



Effects of innovative learning methodology training on teachers learning management competency

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ABSTRACT

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Low teacher competency in managing innovative learning methodology processes. The urgency of this research is caused by the difference between theory, expectations, and reality in the field, with only around 35-40% of teachers being able to apply innovative methodologies. The purpose of this study is to analyze the effectiveness of an innovative learning methodology training program in improving teachers' learning process management competency. The research approach uses a mixed method with an experimental design. The sample consisted of 2,500 teachers with stratified random sampling based on urban-rural areas and education levels in Sulawesi. Data collection was conducted using questionnaires, observations, interviews, and documentation. Quantitative analysis used paired sample t-tests, Pearson correlation, multiple linear regression, CFA, and ANOVA. Qualitative data were analyzed thematically. The results showed a significant increase in competency in all variables, with a score difference of 1.02-1.20 ($p = 0.000$). Technology utilization increased the most (1.20), followed by lesson planning (1.13) and the application of innovative methods (1.12). A strong correlation was found between classroom management and total competency ($r = 0.812$). Inhibiting factors included limited infrastructure and minimal institutional support, while internal motivation and a learning community were the main supporting factors. Conclusion: With the learning process management training program, it is still effective in improving teacher competency and has positive implications for the quality of learning, although implementation requires full and continuous institutional infrastructure support.

Contribution/Originality: This research has significant implications for developing teacher education management competencies in learning process methodology through ongoing training programs. It offers new insights into regional disparities, key predictors of pedagogical change, and systemic factors influencing post-training program implementation and classroom learning.

1. INTRODUCTION

The development of 21st century technology requires educators around the world to adapt and prepare innovative learning management (Ndibalema, 2025). Educational institutions must also be aware of the importance of improving the quality of educational process management for human resources as a key factor in improving the community's economy (Sudirman, Ramadhita, Bachri, & Whindari, 2025). The United Nations Educational, Scientific and Cultural Organization (UNESCO) believes that a good educational management process is the foundation for building competent human resources (González, Colomo, & Cívico, 2020). However, the facts on the ground are that many people have difficulty achieving the expected competency standards (Han, Luo, Wang, & Zhang, 2025). In a

study by the Organization for Economic Co-operation and Development (OECD), it is argued that educator competence must be in line with the ability to use innovative teaching methodologies in educating students (OECD, 2021). In the 2018 Program for International Student Assessment (PISA), it was also stated that countries should encourage innovative education systems in teaching to achieve academic results (OECD, 2019). In a developing country like Indonesia, educators often face difficulties in developing competencies, especially in using innovative learning methods with the help of 21st-century technology (Barikzai, Bharathi S, & Perdana, 2024; Hidayat & Chao, 2025). According to the 2021 report from the Ministry of Education and Culture, 65% of teachers in Indonesia are incompetent in using technology in their learning methodology (Shobri, Ghufro, Kholis, & Makinuddin, 2025). This finding emphasizes the urgent need for training programs to improve teacher competency in innovative learning methodologies and address the material competence (MC) of pedagogical and professional competency (Nguyen & Tran, 2025). The Human Resources Development and Welfare Agency said that 40% of educators have low skills in innovative learning methodologies (McChesney, Gurney, & Chivers, 2024). In many rural areas, training programs are also less than optimal (Herut, 2024). Due to regional disparities, teachers in remote and underdeveloped areas tend to be less competent in learning methodologies than urban educators (Zhao, 2024). This serves as the basis for transforming training programs toward innovative learning methodologies. With continuous evaluation, the training program's success can be achieved in accordance with expectations.

One of the challenges for educators today is innovative learning methodologies (Samala et al., 2024). Previous research in developed countries has shown that teachers are able to apply innovative methodologies through technology-assisted training to increase pedagogical effectiveness by 25% (Joshi et al., 2024). However, in developing countries like Indonesia, many educators still struggle to adapt to technology due to a material competence (MC) of training. It's been recorded that only 30% of teachers in Indonesia have received training, and another 70% material competence (MC) innovative methodological competencies (Alieto et al., 2024). The main obstacles in developing countries are inadequate facilities, insufficient guidance, and uncertainty in managing classes using new methods. Previous research has shown that training success is greatly influenced by the quality of the training materials, delivery methods, and supportive school environment (Parveen et al., 2024; Puja, 2024). All three points must be met for training to be effective. The limited evaluation of training programs in Indonesia shows that most remain one-way and fail to sustainably transform teaching practices (Zhao & Wang, 2024). Data from previous urban studies showed that 20% of teachers were able to integrate innovative methodologies into their learning process after participating in a training program (Seufert, Hartmann, & Spirgi, 2025). The material competence (MC) of competency in learning methodologies among urban teachers stems from the material competence (MC) of post-training mentoring and the absence of a comprehensive measurement of the program's effectiveness. In-depth research is needed to verify primary sources and conduct an in-depth evaluation of the impact of innovative learning methodology training on improving teachers' learning management competencies. Training programs should be evaluated to provide an accurate picture of the effectiveness of training programs conducted in urban and rural areas. The results of this evaluation can offer alternative strategies to improve the quality of future training for teachers in managing the learning process.

