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Exploring the Role of Inquiry-Based Learning, Technology Integration, and Peer Mentoring in Developing Professional Competence of Educators in Indonesia

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ABSTRACT

This study assesses the combined effects of Inquiry-Based Learning, Technology Integration, and Peer Mentoring on educators' Professional Competence in Indonesia. In this quantitative study, a sample size of 86 respondents was drawn through simple random sampling. The research instrument was a structured questionnaire with a five-point Likert scale used for measuring perceptions about the variables. Data were analyzed using SPSS version 26, along with multiple linear regression. The results showed that all three independent variables significantly and positively predict Professional Competence, jointly accounting for 68.3% of the variance. Among these, inquiry-based learning had the strongest individual effect, followed by peer mentoring and technology integration. These findings support the integrated approach in professional development programs. This study offers valuable suggestions for policymakers and educational stakeholders to further improve the professional competencies of teachers, leading to a better quality of education in Indonesia.

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1. INTRODUCTION

The professional competence of educators is one of the most critical determinants of education quality in any country. In Indonesia, where educational reform is always on the agenda, much attention has recently been given to enhancing educators' competencies in the face of challenges posed by diversified classroom dynamics, rapidly developing technology, and raised standards of global education [1], [2]. Competency within a professional framework means being capable of appropriately planning, implementing, and evaluating learning processes, hence promoting the integral development of learners [3], [4]. Though significant, these roles have still been quite demanding for most Indonesian educators due to the traditional approaches to teaching, scarcity of modern

equipment, and inadequate collaboration [1], [3], [5].

The integration of innovative pedagogies and collaborative frameworks is one promising direction toward such challenges. Inquiry-based learning, technology integration, and peer mentoring have become increasingly important strategies for enhancing educator competencies [6], [7]. Inquiry-based learning underlines student-centered ways in which educators are expected to design and facilitate learning activities that will help students develop their critical thinking and problem-solving skills [8], [9]. At the same time, technology integration provides transformative tools that reinforce teaching effectiveness, engagement, and accessibility [8], [10]. It has helped in fostering knowledge sharing, support networks, and problem-solving for educators; hence, peer mentoring acts as a mechanism for professional growth.

Although previous studies have separately highlighted the potential of these approaches, comprehensive studies exploring their combined effects on educators' professional competence are still lacking such as [11]–[14], especially within the Indonesian context. Further, empirical analysis of these relationships will provide a better insight into how these strategies can be effectively implemented within the professional development programs.

The quality of education is the backbone of development at a national level, and educators bear prime importance in the development of the future of society. The ever-increasing classroom environments, the rapid pace of technological advancement, and the urgent need for alignment with global educational standards have brought about a situation in Indonesia where there is an emergent need for improvement in the professional competence of educators. Traditional pedagogical approaches often fail to meet the dynamic needs of modern learners, leading to critical thinking gaps, problem-solving, and technological fluency among students [15]–[18]. Indonesia will lag in its endeavor to develop a globally competitive education system if this is not addressed immediately through innovative pedagogical strategies [13], [15]. The need to equip educators with advanced skills, modern tools, and collaborative support mechanisms is greater now than ever before, as the country's educational landscape continues to evolve to meet the challenges of the 21st century.

Despite the growing emphasis on educational reform in Indonesia, many educators face significant barriers to achieving professional competence. Traditional teaching approaches dominate classroom practices, limiting opportunities for student engagement and critical thinking. Furthermore, these challenges exacerbate the lack of widespread access to technology and insufficient training on its integration into teaching methodologies. Collaborative opportunities, such as peer mentoring, are not yet widely used, thus leaving educators without sufficient support networks to share best practices and solve problems collaboratively. While inquiry-based learning, technology integration, and peer mentoring have been identified as effective in developing educator competence, their combined impact has not been explored in depth in the Indonesian context. This lack of understanding prohibits the effective development of professional development programs that address the specific needs of Indonesian educators. The present study addresses these issues by trying to see how these new approaches can be combined to develop the professional competence of educators in Indonesia. This study tries to fill this gap by exploring the roles of inquiry-based learning, technology integration, and peer mentoring in developing the professional competence of educators in Indonesia.

