measurement limitations related to critical thinking, as several indicators did not meet established validity thresholds, underscoring the need for further refinement of contextually appropriate measurement instruments within the Indonesian higher education setting.

From a practical perspective, these findings highlight the importance of faculty development programs that simultaneously strengthen lecturers' self-efficacy and critical thinking skills. Higher education institutions are therefore encouraged to design professional development initiatives that promote confidence-building, analytical reasoning, and reflective practice to support sustainable innovation in teaching, research, and community engagement. Future research is recommended to refine measurement constructs, incorporate organizational and contextual variables, and expand the scope of investigation across institutions and regions, thereby enhancing the generalizability and robustness of the findings.

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