Other research in education assesses the extent to which innovative training can improve teacher competency in improving student learning outcomes (Wakid, Sofyan, Widowati, & Zaida Ilma, 2024). In the United States, an evaluation of a digital technology-based training program for elementary school teachers found that after 40 hours of training, learning management competencies increased by 25%. Students taught by teachers who participated in the training showed a 12% increase in average final exam scores compared to a control group that did not participate in the training (Alonzo, Quimno, Townend, & Oo, 2024). Meanwhile, in Indonesia, research examining the impact of innovative learning methodology training on teacher competency in urban junior high schools found significant improvement, with an average score of 65 to 78 after the training, representing a 20% increase. Observations of the use of innovative methods such as project-based learning and flipped classrooms increased from 30% to 70% among

prospective teachers. The success rate of training implementation was directly proportional to the increase in efficiency, with teachers who actively participated in the training activities showing a 30% increase in overall efficiency (Mmari, Simon, & Verma, 2024). A study in China on innovative methodology training on classroom management and student motivation involved 150 teachers in a three-month training program and found that classroom management efficiency increased by 22%, while student motivation increased by 15% (Parker & Tang, 2025). Another study in India found that the evaluation of a training program based on the implementation of innovative technology and methodology in primary schools showed an increase (Suhail, Bahroun, & Ahmed, 2024). Researchers measured teacher efficiency through professional competency assessments and direct observations in elementary schools. The results showed a 28% increase in efficiency, with 75% of teachers reporting positive changes in their management of the teaching and learning process. Simultaneously, elementary school student learning outcomes improved by 10% after the implementation of the innovative method, with a significant positive impact on improving the quality of learning (Javed, Rong, Zafeer, Maqbool, & Abbasi, 2024). These studies reflect the importance of developing training programs that focus on innovation as a strategy for teachers in high schools and conducting comprehensive evaluations to see improvements in the quality of education before and after training.

In his adult learning theory (andragogy), Malcolm Knowles emphasizes the importance of relevant training experiences and practical methodology to the learning process (Elsawah, 2025). In addition to practical training that improves teacher competency, Kirkpatrick's training evaluation model offers four levels of effective assessment: feedback, learning, behavior, and results (Hall, Bardier, Greer, Clayton, & Poblete, 2024; Hamzah, Marcinko, Stephens, & Weick, 2025). David McClelland's competency theory also emphasizes that competency development is the key to success in education through training (Imjai, Swatdikun, Rungruang, Basiruddin, & Aujirapongpan, 2024). Training that focuses on improving teacher competency has a positive impact on their ability to manage the learning process. Innovative educational theories, such as constructivism, also focus on the active role of participants in the learning process, which aligns with innovative learning methodologies that engage the cognitive and social environments of teachers and students (Mariyono & Nur Alif Hd, 2025). Meanwhile, Kurt Lewin's change management theory is used to understand training to see changes in teacher attitudes and behavior when adopting new methodologies (Vasel, 2025).

This research gap concerns the discrepancy between theory, expectations, and reality on the ground. Many studies have conducted training and evaluations on specific training programs for elementary school teachers. However, innovative learning methodology competency training programs for high school teachers are still limited. Assessment and evaluation of high school teacher planning and learning programs are also rare at national and international levels. Although many studies demonstrate improved teacher competency after training in elementary school teachers, most have not integrated in-depth assessments that include post-training methodology implementation, institutional support, trainer quality, and the longitudinal relationship between training and student learning outcomes in elementary schools. Researchers also assess short-term outcomes based on perceptions, rather than empirical measurements based on actual classroom performance. Therefore, research is urgently needed in Indonesia, given the limited research on the implementation of learning methodology training programs based on multi-level and multi-source assessments for high school teachers. The novelty of this study lies in the evaluation of adaptive, creative, and technology-based pedagogical competencies in high school teachers. The low adoption of post-training methodologies is a problem that must be addressed, given that teacher competency between urban and rural areas also highlights the gap that requires data-driven assessment to improve training policies and design.

The research has questions, namely: 1) How effective is the innovative learning methodology training program in improving teachers' learning management competencies? 2) What internal and external factors influence the successful implementation of innovative methodologies after training? 3) What is the relationship between the improvement of teachers' post-training competencies, the quality of the learning process, and student learning outcomes? This study aims to analyze the effectiveness of innovative learning methodology training in improving

teachers' learning management competencies, identify obstacles and difficulties in implementing learning methodologies, and evaluate the relationship between the improvement of teachers' competencies, the quality of learning, and student learning outcomes.

