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EVALUATION OF THE GURU PENGGERAK PROGRAM ON TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE OF JUNIOR HIGH SCHOOLS IN CENTRAL JAVA PROVINCE, INDONESIA

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ABSTRACT

This study aims to evaluate the effectiveness of the Guru Penggerak Program in improving the Technological Pedagogical Content Knowledge (TPACK) competencies of Guru Penggerak at the Junior High School level in Central Java Province. This evaluative study adopted the CIPPO Evaluation Model (Context, Input, Process, Product, Outcome) using a mixed method approach to obtain in-depth quantitative and qualitative data. The research sample consisted of 560 respondents. Data collection techniques included interviews, questionnaires, and documentation studies. The results showed a program efficiency ratio of 1.03 in the efficient category. In terms of effectiveness, the Guru Penggerak Program was found to be highly optimal. Based on the overall T-score calculation, all five aspects of the CIPPO evaluation received positive scores (+++++), which, according to the criteria, placed the program in Quadrant I of the Glickman Model. These findings indicate the holistic success of the program: The Context aspect shows the program's high relevance to teachers' needs; Input shows the quality of participant criteria and very adequate resources; Process shows effective training and guidance in integrating TPACK; Product confirms the ability of Guru Penggerak to produce teaching tools. These findings indicate the holistic success of the program: The Context aspect shows the program's high relevance to teachers' needs; Input shows the quality of participant criteria and highly adequate resources; Process shows effective training and guidance in integrating TPACK; Product confirms the ability of Guru Penggerak to produce innovative TPACK-based learning tools; and Outcome confirms the transformative impact on improving teachers' TPACK competencies and increasing student motivation and learning activity in the classroom. Overall, this study shows that the Guru Penggerak program is a highly successful policy intervention model and is recommended for replication on a wider scale to ensure the continuous improvement of teaching quality and teacher competency throughout Indonesia.

KEYWORDS: TPACK; Teacher Professional Development; Educational Policy Evaluation; Guru Penggerak; CIPPO Model.

1. INTRODUCTION

Due to their significant role in education, teachers must possess a variety of abilities to fulfil national educational objectives (Tabroni *et al.*, 2022). Law Number 14 of 2005 Article 10 stipulates that professional teacher must possess four fundamental competencies: educational, personality, social, and professional. The prevailing phenomenon is that educators continue to possess comparatively poor abilities (Darling-Hammond, 2023). The results of the national Teacher Competency Test (UKG) clearly indicate that performance remains below the target of 58.5. Data from the Directorate General of Teachers and Educational Personnel of Central Java Province indicates that teachers' proficiency in fulfilling their responsibilities as professional educators remains inadequate. The 2023 Junior High School Teacher Competency Test (UKG) results in Central Java Province indicate an average score of 50.57. This score remains within the minimal competency standard target of 70.00. The UKG results suggest that teacher competency remains inadequate, potentially attributable to a deficiency in teachers' command and comprehension of pedagogical methods, theories, and procedures, alongside a lack of proficiency in science and technology.

The Minister of Education, Culture, Research, and Technology asserted in his address at the LPMP NTB office on Wednesday, October 6, 2021, that Guru Penggerak serve as the vanguard of education capable of instigating significant transformations in the educational landscape of Indonesia (Vičič Krabonja *et al.*, 2024). Guru Penggerak is a new initiative designed to enhance the competence and capacity of educators in Indonesia (Halil *et al.*, 2024a). Guru Penggerak aims to address the educational demands of the 21st century, necessitating the essential incorporation of technology in the learning process to cultivate graduates with digital competencies (Dyah Kaeksi Setianingrum *et al.*, 2024). This prerequisite is explicitly defined within the Technological Pedagogical Content Knowledge (TPACK) framework, which is internationally acknowledged as a crucial norm for teacher proficiency in the digital era (Wohlfart & Wagner, 2023). (Abdillah & Setianingsig, 2025) in a research journal article titled Evaluation of the Guru Penggerak Program in Bandar Lampung City reported favourable evaluation outcomes for the Guru Penggerak program. According to research by (Ruhimat *et al.*, 2024), the assessment of the implementation context of the Guru Penggerak program in Kubu Raya Regency High School reveals disparate outcomes.

Research conducted by (Istiyarini, 2022) indicates that the execution of the Guru Penggerak Program to the established requirements, with all inputs and processes satisfied and all teachers receiving certification.