2. LITERATURE REVIEW

2.1 Inquiry-Based Learning

Inquiry-based learning is a pedagogical approach in which learners are involved through

questioning, investigation, and discovery; this requires educators to move away from lecture-driven teaching to the dynamic role of facilitator of learning [19]. It will develop in students the ability to think critically, solve problems, and learn independently while developing in educators the competencies of curriculum design, classroom management, and adaptability [20]. Research points out that IBL impacts positively teachers' professional development by enhancing reflective practices and subject content knowledge [21], [22]. For example, a study by [23] indicated that the instructors involved in teaching with IBL had better teaching methods and more confidence in dealing with different classroom situations,

H1: Inquiry-based learning contributes positively and significantly to the professional competence of educators.

2.2 *Technology Integration*

The integration of technology into education utilizes digital means and platforms for teaching enhancement, engaging learning, and accessibility, hence educators are to be prepared in acquiring technical capacity and pedagogical knowledge to be able to provide meaningful learning experiences to their learners [24]. This process is closely related to professional competence since it extends instructional capabilities and aligns teaching practices with the demands of modern learners [25]. Research has pointed out the transformative effect of technology on educator competence, with the TPACK framework by [26]illustrating how technology integration enhances content delivery. Moreover, a meta-analysis [27]–[29] showed that educators utilizing technology reported better student outcomes and even more confidence in their professional capabilities; this further supported the crucial role played by technology in enhancing professional competence.

H2: Technology integration positively and significantly impacts the professional competence of educators.

2.3 *Peer Mentoring*

Peer mentoring is the collaborative relationship among educators in knowledge sharing, support, and problem-solving, leading to a culture of continuous learning, mutual accountability, and professional growth [30]. With peer mentoring, educators improve their communication skills, emotional intelligence, and innovative teaching practices. According to research by [31], [32], mentoring programs significantly enhance teacher retention and professional satisfaction, thus drawing a strong link between peer mentoring and competence. Likewise, [33], [34] established that mentoring makes educators better at adapting to new challenges, managing classrooms, and maintaining high standards of teaching. The above also indicates the importance of peer mentoring in professional development.

H3: Peer mentoring significantly and positively influences the professional competence of educators.

2.4 *Combined Effects on Professional Competence*

While the individual impacts of Inquiry-Based Learning (IBL), technology integration, and peer mentoring on professional competence are well-documented, their combined influence has received limited attention [35], [36]. These strategies are inherently complementary, with IBL fostering critical thinking, technology integration enhancing the use of teaching tools, and peer mentoring providing collaborative support, collectively creating a holistic framework for improving professional competence [37]–[39]. This study hypothesizes that the simultaneous implementation of these strategies will produce a synergistic effect, leading to greater improvements in professional competence than any single approach alone.

H4: Inquiry-based learning, technology integration, and peer mentoring collectively have a positive and significant effect on the professional competence of educators.

3. METHODS

3.1 Research Type

This research study utilized a quantitative research design in the form of a cross-sectional survey approach. Quantitative research was thus considered to systematically explore how independent variables (IBL, Technology Integration, and Peer Mentoring) related to the dependent variable of Professional Competence. The cross-sectional approach allowed for data to be gathered at one point in time regarding the status of these variables.

3.2 Population and Sampling

The population in this study consisted of educators from primary and secondary schools in Indonesia, selected based on their critical role in the determination of educational quality and the adjustment to pedagogical and technological innovations. Participants were selected by using simple random sampling, where every educator had an equal chance of being included, thus reducing the threat of sampling bias and enhancing the generalizability of the findings. The final sample size was 86 educators, determined based on participant availability and the requirements for statistical analysis, providing sufficient reliability for the scope of this study.