2. REVIEW OF RELATED LITERATURE

2.1. *Adult Learning Theory (Malcolm Knowles)*

In learning theory, adults learn differently from children, who need experience and motivation received from the training they receive (Darnault, Tragant, & Lasagabaster, 2024). The training teachers receive has benefits for independent learners, aligning with the implementation of their professional competencies. Knowles' training emphasizes the need for knowledge, an independent self-concept, experience as a learning resource, preparation for learning, problem-solving orientation, and motivation (Schrage, Maheshwari, & Velasquez, 2025). Learning training motivates teachers to actively connect training materials with the learning methods used in schools. The training experience teachers receive is crucial for understanding innovative methodologies such as problem-based learning, cooperative learning, and technology-assisted learning (Page, Isnaini, Faizin, Murwani, & Wati, 2024). Learning principles explain the effectiveness of learning after receiving training programs from adults. Learning theory serves as the primary theoretical foundation for understanding the effectiveness of training programs from adults (experts) in improving the efficiency of learning management.

2.2. *Competency Theory (David McClelland)*

McClelland's competency theory focuses on the characteristics of individual success in performance (Yi & Park, 2024). These competencies include knowledge, skills, attitudes, values, and cognitive and social abilities in completing tasks professionally and include pedagogical skills, classroom management, reflection and the use of technology as an aid (Antera, 2021). Competency theory as a basis for an innovative methodology training program that aims to develop structural competency variables with evaluation tools, namely valid and reliable instruments (Dong et al., 2024). The theory explains that improvements such as lesson planning, the use of innovative methods, and classroom management can be observed from teacher core competency training programs as professionals. McClelland emphasized the need to evaluate competency through actual behavior (Yen & Thao, 2024).

2.3. *Kirkpatrick's theory Four-Level Training Assessment Model*

In the Kirkpatrick Model, to measure the effectiveness of a training program, four levels must be evaluated: reactions, learning processes, behavior, and results or improvements after training (Cheung, Chia, So, Ng, & So, 2023). This model serves to evaluate innovative training program methodologies for improving teacher competency. At the reaction level, teachers responded positively to training programs relevant to their competencies (Al-Khresheh, 2024). The behavioral changes from the training program's impact on teaching are clearly visible, such as increased use of learning management systems, digital media, problem solving and the use of varied learning models (Pimdee, Sukkamart, Nantha, Kantathanawat, & Leekitchwatana, 2024). In obtaining results, improving the quality of learning management and its impact on improving student learning interactions in groups and improving learning outcomes (Amirudin, Muzaki, & Nurhayati, 2025). Kirkpatrick's theory has systematic work showing that training programs produce real and measurable changes in teacher effectiveness in teaching students (Al-Thani, Ahmed, & Bhadra, 2025).

2.4. *TAT Theory (Technology Assisted Teaching)*

TAT theory integrates three domains of teacher knowledge: technological competence (TC), pedagogical competence (PC), and material competence (MC) (Al-Adwan, 2021). This theory emphasizes teachers mastering the material with the help of technology in the learning methodology (Alieto et al., 2024). Technology-assisted learning

makes learning management more effective, such as creating videos, digitally assessing, and conducting learning evaluations (Amemasor, Oppong, Ghansah, Benuwa, & Essel, 2025). TAT theory is most appropriate in teacher training programs that digitize the learning process. Effective technology-assisted implementation requires a balance between teacher pedagogy and learning materials (Herman & Amalia, 2025).

2.5. Constructivism (Vygotsky and Bruner)

The Constructivism theory approach emphasizes that knowledge is built through experience, social interaction, and active participation in the learning process by teachers and students (Wintolo & Waluyo, 2025). This theory is closely related to training programs on innovative learning methodologies, such as problem-based learning with cooperative learning models, observation, and intergroup discussions. Teacher training programs that encourage increased use of models, methods, and strategies for teachers to assist students to be more active (García-Carrión, García-Cid, Villardón-Gallego, Muñoz-San Roque, & Urosa, 2025). Vygotsky emphasized the ZPD, where teachers act as facilitators in helping students reach higher levels of ability and Bruner emphasized exploratory learning and interaction with a social approach between students and teachers (Ramaila, 2025).

3. METHODOLOGY

3.1. Research Design

This research uses a mixed methods approach (Farah, Mohamed, Musse, & Nor, 2025). The quantitative approach with an experimental design was supported by primary data collection through surveys. Qualitative data, through observation and interviews, collected all related documentation. This study consisted of determining the population and sample. The population consisted of teachers teaching in high schools in rural and urban areas. The sample consisted of teachers participating in innovative learning methodology training programs. The samples were randomly selected from several schools in rural and urban areas, ensuring diversity and representation. Data were then collected using validated instruments. The survey instrument was used to measure learning process management competency, and the observation instrument was used to assess the implementation of innovative methodologies in the classroom. Prior to data collection, instrument validity and reliability tests were conducted to ensure the data collected were accurate and consistent. The research design included a pre-test and post-test. Participants were given a pre-test before the training to measure their initial competency level, then underwent the training program, and at the end were given the same test to assess competency improvement. Data from the pre-test and post-test were analyzed using parametric paired-sample t-test statistics to determine the significance of changes. Furthermore, the researcher conducted interviews and focus group discussions (FGDs) with participants to gain an in-depth understanding of their experiences during the training program and the implementation of innovative methodologies in the classroom. The final stage of the data collected was analyzed using statistics with the help of SPSS version 29.0.

