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# DIGITAL EMPOWERMENT IN VOCATIONAL EDUCATION: ASSESSING THE IMPACT OF TRAINING PROGRAMS ON TEACHERS' DIGITAL COMPETENCE IN MAJALENGKA

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**ABSTRACT**
The rapid advancement of digital technology requires teachers to possess strong digital competencies to effectively integrate technology into the teaching and learning process. This study aims to analyze the relationship between the effectiveness of a digital training program and the improvement of teachers' digital competence in public vocational high schools (SMK Negeri) across Majalengka, West Java. The research employed a quantitative method with a correlational approach. The population consisted of all teachers at public vocational schools in Majalengka, with a total of 225 respondents selected through random sampling. Data were analyzed using the Chi-Square test and Spearman's rho correlation. The findings revealed a significant and strong relationship between training effectiveness and teachers' digital competence. These results suggest that well-designed and effective digital training programs can enhance teachers' readiness to adapt to digital transformation in the education sector.

**Key words:** *Training effectiveness; Digital competence; Vocational teachers; Educational digital transformation*

## INTRODUCTION

The advancement of information and communication technology (ICT) has brought significant changes to the education sector (Dewi et al., 2023). Technological competence has not only become an added value in professional competition but also serves as a catalyst for innovation and development across various fields. By equipping students with relevant knowledge and skills, the education system can make a substantial contribution to shaping a generation that is ready to face challenges and seize opportunities in the digital era (Wati & Nurhasannah, 2024). Digital transformation demands that teachers possess strong digital competencies to effectively integrate technology into the learning process. Digital competence encompasses more than basic technological skills. In the context of digitalization, teachers are expected to demonstrate five core competencies: digital literacy (access, evaluate, use, participate, and understand digital ethics and safety for learning purposes), digital communication through platforms such as email, social media, video conferencing, and messaging applications; the ability to use digital tools for learning assessment; and creativity and innovation in applying technology for educational purposes (Van Laar et al., 2017).

However, in practice, responses to technological developments remain sluggish, and teachers' digital competence in utilizing technology for classroom learning is still suboptimal (Soenarto et al., 2020). According to UNESCO (2020), only about 30% of teachers feel confident in actively using digital technology in the learning process, indicating a digital skills gap that must be addressed through structured education and training programs. Similarly, a national survey conducted by the Center for Educational Data and Technology (Pusdatin) in 2020 reported that 60% of teachers were unable to integrate technology into teaching, with a significant portion categorized as technologically illiterate (Syahid et al., 2022). These findings indicate that teaching and learning in Indonesia remain largely conventional despite the vast opportunities and innovations of the Industrial Revolution 4.0 era (Ardiansyah & Trihantoyo, 2023). Based on data from the Indonesian Ministry of Education and Culture (Muhamad, 2024), the number of teachers in the first semester of the 2024/2025 academic year reached 3,432,460 nationwide, with West Java being the province with the largest teacher population, totaling 482,301 teachers.

As stipulated in Law No. 14 of 2005 on Teachers and Lecturers (Ifriani et al., 2024), teacher competencies include pedagogical, professional, personal, and social competencies. Within the pedagogical dimension, teachers are required to master the ability to utilize ICT effectively in teaching, emphasizing their capability to integrate technological practices into learning as a means of creating innovative and evaluative educational experiences (Munir, 2014). Digital competence thus encompasses two dimensions: pedagogical competence (the use of ICT in learning) and professional competence (the use of ICT for self-development) (Syahid et al., 2022).

This condition warrants further investigation, as teachers' digital competence significantly influences the teaching and learning process, impacting motivation, learning outcomes, and even teachers' own professional development (Suwandi et al., 2020; Titu et al., 2023; Simanjuntak, 2022). Moreover, although West Java has the highest number of teachers in Indonesia, no comprehensive data currently exist regarding teachers' digital competence across educational levels. If this issue remains unresolved, challenges in evaluating teacher

competency improvement will persist due to the lack of recent survey data, potentially leading to declining student performance and worsening national education quality. According to Sutermeister (1963), individual competence is influenced by knowledge, skills, experience, training, and motivation. Effective training programs can significantly enhance teachers' digital competence. The OECD (2021) found that teachers who participated in technology-based training experienced a 60% improvement in digital skills compared to those who did not.

Specifically, this study examines the contribution of the effectiveness of education and training (diklat) programs to improving teachers' digital competence. The research focuses on vocational high school (SMK) teachers and measures training effectiveness based on teachers' perceptions, while analyzing improvements in digital competence according to the European Framework for the Digital Competence of Educators (DigCompEdu) developed by Ala-Mutka and Ferrari. The framework includes six dimensions: teaching and learning, information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving (OECD, 2021; Iordache et al., 2017).