Teacher involvement in collaborative subject-based professional development groups significantly enhances understanding of 21st-century learning, ICT utilisation, student guidance strategies, problem-solving and collaboration skills, and conceptual comprehension (Shavard, 2022). (Liou *et al.*, 2025) study indicates that the Teacher Professional Certification Program at Bangladeshi institutions markedly enhances teacher leadership alongside pedagogical, professional, research, and collaborative competencies. The research conducted by (Gul *et al.*, 2025) on Teacher Leadership Programs indicates that such training enhances teachers' ability to exert a more significant impact on the educational system, cultivates self-assurance, and enables educators to act as catalysts for change within their classrooms, schools, and communities. According to the research by (Ghamrawi *et al.*, 2024) conducted in Lebanon, transformative teacher professional development programs empower educators, sustain their leadership potential, drive educational excellence, promote a shift from traditional learning, and foster an environment where teachers actively contribute to shaping educational vision and goals. Research by (Martinovic & Milner-Bolotin, 2025) indicates that the Disciplinary Professional Learning Community (DPLC) - STEM (International) program, implemented in Israel, seeks to enhance teachers' pedagogical competencies concerning disciplinary content (SMK/PCK) and assist educators in designing, testing, and producing teaching materials and activities suitable for classroom application. Research conducted by (Whitlock, 2024) shown that properly structured Guru Penggerak programs can positively influence schools in the United States.

The 21st century, characterised by swift technology advancements, has intensified the responsibilities placed on educators (Ridhuan *et al.*, 2022). Educators are anticipated to integrate technology into the instructional process, alongside their expertise in subject matter and pedagogical strategies (Adnan *et al.*, 2024). The framework for comprehending the amalgamation of technology, content, and pedagogy in education is known as technical pedagogical content knowledge (TPACK). TPACK, formulated by (Aldalalah *et al.*, 2025) comprehensively addresses the individual components of content knowledge (CK), pedagogical

knowledge (PK), and technology knowledge (TK), as well as the interrelations among them, specifically pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical knowledge (TPK), culminating in the synthesis of all three components, referred to as TPACK. The Guru Penggerak program can mobilise learning communities and serve as practical educators for their peers, particularly in navigating the contemporary period of globalisation (Retnowati et al., 2024). Consequently, the presence of motivated educators can enhance instructors' proficiency in content mastery, pedagogical techniques, and technological integration. The researcher aims to assess the efficacy of the Guru Penggerak program on TPACK competencies through a qualitative research methodology utilising the CIPPO assessment model. The CIPPO assessment model (Context, Input, Process, Product, Outcome) is an adaptation of the CIPP model (Context, Input, Process, Product) developed that the objective of CIPP evaluation is to facilitate decision-making (Oghenerume, 2026). Program evaluation necessitates assessing its influence or outcome, namely the achievement of graduates in their professional environments. This study use the CIPPO assessment model as an innovative approach to assess the efficacy of the Guru Penggerak Program in enhancing school quality. Moreover, the CIPPO model is deemed more suitable for articulating the program's performance in a detailed and thorough manner.

This study was undertaken in Central Java Province because to the substantial number of participants in the Guru Penggerak Program, totalling 16,842, in contrast to 11,483 in West Java and 4,465 in North Sumatra. This study will evaluate the Guru Penggerak Program's impact on the TPACK of Guru Penggerak in Junior High Schools in Central Java, based on the identified research gap and novelty presented. This study used the lesson study research model with teachers and students in Brunei Darussalam as the research subjects. This study used the Twenty-first Century Teaching and Learning (21CTL) theory. The results showed that teachers who participated in the professional development program had a better understanding of 21st-century teaching and learning, had practical ideas that could be used in the classroom, had a better understanding of the use of ICT in learning, had a better understanding of guiding students to manage their own learning, had a better understanding of improving problem solving and encouraging collaboration among students, had a better understanding of building students' deeper