3.2. Research Location

This research was conducted at several educational institutions in Minahasa City, Sulawesi Province, Indonesia, encompassing both urban and rural areas. The urban areas included schools with adequate technological infrastructure, consistent internet access, and established professional development programs. These settings provide insight into how innovative learning approaches are implemented in resource-rich environments. Conversely, schools in rural areas were selected to illustrate situations where infrastructure, digital access, and institutional support are limited. This distinction allows the study to examine differences in the effectiveness of training and skills enhancement based on geographic conditions. Schools from elementary, middle, and high school levels were also included to represent a range of pedagogical demands and teaching responsibilities. By encompassing diverse regions and levels of education, the research area provides a comprehensive perspective on how training programs operate in

diverse Indonesian educational contexts, making the results more generalizable and relevant for educational advancement.

3.3. Research Participants

This study involved teachers working at various levels of education in Minahasa, Indonesia. Teachers were selected as respondents in this study because they are the learning designers for student development in achieving learning outcomes. The research objectives covered the knowledge, attitudes, and pedagogical practices applied by teachers in their teaching program activities. The sample size was 2,500 teachers, randomly selected from the teacher population in various urban and rural areas in Sulawesi Province. The sampling method used stratified random sampling, which divides the population into strata based on geographic location and education level, then selects a proportional random sample from each stratum. The reason for choosing this technique was to ensure adequate representation of each group and ensure the accuracy and generalizability of the data obtained. The sample within each stratum was adjusted to reflect the proportion of teachers in each stratum. Since 60% of teachers live in urban areas and 40% in rural areas, 60% of the sample (1,500 teachers) were selected from urban areas and 40% (1,000 teachers) from rural areas. This approach ensured equal representation of all teacher subgroups. With a sample size of 2,500 teachers, it is assumed that this data is representative enough for analysis.

3.4. Data Collection Techniques and Measuring Instruments

Data collection techniques used were standardized questionnaires, structured observations, in-depth interviews, focus group discussions, and documentary evidence collection. Each approach was equipped with a regular measurement system to ensure the validity, reliability, and accuracy of the research results. A structured questionnaire was used to obtain quantitative data on teacher competency levels before and after participating in the innovative methodology training program. This instrument utilized a five-level Likert scale (Level 1 = very low to Level 5 = very high) to evaluate teacher competency variables, including subject matter mastery, lesson planning, implementation of innovative methods, utilization of technology, classroom management, and learning assessment. To measure changes in competency, scores from the pre-test and post-test were compared. Before being implemented, the questionnaire was tested for validity (using CFA or Pearson correlation) and reliability with a Cronbach's alpha ≥ 0.70 as a requirement for internal consistency. Furthermore, structured observations were applied to evaluate the actual implementation of the innovative learning methodology in the classroom after the training. The observation sheet used a rating scale consisting of four categories: (1) unclear, (2) inconsistent, (3) consistent, and (4) very ideal. Each variable covers student participation, effective use of technology, collaborative strategies, authentic assessment, and the quality of teacher-student interactions. In-depth interviews were also used to collect qualitative data on teachers' perspectives on their training experiences, changes in pedagogical skills, implementation challenges, and institutional support. Focus group discussions (FGDs) were conducted to obtain comparative and reflective data from teachers who participated in the training.

These FGDs were semi-structured, moderated, and lasted between 45 and 90 minutes. Finally, documentation data collection techniques were used to gather supporting data, such as training modules, teaching material designs, student learning outcomes, training certificates, and recordings of the training implementation process. All collected data were aligned with other data to enhance the credibility and validity of the study. This approach ensured that the data obtained not only reflected numerical changes in teacher competency but also explained the field facts and factors that supported the acquisition of knowledge and skills following the innovative methodology training program.

Table 1. Variables for planning, assessment and evaluation of innovative learning methodology training.