3.3 Data Collection Techniques

Data were collected through a structured questionnaire both online and in person, utilizing a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) to enable a quantitative assessment of participants' perceptions and practices. The items of the questionnaire were adapted from the validated scales in prior research to ensure reliability and validity. This includes Inquiry-Based Learning adapted from Hmelo-Silver et al. (2007) about critical thinking and problem-solving; Technology Integration was based on the TPACK framework developed by Mishra and Koehler, 2006; Peer Mentoring derived from the scales developed by Ingersoll and Strong, 2011; Professional Competence adapted from Shulman's teaching competence framework, 1987.

3.4 Data Analysis Techniques

Data analysis was done through SPSS version 26 in a structured approach to get robust results [40]. First, the demographic data and distribution of responses for each variable were summarized using descriptive statistics. Validity and reliability tests were performed, with validity checked through Pearson, while reliability was checked through Cronbach's alpha for internal consistency [41]. Classical assumption tests

were conducted, including normality testing using the Kolmogorov-Smirnov test, heteroscedasticity testing with the Glejser test, and multicollinearity evaluation through Variance Inflation Factor (VIF) and tolerance values [41]. Finally, multiple linear regression analysis was applied to evaluate the individual and combined effects of IBL, Technology Integration, and Peer Mentoring on Professional Competence by using F-tests and the-tests to test the statistical significance of the model and generating a regression equation to explain the relationships between the variables.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

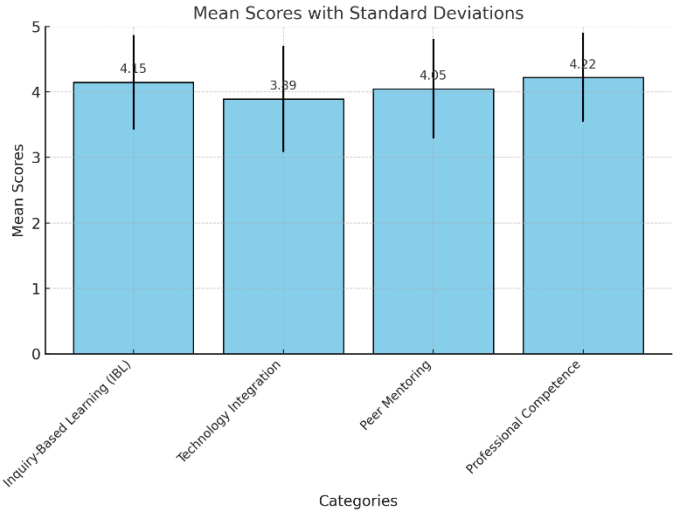

Figure 1. Descriptive Statistics

The mean scores of the study variables were high, indicating that there is generally a high level of agreement among respondents on the use of these strategies in their professional practice. IBL scored a mean of 4.15 with an SD of 0.72, Technology Integration scored a mean of 3.89 with an SD of 0.81, and Peer Mentoring had a mean of 4.05 with an SD of 0.76, while Professional Competence achieved the highest mean score of 4.22 and an SD of 0.68. These findings reflect the positive perception and application of such strategies by educators in their professional practices.

Table 1. Demographic Characteristics of the Sample

Category	N = 86	%
Gender		
Male	39	45.3%
Female	47	54.7%
Age		
Under 30	22	25.6%
30–40	38	44.2%
Over 40	26	30.2%
Teaching Experience		
Less than 5 years	30	34.9%
5–10 years	36	41.9%
More than 10 years	20	23.3%
Educational Background		
Bachelor's Degree	54	62.8%
Master's Degree	32	37.2%
Current Teaching Role		

Primary School	36	41.9%
Secondary School	50	58.1%

Source: Results of Data Analysis (2024)

The demographic profile of the study participants consisted of 86 respondents, with 39 males (45%) and 47 females (55%). In terms of age, 22 respondents (25.6%) were under 30 years, 38 respondents (44.2%) were between 30–40 years, and 26 respondents (30.2%) were over 40 years. Regarding teaching experience, 30 respondents (34.9%) had less than 5 years of experience, 36 respondents (41.9%) had 5–10 years, and 20 respondents (23.3%) had more than 10 years. Educationally, 54 respondents (62.8%) held a bachelor's degree, while 32 respondents (37.2%) held a master's degree. Lastly, 36 respondents (41.9%) were primary school educators, and 50 respondents (58.1%) were secondary school educators.