understanding of the material, and had more productive ways to discuss teaching and learning with colleagues. Research conducted by (Willis et al., 2022) entitled "Teacher Leadership Development: The Role of Professional Certification Programs" reveals that professional certification programs contribute significantly to making teachers leaders, improving pedagogical, professional, research, and collaborative skills. In addition, professionally certified Guru Penggerak motivate students to pursue better careers, inspire colleagues to pursue higher degrees, exchange innovative learning approaches, and provide valuable insights for overall college improvement. Research conducted by Roofe & Blair (2024) entitled "The Essence of Teacher Leadership: A Phenomenological Inquiry of Professional Growth" aims to assess how online graduate programs in Teacher Leadership affect participants' professional growth. The research was conducted by identifying themes that emerged from participants' final reflection papers in the Graduate Teacher Leadership program. The results showed that the Teacher Leadership training program built teachers' capacity to have a greater influence on the school system, fostered self-confidence, and empowered teachers to become agents of change in their classrooms, schools, and regions. Research by Ghamrawi et al. (2024) entitled "Cultivating Teacher Leadership: Evidence from a Transformative Professional Development Model" shows that transformative professional development programs for teachers have an impact on empowering teachers, nurturing their leadership potential, driving excellence in education, encouraging change from traditional learning, and creating an atmosphere where teachers actively participate in shaping the vision and goals of education. In addition, teachers have also begun to use project-based learning and digital technology approaches. However, there are obstacles in the implementation of the program, such as limited supporting facilities, lack of continuous mentoring, and high administrative burdens. Furthermore, research conducted by (Dewi et al., 2024) entitled "Evaluasi Program Guru Penggerak di SMA Kabupaten Kubu Raya" shows that the evaluation of the PGP in Kubu Raya Regency High Schools indicates that this program can improve student learning outcomes and the quality of Guru Penggerak in self-development and peer development, as well as the empowerment of Guru Penggerak. The recommendations given included increasing support and resources to ensure the sustainability and development of the program in the future.

2. METHOD

This study used the CIPPO evaluation model, which combines formative and summative evaluations, so that improvements or modifications to the Guru Penggerak program can be identified, or whether to continue the existing program. Based on the research questions and objectives, this study used the CIPPO (Context, Input, Process, Product, Output) evaluation approach because the aspects contained in CIPPO are relevant to the Guru Penggerak program evaluation instruments (Halil *et al.*, 2024b). Data collection for this study was conducted in junior high schools in Central Java Province. The selected junior high schools were located in Banyumas Regency, Blora Regency, Brebes Regency, Cilacap Regency, Grobogan Regency, Karanganyar Regency, Kebumen Regency, Klaten Regency, Wonogiri Regency, and Semarang City. The research was conducted from March 2024. This study evaluates the Guru Penggerak program so that the results of the study can be described in a qualitative descriptive study. Qualitative studies do not use the term population, but rather social situations in the form of places, actors, and activities (Wade-Jaimes & King, 2025). These social situations can be objects that are observed in depth, and in this study, they take the form of the Guru Penggerak program. The informants needed in this study are school principals, motivational teachers, fellow teachers, the education office, BBGTK, and students. The informants will fill out questionnaires as a source of quantitative data and will be interviewed by researchers as a source of qualitative data. Additional data needed by researchers includes school report cards and data on Guru Penggerak and non-Guru Penggerak. The researcher uses additional data to see how the implementation of Guru Penggerak affects TPACK abilities.

In this study, the content validity of the instrument is measured using Aiken's V validity coefficient (Wilkie *et al.*, 2023). The technique used to test the reliability of the rubric in the TPACK Guru Penggerak program evaluation instrument is Consistency Reliability using the Inter-Rater Reliability technique from the Interclass Correlation Coefficient (ICC). In this case, the statistical analysis used was analysis of variance (Mohammadpour Rozehkhani *et al.*, 2025). Measuring the efficiency of the implementation of the Guru Penggerak program on the TPACK of Guru Penggerak Junior High School teachers in Central Java Province using Perceived Program Efficiency. Perceived efficiency is a proxy variable that measures the extent to which the perceived results (Product) are proportional to

the efforts and non-financial resources invested (Input and Process) based on the respondents' views (Chen *et al.*, 2024).

3. RESULT

3.1. Context Evaluation

Program Suitability for Teacher Professional Development Needs

Based on the questionnaire results, the majority of respondents assessed that the Guru Penggerak Program was suitable for the professional development needs of Junior High School teachers. A total of 37% of respondents stated that the program was in the Very Optimal category and 35% in the Optimal category in helping to meet the professional development needs of teachers. Thus, cumulatively, 72% of respondents gave a positive assessment. Meanwhile, only 25% of respondents rated it as Not Optimal and 3% as Very Not Optimal. This data shows that negative perceptions of the program's suitability are relatively small. On the indicator of the relevance of program material to the challenges faced by Junior High School teachers, the questionnaire results show that 26% of respondents rated it as Very Optimal and 45% as Optimal. The total positive assessment reached 71%. Conversely, 26% of respondents rated it as Not Optimal and 2% as Very Not Optimal. These quantitative findings are reinforced by the results of interviews with Guru Penggerak who stated that PGP material is relevant to learning needs, contextual, and emphasizes student-centered learning.