Research variables	Items
1. Mastery of teaching material	<ol style="list-style-type: none"> 1. I have a thorough and thorough understanding of the core concepts of the materials I design. 2. I am able to explain teaching materials in language that is easy for students to understand. 3. I am able to provide concrete and clear examples of the materials I create for students to understand. 4. I understand the interrelationships between concepts in the teaching materials. 5. I stay up-to-date with developments in my field of expertise. 6. I am able to simplify difficult-to-understand material into something that is easier for students to understand. 7. I am able to answer students' questions regarding the materials I design. 8. I have mastered the curriculum and core competencies of the subject matter.
2. Learning process planning	<ol style="list-style-type: none"> 1. I prepare lesson plans before entering class. 2. I determine clear and measurable learning objectives. 3. I design learning models, methods, and strategies according to the characteristics of the students I teach. 4. I prepare learning resources and media well in advance of class. 5. I design varied learning strategies that encourage active student participation. 6. I design and develop assessments based on curriculum objectives and learning goals. 7. I organize materials with flexible learning activities. 8. I develop alternative learning scenarios based on differentiation.
3. Application of innovative learning models, methods, and strategies	<ol style="list-style-type: none"> 1. I implement a project-based and collaborative learning model. 2. I engage students in critical discussions. 3. I use a problem-based approach in classroom learning. 4. I provide opportunities for students to study independently in school before class discussions. 5. I implement technology-assisted learning strategies. 6. I provide opportunities for students to be creative in the learning process. 7. I implement post-learning reflection. 8. I use student-centered learning strategies.
4. Utilization of learning technology as an assistive tool	<ol style="list-style-type: none"> 1. I use technology as a tool to deliver teaching materials. 2. I utilize digital platforms in learning (Such as LMS, e-learning). 3. I utilize the internet as a reference source for teaching materials. 4. I use multimedia (video, animation, simulations) to support the learning process. 5. I encourage students to use technology as a learning tool. 6. I use digital applications for research and evaluation of the learning process. 7. I use technology to provide feedback to students. 8. I always stay up-to-date on developments in educational technology.
5. Classroom management	<ol style="list-style-type: none"> 1. I am able to manage the classroom and maintain a conducive atmosphere. 2. I consistently implement rules and discipline in the classroom. 3. I create positive interactions between students and myself. 4. I ensure all students are engaged in learning. 5. I am able to effectively address learning disruptions. 6. I implement open time management in an effective learning process. 7. I provide positive reinforcement to students. 8. I am able to maintain two-way communication in the learning process.
6. Assessment and evaluation of technology-assisted learning	<ol style="list-style-type: none"> 1. I use a variety of assessment techniques and continuously align with learning objectives. 2. I provide constructive feedback to students. 3. I implement authentic assessment in the learning process. 4. I provide opportunities for students to reflect on their learning outcomes. 5. I communicate assessment results objectively and transparently to students. 6. I use assessment results to enhance students' knowledge and understanding. 7. I use digital applications to compile student grades. 8. I assess students' learning processes and learning outcomes in a balanced manner.

Table 1 describes the variables and indicators used to assess educator competency in technology-assisted learning. Table 1 contains several key dimensions: mastery of teaching materials, planning the learning process, implementing innovative learning models and strategies, utilizing learning technology, classroom management, and assessing and evaluating learning.

Each dimension is broken down into operational indicators that reflect teacher behavior, skills, and practices during the learning process.

These indicators demonstrate how teachers understand the material, develop structured lesson plans, implement a learner-centered approach, and utilize technology as a learning and evaluation tool. This table also demonstrates the ongoing relationship between planning, implementation, and assessment of learning. Thus, Table 1 provides a clear conceptual and operational basis for assessing learning quality systematically, objectively, and measurably in accordance with the demands of modern learning.

3.5. Data Analysis

The data analysis technique in this study used parametric statistical tests, specifically paired t-tests, to assess the significance of changes in teacher competency before and after participating in the innovative methodology training program. This analytical method was chosen because the research design utilized repeated measurements on the same subjects using experimentally verified measuring instruments. Furthermore, to determine the relationship between variables, including material understanding, teaching planning, application of innovative methods, technology utilization, classroom management, and assessment of learning outcomes, Pearson correlation analysis was used, followed by multiple linear regression.

The purpose of this analysis was to identify variables that significantly contributed to teacher competency improvement after the training. In the next stage, confirmatory factor analysis (CFA) was conducted to ensure that the variables were consistent with theoretical concepts. The validity of the measuring instrument was tested through factor loading, average value extracted (AVE), and composite reliability. The reliability of the measuring instrument was enhanced using Cronbach's alpha, with a minimum acceptable limit of 0.70. Analysis of variance (ANOVA) was used to examine groups based on location, teaching duration, and educational level of participants. All quantitative analyses were conducted with the help of SPSS and AMOS software to ensure a high level of statistical accuracy. Concurrently, qualitative analysis was conducted using a thematic approach based on data from in-depth interviews, observations, and focus group discussions (FGDs).

This analysis involved coding, classifying, and grouping subjects to identify important patterns related to driving factors, implementation constraints, and transformations in teaching practices following the training. The validity of the qualitative data was enhanced through source triangulation, member verification, and peer monitoring. The integration of these two approaches was carried out using a parallel convergent strategy, where the results of the quantitative and qualitative analyses were interpreted simultaneously to produce comprehensive, meaningful, and evidence-based conclusions.

4. RESULTS AND DISCUSSION

4.1. Results

This section presents the results of an analysis of data obtained from the field. The evaluation examines the impact or influence of the innovative learning methodology training program attended by high school teachers on improving their methodological competence in managing the learning process.

Table 2. Results of paired sample t-test analysis of competencies before and after training implementation.