4.2 Validity and Reliability Analysis

The validity of the questionnaire items was assessed by comparing the Pearson correlation coefficient (r-value) of each item with the critical r-table value (0.213) at a 0.05 significance level, based on 84 degrees of freedom (df=n−2). Items were deemed valid if rhit>rtable (0.213) and p<0.05. Reliability was evaluated using Cronbach's alpha, with values above 0.70 indicating acceptable internal consistency. The results of the validity and reliability tests are summarized in Table 2.

Table 2. Validity Test Results

Variable	Item	r Hitung	Sig	Validity	Cronbach's Alpha
Inquiry-Based Learning	X1.1	0.612	0.000	Valid	0.855
	X1.2	0.689	0.000	Valid	
	X1.3	0.725	0.000	Valid	
Technology Integration	X2.1	0.582	0.000	Valid	0.881
	X2.2	0.645	0.000	Valid	
	X2.3	0.663	0.000	Valid	
Peer Mentoring	X3.1	0.601	0.000	Valid	0.825
	X3.2	0.678	0.000	Valid	
	X3.3	0.695	0.000	Valid	
Professional Competence	Y.1	0.708	0.000	Valid	0.869
	Y.2	0.732	0.000	Valid	
	Y.3	0.752	0.000	Valid	

Source: Results of Data Analysis (2024)

All the items in the questionnaire were valid because all had rhit>rtable with 0.213 and p<0.05. Meanwhile, all the variables were reliable because all of the variables had a Cronbach's alpha value above 0.70, which means the measurement instruments were internally consistent.

4.3 Classical Assumption Tests

Before running multiple linear regression analysis, tests for the classical assumptions were conducted to justify the validity of the regression model. These tests included normality, heteroscedasticity, and multicollinearity.

1. Normality Test

The normality test was performed to determine if the residuals of the regression model were normally distributed using the Kolmogorov-Smirnov (K-S) test. The K-S statistic is 0.091 with a p-value of 0.200, which is greater than 0.05. This means that the residuals are normally distributed, and hence the normality assumption holds for the regression analysis.

2. Heteroscedasticity Test

The heteroscedasticity test was done using the Glejser test, which checks whether the variance of residuals is constant across different levels of independent variables.

Table 3. Results of the Glejser Test

Independent Variable	t-Value	Significance (p)
Inquiry-Based Learning	0.758	0.451
Technology Integration	0.834	0.407
Peer Mentoring	1.012	0.314

Source: Results of Data Analysis (2024)

All the P-values are greater than 0.05, indicating no heteroscedasticity. That is, the variance of residuals is constant across all levels of the independent variables.

3. Multicollinearity Test

The multicollinearity test was performed with the Variance Inflation Factor and tolerance values. If VIF > 10 or tolerance < 0.1, then multicollinearity exists.

Table 4. Results of the Multicollinearity Test

Independent Variable	Tolerance	VIF
Inquiry-Based Learning	0.621	1.610
Technology Integration	0.712	1.405
Peer Mentoring	0.653	1.531

Source: Results of Data Analysis (2024)

The tolerance value of all the variables is greater than 0.1, and the VIF value is less than 10, which shows no multicollinearity between independent variables.

4.4 Multiple Regression Analysis

Multiple regression analysis was done to see the individual and combined effects of IBL, technology integration, and peer mentoring on professional competence. The model explains 68.3% of the variance in Professional Competence (R^2 = 0.683), indicating a strong relationship between the independent variables and the dependent variable.