3.1.1. Suitability of Program Objectives with TPACK Ability Improvement

The questionnaire results show that the objectives of the Guru Penggerak Program are considered to be in line with efforts to improve teachers' TPACK abilities. A total of 35% of respondents rated the program's objectives as Very Optimal and 40% as Optimal in covering the development of technology, pedagogy, and learning content integration. The total percentage of positive ratings reached 75%. In terms of program implementation focused on developing technological skills, 26% of respondents rated it as Very Optimal and 42% as Optimal, with a total positive rating of 68%. These results were reinforced by interviews with representatives from the Education Office, who stated that the PGP effectively helped teachers improve their technological mastery and supported the integration of TPACK in learning.

3.1.2. Educational Policy Support for Program

Implementation

The results of the study show that education policies at the central and school levels are considered to support the implementation of the Guru Penggerak Program. A total of 29% of respondents rated the policies as Very Appropriate and 39% as Appropriate to the needs of teachers in the field. The total positive rating reached 68%. In addition, support from schools was also considered strong. A total of 45% of respondents rated school support as Optimal and 25% as Very Optimal, bringing the total positive percentage to 70%.

3.1.3. Alignment of Program Objectives with the Profile and Needs of Junior High School Teacher

Very Appropriate and 34% Appropriate to the needs of Junior High School teachers. Thus, 68% of respondents gave a positive assessment of the appropriateness of the program's objectives. On the indicator of participant criteria suitability with the Junior High School teacher profile, 33% of respondents rated Very Suitable and 35% Suitable, with a total positive percentage of 68%. However, interviews with the Education Office showed that the distribution of PGP participants was not yet completely even, mainly because the selection mechanism was carried out nationally and there were age restrictions for participants.

3.2. Input Evaluation

3.2.1. Qualifications and Competencies of Facilitators and Trainers

The results of the questionnaire data processing show that the majority of respondents rated the quality of the Guru Penggerak Program facilitators as positive. A total of 35% of respondents gave a rating of "Very Optimal" and 26% rated "Optimal" for the facilitators' ability to deliver training material, bringing the positive rating percentage to 61%. In terms of the facilitators' guidance in integrating TPACK, the results show that 33% of respondents rated it as "Very Optimal" and 33% rated it as "Optimal," with a total positive percentage of 66%. This data indicates that facilitators are considered to have adequate competence in supporting the development of participants' TPACK. These results are reinforced by interview data with representatives from the Center for Teacher and Education Personnel Development (BBGTK), who stated that facilitators are recruited through a national selection process and provided with special training before carrying out their mentoring duties.

3.2.2. Availability of Teaching Materials and TPACK-Based Training Modules Trainers

The evaluation results on the availability of teaching materials and training modules show that respondents' perceptions vary considerably. Regarding the indicator of TPACK component coverage in teaching materials, 56% of respondents gave a positive assessment, while 44% gave a negative assessment. On the indicator of the suitability of the module content to daily learning needs in the classroom, the percentage of positive assessments reached 64%. Meanwhile, on the aspect of the ease of understanding and applying the teaching materials, the results showed that 65% of respondents gave a positive assessment and 35% gave a negative assessment. Interview data with BBGTK representatives showed that the modules available on the Learning Management System (LMS) were considered easy to follow and could be directly applied in learning with the assistance of teaching practitioners.

3.2.3. Completeness of Supporting Facilities

Completeness of training facilities, such as training rooms, teaching aids, and access to technology. However, 41% of respondents still considered these facilities to be sub optimal. On the specific indicator related to technology access, the results showed a higher rating, with 72% of respondents rating it as "Optimal" and "Very Optimal." This indicates that technology, as a key component of TPACK development, is sufficiently available. The interview with BBGTK representatives confirmed that the facilities provided include LMS, online learning tools, and workshop equipment that support synchronous and asynchronous learning.

3.2.4. Selection and Readiness of Guru Penggerak Program Participants

The evaluation results show that the selection process for participants in the Guru Penggerak Program was viewed positively by the majority of respondents. A total of 72% of respondents considered the selection process to be transparent and objective. However, in terms of the participants' readiness to join the program, only 57% of respondents gave a positive assessment, while 39% of respondents considered the participants to be not fully ready. On the indicator of the suitability of the selection criteria with the profile of Junior High School teachers, the percentage of positive assessments reached 60%, while 40% of respondents gave negative assessments.