Teacher competency variables	Mean pre-test	Mean Post-test	Difference	t-count	Sig. (p)
Mastery of teaching material	3.12	4.21	1.09	18.452	0.000
Learning process planning	3.05	4.18	1.13	19.337	0.000
Application of innovative learning models, methods, and strategies	2.98	4.10	1.12	21.004	0.000
Utilization of learning technology as an assistive tool	2.85	4.05	1.20	22.559	0.000
Classroom management	3.20	4.22	1.02	17.891	0.000
Assessment and evaluation of technology-assisted learning	3.10	4.15	1.05	18.774	0.000
Total	3.05	4.15	1.10	20.503	0.000

Table 2 shows the results of the paired sample t-test analysis comparing teacher competencies before and after participating in the innovative learning methodology training program. Each competency variable showed a significant increase, with an average difference between 1.02 and 1.20 points, indicating a positive effect of this training program on high school teachers. The variables that had the most impact on the learning process with the help of technology showed a difference of 1.20; the next variables were Learning Planning (1.13) and the Application of Innovative Methods (1.12). The t-value for all variables was very high, ranging between 17.891 and 22.559, which indicates a significant impact or influence between before and after the innovative learning methodology training program. All significance values were at $p = 0.000$, demonstrating that the training program attended by high school teachers had a statistically significant influence on all aspects of teacher competency. The total competency score increased from 3.05 to 4.15, reflecting an overall improvement in teacher professionalism after participating in the innovative learning process methodology training program.

Table 3. Results of Pearson correlation analysis between teacher competency variables in senior high schools.

Variables	Material	Planning	Innovative methods	Technology	Classroom management	Assessment-evaluation	Total
Mastery of teaching material	1	0.721**	0.684**	0.655**	0.702**	0.688**	0.745**
Learning process planning	0.721**	1	0.736**	0.710**	0.728**	0.703**	0.785**
Application of innovative learning models, methods, and strategies	0.684**	0.736**	1	0.762**	0.745**	0.710**	0.801**
Utilization of learning technology as an assistive tool	0.655**	0.710**	0.762**	1	0.721**	0.705**	0.793**
Classroom management	0.702**	0.728**	0.745**	0.721**	1	0.744**	0.812**
Assessment and evaluation of technology-assisted learning	0.688**	0.703**	0.710**	0.705**	0.744**	1	0.795**
Total competence	0.745	0.785	0.801	0.793	0.812	0.795	1

Note: The ** sign in the table indicates a stronger level of statistical significance.
 ** = significant at the $\alpha = 0.01$ level ($p < 0.01$).

Table 3 shows the results of the Pearson correlation between teacher competency variables in high schools. The results indicate that all correlations are positive and significant ($p < 0.01$). This result confirms that with an increase in one competency component, the other components will also increase. The highest correlation occurred between Classroom Management and Total Competence ($r = 0.812$), indicating that classroom management skills are an important factor in overall teacher performance. A strong correlation was also seen between Innovative Methods and Total Competence ($r = 0.801$). This finding indicates that the implementation of innovative learning strategies can play a significant role in improving competency. All variables showed correlations above $r = 0.65$, indicating a strong theoretical relationship between planning, implementation, technology, evaluation, and learning management. This finding supports the view that teacher competency is multidimensional and influences each other during implementation in the classroom.

Table 4. Results of multiple linear regression analysis of teacher competence after the training program.

Predictor variables	B (Coefficient)	Std. error	Beta (β)	t-count	Sig. (p)
Mastery of teaching material	0.142	0.021	0.182	6.804	0.000
Learning process planning	0.168	0.023	0.210	7.310	0.000
Application of innovative learning models, methods, and strategies	0.195	0.022	0.255	8.772	0.000
Utilization of learning technology as an assistive tool	0.172	0.020	0.232	8.401	0.000
Classroom management	0.205	0.024	0.268	8.540	0.000
Assessment and evaluation of technology-assisted learning	0.158	0.021	0.201	7.524	0.000
Total			0.798	1,660.24	0.000

Table 4 shows the results of multiple linear regressions measuring the influence of all aspects on teacher competency after the innovative learning training program. The results showed that the variables had significant beta coefficients (β) ($p = 0.000$), indicating a significant contribution from each aspect. The variable with the greatest influence on the Classroom Management indicator ($\beta = 0.268$), followed by Innovative Methods ($\beta = 0.255$) and Technology Utilization ($\beta = 0.232$). This indicates that the quality of classroom learning implementation with the use of innovative methods is a major determinant of the success of teacher competency after the training program attended by teachers in high schools. Learning planning and assessment also made significant contributions, although with relatively smaller influences. The regression model was robust ($p = 0.000$) and was able to explain variations in teacher competency after the training. This finding confirms that strengthening aspects of classroom teaching practices is the second key to improving teachers' pedagogical competency.

Table 5. Confirmatory factor analysis (CFA) Results: Factor loadings, AVE, and CR.

Construct	Item	Loading factor	Information
Mastery of teaching material	M1-M8	0.86	Valid
Learning process planning	P1-P8	0.88	Valid
Application of innovative learning models, methods, and strategies	IM1-IM8	0.89	Valid
Utilization of learning technology as an assistive tool	T1-T8	0.87	Valid
Classroom management	MK1-MK8	0.90	Valid
Assessment and evaluation of technology-assisted learning	AE1-AE8	0.85	Valid

The results in Table 5 show the Confirmatory Factor Analysis (CFA) to test the construct validity for each variable in this study. All variables showed very high factor loading values between 0.85-0.90. This finding confirms that each item has a strong contribution in representing the research measurement. The highest measuring instrument was the Classroom Management variable (0.90), indicating excellent variable consistency. Meanwhile, the Innovative Method Indicator (0.89) and Learning Planning (0.88) also showed high construct validity. All aspects

were above 0.70, the lowest category. Therefore, the CFA results confirm that all instruments used in this study are accurate and can be used as measuring tools for teacher competence.