Table 5. F Test

Source	Sum of Squares	df	Mean Square	F	Sig
Regression	42.316	3	14.105	83.015	0.000
Residual	19.629	82	0.239		
Total	61.945	85			

Source: Results of Data Analysis (2024)

This means that, statistically, there is a regression model, since FFF = 83.015, and p < 0.001. Therefore, the independent variables as a whole explain a significant amount of the variation in Professional Competence.

Table 6. T Test

Variable	Unstandardized Coefficients (B)	Standardized Coefficients (β)	t	Sig
(Constant)	0.672		3.011	0.003
Inquiry-Based Learning	0.428	0.453	6.514	0.000
Technology Integration	0.312	0.323	5.204	0.000
Peer Mentoring	0.365	0.372	5.943	0.000

Source: Results of Data Analysis (2024)

The regression equation derived from the analysis is:

Professional Competence = 0.672+0.428 (IBL) +0.312 (Technology Integration) + 0.365 (Peer Mentoring).

The coefficients indicate the individual contributions of each independent variable to Professional Competence. For Inquiry-Based Learning (IBL), the coefficient B=0.428 signifies that a one-unit increase in IBL leads to a 0.428-unit increase in Professional Competence, with a significant p<0.001, confirming its strong positive effect. For Technology Integration, the coefficient B=0.312 shows that a one-unit increase in this variable results in a 0.312-unit increase in Professional Competence, with p<0.001, indicating a significant contribution. Lastly, Peer Mentoring has a coefficient of B=0.365, suggesting that a one-unit increase in Peer Mentoring improves Professional Competence by 0.365 units, with p<0.001, highlighting its significant positive impact. These results demonstrate the importance of all three variables in enhancing educators' professional competence.

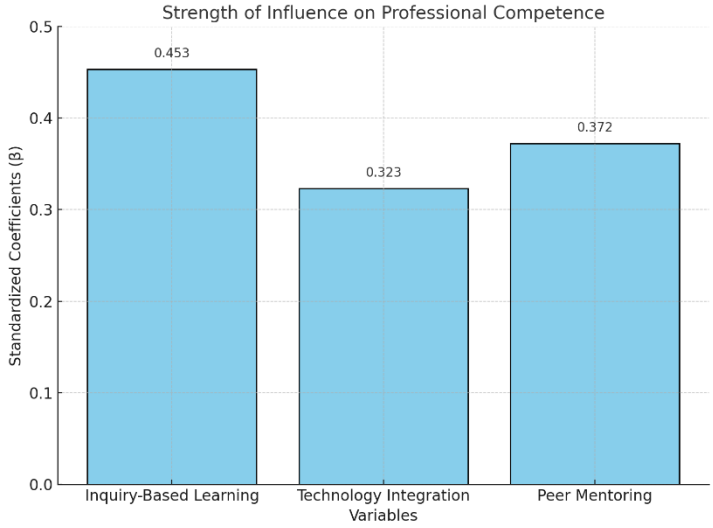

Figure 2. Large and No Effect

Discussion

The results of this study offer several meaningful insights into the relationships among Inquiry-Based Learning, Technology Integration, and Peer Mentoring about the Professional Competence of educators in Indonesia.

1. Impact of Inquiry-Based Learning

Among the factors that contribute to Professional Competence, the most significant influence is Inquiry-Based Learning; this is in agreement with the findings of [42]–[44], who asserted that IBL provides much potential for enhancing critical thinking and problem-solving skills and reflection practices for educators. By encouraging student-centered teaching methods, IBL increases student engagement and helps teachers to be more flexible when dealing with various situations in the classroom. In Indonesia, the method is very important for improving professional practices since traditional approaches dominate. Educators who use inquiry-based methods are more capable of developing innovative lesson plans and managing active learning, which is crucial for meeting modern education challenges.