3.3. Process Evaluation

3.3.1. Implementation of the Guru Penggerak Program Curriculum According to Plan

The results of the study show that the implementation of the Guru Penggerak Program curriculum has generally been carried out according to the predetermined plan. A total of 37% of respondents stated that the training material was delivered according to schedule, and 27% stated that it was appropriate, bringing the total positive percentage to 64%. Furthermore, regarding the scope of the curriculum for TPACK development, 76% of respondents gave a positive assessment that the Guru Penggerak Program curriculum covers the development of TPACK competencies. However, in terms of the depth of material delivery, only 65% of respondents stated that all topics were explained in depth, while 35% of respondents felt that the explanation of the material was not entirely optimal. Interviews with participants also reinforced this finding, with participants stating that the training schedule was systematically organized and helped them prepare for each training session.

3.3.2. Training Activities that Integrate TPACK Components

The results show that training activities in the Guru Penggerak Program have strongly integrated TPACK components. A total of 78% of respondents gave a positive assessment of the integration of TPACK in training activities, with 34% rating it as highly optimal and 44% as optimal. In addition, 70% of respondents assessed that the program provided adequate opportunities to try using technology in learning, and 68% of respondents stated that there were simulations or hands-on practices that integrated technology, pedagogy, and learning content. Interviews with BBGTK representatives showed that all stages of training, from registration to implementation, were technology-based through LMS and various learning support applications.

3.3.3. Teachers' Active Participation in Program Activities

The results showed that the level of participation of Guru Penggerak during training was high. A total of 70% of respondents gave a positive assessment of the participants' activeness in each training session, with 43% rating it as very optimal and 27% as optimal. In addition, 71% of respondents stated that the program provided sufficient opportunities for participants to share their experiences and ideas during the training. Interviews with Guru Penggerak

also showed that participants were actively involved in discussions, presentations, and reflective activities.

3.3.4. Effectiveness of Monitoring and Evaluation during Implementation

The results show that the majority of respondents consider the monitoring and evaluation mechanisms in the Guru Penggerak Program to be effective. A total of 66% of respondents gave a positive assessment of the evaluation mechanisms used to measure participants' understanding. Furthermore, 76% of respondents assessed that the feedback provided by facilitators was constructive and helped improve participants' performance. In addition, 71% of respondents stated that the monitoring carried out during the training played an important role in ensuring the achievement of program objectives. The interview results showed that evaluations were carried out through LMS, Padlet, task assessments, and observations by facilitators and teaching practitioners.

3.4. Implementation of the Guru Penggerak Program Curriculum According to Plan

3.4.1. Improvement in Teachers' Understanding of the TPACK Concept

The results of the study show that the Guru Penggerak Program had a positive impact on improving teachers' understanding of the TPACK concept. The majority of respondents gave positive assessments of teachers' understanding of integrating technology, pedagogy, and learning content. Overall, around 68% of respondents stated that the Guru Penggerak had a good to very good understanding of the application of TPACK in learning. Teachers were considered capable of choosing appropriate technology, integrating it with the right pedagogical strategies, and adapting it to the characteristics of the material and students.

3.4.2. Teachers' Performance in Planning and Implementing TPACK-Based Learning

The evaluation results show that Guru Penggerak teachers are able to translate their understanding of TPACK into learning practices. A total of 75% of respondents assessed that Guru Penggerak are able to plan learning by utilizing technology effectively and implementing it in the classroom. In addition, around 72% of respondents stated that the Guru Penggerak were able to analyze student needs and design learning that was appropriate to the classroom context. Teachers were also considered

capable of creating active, creative, and innovative learning through the integration of relevant technology.

3.4.3. Suitability of Training Products to Learning Needs in Junior High Schools

The results showed that training products developed by Guru Penggerak, such as modules and learning tools, were deemed suitable for learning needs in junior high schools. Approximately 76% of respondents gave positive assessments of the suitability of training products to learning needs in the field. In addition to being relevant, these learning products were also considered easy to implement. Approximately 75% of respondents stated that the learning tools produced by PGP could be applied in Junior High School classrooms with minimal adjustments.

3.4.4. Development of Innovative Learning Tools by Guru Penggerak

The results of the study show that Guru Penggerak are capable of developing innovative learning tools based on TPACK. Approximately 74% of respondents assessed that teachers were successful in producing learning tools that were creative, innovative, and relevant to technological developments. In addition, approximately 76% of respondents stated that the learning tools developed were able to increase student engagement in learning. This shows that the learning products produced were not only teacher-oriented but also had a direct impact on student activities and participation.