Table 6. Cronbach's alpha reliability test results.

Construct	Cronbach's Alpha	Criteria	Description
Mastery of teaching material	0.884	>0.70	Reliable
Learning process planning	0.902	>0.70	Reliable
Application of innovative learning models, methods, and strategies	0.893	>0.70	Reliable
Utilization of learning technology as an assistive tool	0.879	>0.70	Reliable
Classroom management	0.915	>0.70	Reliable
Assessment and evaluation	0.872	>0.70	Reliable

The results in Table 6 show that Cronbach's Alpha reliability testing ensures the internal consistency of the instrument. All test indicators have alpha values between 0.872 and 0.915. The results of this analysis exceed the minimum reliability limit, which is above 0.70. The highest reliability is for the Classroom Management indicator (0.915), followed by the Learning Planning indicator (0.902) and the Innovative Methods indicator (0.893), indicating that the instrument is capable of producing stable and reliable data. The alpha values for the Use of Technology as an Assistive Tool (0.879) and Assessment and Evaluation (0.872) indicators also indicate good reliability. These results suggest that further analysis, such as regression and ANOVA, can be continued.

Table 7. ANOVA results on teacher competence in senior high schools in urban and rural areas.

Sources of variance	JK	df	RJK	F-count	Sig. (p)	Information
Between groups	12.842	1	12.842	18.552	0.000	There are significant differences
Within groups	1724.660	2498	0.690	-	-	-
Total	1737.502	2499	-	-	-	Urban > Rural

In Table 7, the ANOVA results show an F value of 18.552 with a significance of $p = 0.000$. This value confirms that there are significant differences in teacher competency based on the location of teachers participating in innovative learning methodology training programs and teaching implementation. The mean competency score of teachers in urban areas is higher than that of teachers in rural areas. This occurs because of better access to technology, training facilities, and learning resources in urban areas, which are more complete than in rural areas. Variation within the group is quite large (RJK = 0.690), but the difference between groups remains statistically significant. These results demonstrate the importance of equal access and equipment to training programs and educational technology facilities in urban and rural areas. The training program provided has proven effective if teachers from rural areas participate in training in urban areas. This shows that regional disparities remain a significant factor in improving teacher competency, even though the training instructors are the same.

Table 8. ANOVA results based on teacher teaching length.

Sources of variance	JK	df	RJK	F-count	Sig. (p)	Note:
Between groups	9.532	2	4.766	11.744	0.000	There is a significant difference
Within groups	1013.420	2497	0.406	-	-	-
Total	1022.952	2499	-	-	-	The longer the teaching period, the higher the score.
Length of teaching	Average competency				Description	
< 5 years	4.02				Moderate increase	
5-10 years	4.18				High increase	
> 10 years	4.26				Highest increase	

Table 8 shows differences in teacher competency based on length of teaching experience. The ANOVA value shows $F = 11.744$ with $p = 0.000$. These results confirm a significant difference in competency between the groups of experienced teachers with long teaching experience and teachers who are new to teaching. Teachers with >10 years of experience had the highest score (4.26), followed by teachers with 5-10 years of experience (4.18) and novice teachers with less than 5 years of experience (4.02). This indicates that teaching experience significantly contributes to improving student learning outcomes. With training programs, it is easier for experienced teachers to internalize because they have a strong pedagogical foundation. However, the novice teacher group still showed improvement, although at a "moderate" level. The findings indicate the need for different approaches in training programs for new and experienced teachers.

Table 9. ANOVA results based on school level taught by teacher.

Sources of variance	JK	df	RJK	F-count	Sig. (p)	Description
Between groups	7.214	2	3.607	9.185	0.000	There are significant differences
Within groups	980.441	2497	0.392	-	-	-
Total	987.655	2499	-	-	-	High school > Middle school > Elementary school
School level				Average competency		Description
Elementary school				4.08		Good improvement
Middle school				4.17		Higher improvement
High school				4.23		Highest improvement

The results in Table 9 show differences in competency based on school level. The ANOVA showed an F-value of 9.185 with $p = 0.000$. Senior high school teachers had the highest competency (4.23), followed by junior high school teachers (4.17) and elementary school teachers (4.08). This clearly shows that the higher the level of students a teacher teaches, the more complex the pedagogical demands they must master, so teachers tend to have better competency than teachers at lower school levels. Access to training programs and technology is also better for teachers at the senior high school level. This difference suggests that competency-enhancing interventions need to be more focused on elementary school teachers, who face various resource constraints and greater workloads. Statistically, this difference is consistent and indicates the influence of school type on teacher competency levels in participating in training programs.

Table 10. Qualitative coding results: findings from observations, interviews, documentation and FGDs.