2. The Impact of Technology Integration

Technology Integration bears significantly on Professional Competence, aligning with the TPACK framework by [26] and [45]–[47], emphasizing the transformative potential of technology in education. With technology integration, educators will be able

to deliver lessons more effectively, increase student engagement in learning, and have more teaching resources. However, the slightly lower beta coefficient compared to Inquiry-Based Learning suggests that the effectiveness of technology integration may depend on exogenous factors such as infrastructure, training, and resource accessibility. In Indonesia, unequal regional access to technology creates challenges that policymakers should address to make sure that equal opportunities for educators to benefit from integrating technology into their professional development are guaranteed.

3. The Impact of Peer Mentoring

Peer Mentoring had a significant positive impact on Professional Competence, as confirmed by [48]–[50], who included mentoring as the most important factors that enhance teacher performance and satisfaction. Peer mentoring provides collaboration, emotional support, and learning from one another, and allows educators to collectively face challenges and better their teaching practices. In Indonesia, if peer mentoring programs were made more formal, their effectiveness could be further increased. Structured mentorship initiatives would allow less experienced teachers to learn from their peers while offering experienced educators opportunities to refine their skills and stay updated on best practices, thereby fostering continuous professional growth.

4. Combined Effects of IBL, Technology Integration, and Peer Mentoring

IBL, Technology Integration, and Peer Mentoring together account for 68.3% of the variance in Professional Competence, showing that integration is imperative. This result points to the fact that an integrated approach that combines innovative teaching methods, digital tools, and collaborative frameworks leads to synergy in enhancing educators' professional skills.

In other words, educators adopting these strategies simultaneously are more likely to achieve better outcomes than relying on a single approach. For example, IBL fosters critical thinking, technology integration provides the tools for effective delivery, and peer mentoring ensures continuous professional growth through collaboration.

5. Practical Implications

The findings emphasize that comprehensive policy development is necessary to support the adoption of IBL, technology integration, and peer mentoring within professional development programs; this is particularly so in underprivileged areas where investment in technology infrastructure and training should be prioritized. Professional development programs should include workshops and training sessions to help educators implement IBL and enhance their digital skills through targeted technology training. In addition, schools and other educational facilities should create formal peer mentoring programs to build up a collaborative learning culture that fosters continuous professional development among educators.

This study adds to the growing evidence on professional competence, as it gives empirical evidence on how IBL, technology integration, and peer mentoring collectively influence professional development. Although individual strategies may have been researched previously, this study emphasizes their combined effect in the Indonesian context.

6. Limitations and Recommendations for Future Research

Notwithstanding these contributions, the study has some limitations. First, the sample size was rather small (n = 86 participants), hence limiting the generalizability of the findings. For this reason, subsequent studies should aim to utilize bigger and more diverse samples, with further longitudinal research needed to study the effects these strategies have on professional competence in the long run. Furthermore, qualitative research could give far-reaching insight into the problems and

experiences of educators while adopting such strategies.

5. CONCLUSION

This study confirms that Inquiry-Based Learning, Technology Integration, and Peer Mentoring have a significant and positive effect on the Professional Competence of educators in Indonesia, with Inquiry-Based Learning emerging as the most influential factor because it helps foster innovative and reflective teaching practices. Technology Integration arms educators with the necessary tools to renew instructional delivery, while Peer Mentoring reinforces collaborative learning and professional development. These strategies together account for 68.3% of the variance in Professional Competence, underlining the added value of an integrated approach. The results have important implications for policymakers and educational institutions, as regards emphasizing the need for training in innovative teaching methods, digital skills, and mentorship. Such investments in technology infrastructure and equal access, while highly important for reducing regional disparities, are complemented by the role of formalized peer mentoring programs in advancing professional growth and encouraging educators to collaborate. Further research is needed with larger, more diverse samples and with longitudinal and qualitative studies that examine the long-term and nuanced effects of these strategies. Results from this study can be used to help Indonesia equip its educators to meet the modern challenges of education, improving learning outcomes throughout the country.

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