This study was conducted in Majalengka Regency, West Java, as an area without existing data on teachers' digital competence. The research excludes factors beyond training effectiveness that may influence teachers' digital competence, such as educational background, school conditions, and national education policies. The study not only contributes to academic discourse but also provides an empirical basis for policymakers to evaluate and enhance teacher development programs through digital training initiatives aimed at improving teaching quality and educational outcomes.

## METHOD

This study employed a quantitative approach with a survey method to investigate the contribution of training effectiveness (diklat) to the improvement of teachers' digital competence. This method was chosen to statistically assess the extent to which education and training programs contribute to digital competence development. The data analysis techniques used include descriptive statistics and inferential statistics. The proposed hypothesis states that "The effectiveness of education and training (diklat) contributes to the improvement of teachers' digital competence."

The unit of analysis consisted of all teachers in public vocational high schools (SMK Negeri) across Majalengka Regency, West Java, with a total population of 514 teachers. Using a random sampling technique, a total of 225 teachers were selected as respondents. The research utilized a 5 point Likert scale as the measurement instrument.

## RESULTS AND DISCUSSION

This study aimed to analyze the contribution of training effectiveness (diklat) to the improvement of teachers' digital competence. The analysis involved 225 respondents who participated in digital competence–oriented training programs. The collected data were analyzed using cross-tabulation and the Chi-square test to examine the relationship between the level of training effectiveness and teachers' digital competence.

Based on the cross-tabulation results presented in Table 1, the data distribution is as follows: within the moderate training effectiveness category, there were 5 respondents (2.2% of the total), all of whom (100%) possessed very high digital competence. However, this category comprised a small sample size, making it less representative for broad generalization.

**Table 1. Cross-Tabulation Results**

| | | | Digital Competence | | |
|---|---|---|---|---|---|
| | | | High | Very High | Total |
| Training Effectiveness (TE) | Moderate | Count | <5 | <5 | 5 |
| | | Expected Count | 1.7 | 3.3 | 5.0 |
| | | % within TE | n<5 | n<5 | 100.0% |
| | High | Count | 65 | 44 | 109 |
| | | Expected Count | 36.8 | 72.2 | 109.0 |
| | | % within TE | 59.6% | 40.4% | 100.0% |
| | Very High | Count | 8 | 103 | 111 |
| | | Expected Count | 37.5 | 73.5 | 111.0 |
| | | % within TE | 7.2% | 92.8% | 100.0% |
| Total | | Count | 76 | 149 | 225 |
| | | Expected Count | 76.0 | 149.0 | 225.0 |
| | | % within TE | 33.8% | 66.2% | 100.0% |

In the high training effectiveness category, there were 109 respondents, with 65 teachers (59.6%) having high digital competence and 44 teachers (40.4%) demonstrating very high digital competence. Meanwhile, in the very high training effectiveness category, 111 respondents were recorded, consisting of 8 teachers (7.2%) with high competence and 103 teachers (92.8%) with very high digital competence.

This distribution pattern clearly indicates that the higher the training effectiveness, the higher the teachers' digital competence. These findings suggest a positive association between the quality of training implementation and the learning outcomes achieved by teachers, particularly in mastering digital technology for instructional purposes.

To examine the statistical significance of the relationship between training effectiveness and teachers' digital competence, the Pearson Chi-Square test was conducted. As shown in Table 2, the Chi-Square value was 69.146 with 2 degrees of freedom (df) and an Asymptotic Significance (2-sided) value of 0.000. Since the significance value is less than 0.05 ($p < 0.05$), it can be concluded that there is a statistically significant relationship between training effectiveness and teachers' digital competence. Thus, the null hypothesis ($H_0$), which states that there is no relationship between the two variables, is rejected, and the alternative hypothesis ($H_1$) is accepted.

**Tabel 2. Chi-Square Tests**

| | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 69.146[a] | 2 | .000 |
| Likelihood Ratio | 76.542 | 2 | .000 |
| Linear-by-Linear Association | 63.930 | 1 | .000 |
| N of Valid Cases | 225 | | |

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.69.

To measure the strength of the relationship between the two variables, Phi and Cramer's V coefficients were employed. The results in Table 3 show that Phi = 0.554 and Cramer's V = 0.554, with a significance value of 0.000. According to Cohen's (1988) interpretation in Statistical Power Analysis for the Behavioral Sciences, coefficients above 0.50 indicate a strong relationship. Therefore, the relationship between training effectiveness and teachers' digital competence can be classified as strong and statistically significant.