3.5. Outcome Evaluation

3.5.1. Program Suitability for Teacher Professional Development Needs

A total of 72% of respondents gave a positive assessment (Very Optimal and Optimal) of the suitability of the Guru Penggerak Program for teacher professional development needs. Respondents assessed that the program helped improve pedagogical competence, learning leadership, and the ability to adapt learning to student characteristics.

3.5.2. Teachers' Performance in Planning and Implementing TPACK-Based Learning

The questionnaire results show that 75% of respondents assessed that the objectives of the Guru Penggerak Program explicitly support the improvement of teachers' TPACK skills. In addition,

68% of respondents stated that the program implementation has focused on developing technological skills that support classroom learning.

3.5.3. Educational Policy Support for Program Implementation

A total of 68% of respondents stated that central government education policy was appropriate and supportive of the implementation of the Guru Penggerak Program. Support from schools was also rated highly, with 70% of respondents stating that schools provided optimal support for program implementation.

3.5.4. Suitability of Program Objectives to Junior High School Teacher Profiles and Needs

The results of the study show that 68% of respondents assessed that the objectives of the Guru Penggerak Program and participant criteria were in line with the profile and needs of Junior High School teachers. However, the interview results revealed that the distribution of participants was not yet fully evenly distributed across regions.

4. DISCUSSION

The importance of institutional support, such as favorable policies, funding for technological infrastructure, and continuous training for teachers, is crucial (Philipsen et al., 2022). This support plays a vital role in ensuring the successful implementation of LMSs in teacher training programs. Furthermore, this study highlights that LMS utilization not only provides flexibility in accessing educational resources but also enables personalized learning tailored to individual needs and capabilities (Villegas-Ch et al., 2024). The findings indicate that integrating LMSs into teacher training programs significantly contributes to enhancing prospective teachers' professional competencies (Záhorec et al., 2021). LMS allows prospective teachers to access various learning resources more flexibly and efficiently while also supporting more personalized learning experiences (Alotaibi, 2024). Other studies have shown that the use of learning management systems (LMS) has a significant positive effect on the quality of teacher competence (Costley et al., 2022). Another study by (Consoli et al., 2025) also indicated that LMS use plays a role in enhancing teacher competence, where the integration of technology, such as LMSs in learning, influences learning outcomes and is supported by strong teacher competence. The opposite findings suggest that LMS use does not impact teacher competence because of factors such as limitations in online interaction

(Simon et al., 2025). Another study by Zhang & Yang (2025) also revealed that ICT training for teachers does not impact their ability to conduct online learning. Instead, the training focuses primarily on developing skills to organize and prepare digital teaching materials, rather than enhancing their ability to teach online via an LMS.

The significant impact of LMS use (LU) has practical implications for policymakers and educators in designing effective training programs (Al-Mamary, 2022). LMS not only facilitates the teaching and learning process but also supports the professional development of prospective teachers. While teacher participation also has an influence, these findings emphasize the importance of leveraging technology in teacher training and professional development. This study confirms that LMS utilization is a key factor in helping prospective teachers prepare to become competent and professional educators in the digital era (Al-Mamary, 2022). Additionally, adequate institutional support and policies are essential for ensuring the successful implementation of LMSs in teacher training programs (Turnbull et al., 2022). A study by (Turnbull et al., 2022) revealed that the role of teachers participating in training significantly influences competency improvement. Through training, teachers become more accustomed to

preparing digital teaching materials, which in turn streamlines other instructional processes. Moreover, other studies have reported that the active participation of teachers in training has a positive effect on their competencies (Stavermann, 2025). This is because the focus and target of mastering new skills play crucial roles in enhancing the quality of teachers' competencies.

5. CONCLUSION

Overall, the LMS is a highly effective tool for supporting the education of prospective elementary school teachers, particularly in preparing them to face the challenges of education in the digital era. Effective LMS utilization can enhance interaction, facilitate access to information, and strengthen prospective teachers' pedagogical skills. However, to achieve maximum effectiveness, it is crucial to ensure that the LMS is well integrated into the curriculum and accompanied by adequate training for prospective teachers. The success of an LMS also depends on how well prospective teachers can transfer the skills they acquire into real teaching practices in schools. Therefore, continuous evaluation and improvement of LMS usage are necessary to support educational objectives.

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