**Table 3. Symmetric Measures**

| | | Value | Asymptotic Standard Error[a] | Approximate T[b] | Approximate Significance |
|---|---|---|---|---|---|
| Nominal by Nominal | Phi | .554 | | | .000 |
| | Cramer's V | .554 | | | .000 |
| Interval by Interval | Pearson's R | .534 | .053 | 9.437 | .000[c] |
| Ordinal by Ordinal | Spearman Correlation | .549 | .051 | 9.798 | .000[c] |
| N of Valid Cases | | 225 | | | |

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

Furthermore, the Spearman's rho correlation analysis yielded a coefficient of 0.549 with a significance value of 0.000, confirming a moderately strong positive relationship between the two variables. This implies that the higher the training effectiveness experienced by teachers, the higher their level of digital competence.

The distribution pattern reveals that 92.8% of teachers who participated in training with very high effectiveness achieved very high levels of digital competence. This finding demonstrates that highly effective training produces optimal learning outcomes. However, in the high-effectiveness training category, the majority of teachers (59.6%) attained only high levels of digital competence. This suggests room for improvement in training design, including delivery methods, duration, and post-training follow-up.

These findings align with the arguments of Fernández-Batanero et al. (2022) and Gemella (2024), who assert that effective training should be accompanied by mentoring and continuous practice to ensure that learning outcomes are implemented in real professional contexts.

The results indicate that training effectiveness significantly influences teachers' digital competence enhancement. Teachers who participated in highly effective training programs demonstrated greater improvements in digital competence compared to those who attended moderately effective programs. This finding reinforces the notion that effective training plays a critical role in enhancing teachers' ability to adapt to and integrate digital technology in the teaching process.

These results are consistent with the findings of Elsayary (2023), Subrahmanyam (2022), and Rajuroy (2025), who emphasized that teachers' digital competence is largely determined by the degree of training effectiveness.

Effective training programs not only focus on theoretical content but also emphasize practical application through project-based learning, simulations, and hands-on practice with digital tools.

The Cramer's V value of 0.554 and the Spearman's rho value of 0.549 indicate a strong and positive relationship between training effectiveness and teachers' digital competence. This demonstrates that training effectiveness makes a meaningful contribution to enhancing teachers' digital skills. Practically, this underscores the importance of designing teacher training programs that are systematic, structured, and aligned with participants' professional needs to ensure optimal outcomes.

Although the relationship is strong, other factors may also influence teachers' digital competence, such as prior experience, learning motivation, availability of technological infrastructure, and managerial support from schools. Therefore, training effectiveness should be viewed as one of the key components within the broader ecosystem of teacher competence development rather than the sole determinant.

In the context of educational digital transformation, teachers are required to possess advanced digital competencies to effectively integrate technology into the learning process. This is in line with Gaur (2024) and Smolyaninova and Bezyzvestnykh (2019), who state that effective professional training plays a strategic role in enhancing teachers' readiness for 21st century learning challenges. Teachers with high digital competence are better equipped to manage Learning Management Systems (LMS), conduct digital assessments, and utilize interactive media to increase student engagement (Chang, 2016; Gisbert Cervera & Caena, 2022).

These findings also align with the European Framework for the Digital Competence of Educators (DigCompEdu) proposed by Redecker and Punie (2017), which emphasizes the importance of teacher training focused on digital pedagogical competencies rather than mere technical proficiency. Accordingly, the effectiveness of digital training should be assessed based on how well teachers transfer their learning outcomes into innovative instructional practices. This framework defines teachers' digital competence comprehensively—encompassing pedagogical capabilities in designing, implementing, and assessing effective digital learning rather than merely mastering technology (Ghomi & Redecker, 2019)

## CONCLUSION

Based on the data analysis and discussion, it can be concluded that training effectiveness contributes significantly to the improvement of teachers' digital competence. The data distribution shows that most teachers who experienced very high training effectiveness achieved very high levels of digital competence, while those in the high-effectiveness category generally demonstrated high competence. This indicates a consistent positive relationship between effective training implementation and enhanced digital competence among teachers.

Conceptually, these findings reinforce existing theories and previous studies suggesting that effective and relevant teacher training programs have a tangible impact on improving teacher professionalism, particularly in mastering digital technology. Therefore, training effectiveness serves as a strategic factor in supporting educational digital transformation and enhancing learning quality in the digital era. Moreover, high training effectiveness contributes not only to the technical mastery of technology but also to teachers' digital pedagogical competencies, such as designing technology-based instruction, utilizing interactive digital media, and implementing online assessment strategies. Consequently, training effectiveness should be understood comprehensively, encompassing planning, implementation, and post-training evaluation dimensions to ensure sustainable teacher competence development.

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