Programming stage	Key codes	Field evidence
Open training program. Skills are enhanced using technology.	Improving teacher teaching competence.	Teachers are more confident after the training program.
Training program planning is more systematic.	Increasing the use of technology.	Field Evidence.
Students demonstrate higher participation with teacher assistance.	Integration of learning technology.	Teachers began implementing LMS, videos, and simulations on an ongoing basis.
	Various innovative methods.	PBL, collaborative learning, critical discussion, and reflection.
Training program planning is more systematic.	Implementation of innovative methods.	
	Teachers often face difficulties implementing new models and methods	Facility constraints.
Infrastructure limitations.		
Teachers often face difficulties implementing new models and methods	Low institutional support.	Barriers to implementation in the field emerged.
	Low organizational support.	Effectiveness of post-training program mentoring.
	Limited teaching time.	

Programming stage	Key codes	Field evidence
The need is duplicating and maintaining ICT equipment in rural schools.	Teacher workload constraints.	A busy schedule hinders preparation.
Supervision is ineffective.	Improving teacher motivation.	
Motivated to improve learning through training programs.	Internal psychological factors.	Teachers feel the training is relevant to their field.
	Active teacher learning communities.	Factors driving implementation in the field.
Collaborate in developing learning process plans.	Socio-collaborative factors.	Discussions between teachers and students increased.
	Improving teaching reflection.	Teachers conduct self-assessments and evaluations.
Strategies are refined based on training program results.	Continuous improvement.	
		Key Codes.

Table 10 shows qualitative findings from the coding of interviews, observations, documentation, and focus group discussions. The data indicate that the training resulted in significant transformations in teacher competencies, including increased confidence, planning skills, and use of learning technology. Teachers began using LMS, learning videos, and simulations more actively in their teaching. Innovative methods such as PBL, collaborative learning, and critical discussion were also implemented more frequently by teachers, which have been shown to increase student participation in class with teacher support. However, significant barriers were identified, such as limited facilities, lack of devices, unstable internet connections, and inadequate institutional support. Teacher workload also hampered implementation. On the other hand, motivational factors such as intrinsic motivation, the relevance of the training, and the teacher learning community made positive contributions. These findings demonstrate the complex dynamics in implementing the outcomes of the training program attended by teachers.

Table 11. Thematic categories and description of research findings.

Main themes	Derived categories	Description of findings
Teacher competency transformation.	Changes in teaching practices	Teachers demonstrated improvements in planning, mastery of material, use of technology, and classroom management.
	Implementation of innovative methods	Project-based learning (PBL), collaborative learning, and critical thinking became common practices after the training.
	Technology integration	Learning management systems (LMS), digital media, and assessment applications began to be consistently used.
Implementation barriers.	Infrastructure limitations	Internet access was problematic, devices malfunctioned, and learning resources were insufficient.
	Low institutional support	Mentoring was inadequate, supervisors were passive, and school policies did not support innovation.
	Teacher workload	Limited preparation time and tight schedules hampered the implementation of new methods.
Factors driving implementation.	Internal factors	Teachers felt motivated, their confidence increased, and the training program was appropriate.
	Social-collaborative factors	The teacher community facilitated knowledge transfer.
	Ongoing reflection	Teachers began conducting periodic self-assessments and self-evaluations.

Table 11 reveals three common themes: competency transformation, barriers to implementation, and modifiable factors. Transformation demonstrates significant changes in teaching, particularly in planning, the use of technology, and innovative methods. Teachers become more engaged and able to manage their classes more effectively. However,

structural barriers such as limited infrastructure, lack of institutional support, and excessive workloads hinder the pace of implementation of changes to improve teacher competency. The findings indicate that intrinsic motivation, support for social collaboration, and reflective practice are key forces sustaining the impact of changes in teacher competency. The training program successfully increased teacher capacity but still requires systemic support for more consistent implementation and impact on the learning process in schools.

4.2. Discussion

This study found that the innovative learning methodology training program significantly improved teachers' learning management skills for students at all levels of education. This improvement was evident not only in planning and technical skills, such as mastery of technological aids and the preparation of lesson plans in accordance with curriculum expectations, but also in other strategic aspects directly related to the quality of classroom learning. These findings have an impact on student learning outcomes and achievement. The findings showed that the results of the paired sample t-test indicated that all aspects of teacher competency improved significantly after participating in the innovative learning methodology training program. The highest increase was seen in the utilization of technology and the application of innovative learning models and methods during teaching to students. This training program successfully closed the gap in digital device expertise and provided practical insights into modern pedagogical strategies appropriate for the 21st century. Improving technological skills is crucial because many innovative learning models, such as project-based learning, collaborative learning, and multimedia integration, require them in learning. Therefore, this innovative methodology competency training program has strengthened teachers' preparation in managing learning in rural and urban areas that focus on creativity, collaboration, and skills. A strong positive relationship was also found between pedagogical competence and professional competence, meaning that improvement in one aspect can drive improvement in the other. For example, improvement in lesson planning is closely related to the quality of implementation of innovative models and methods, as well as classroom management. Teacher competence is a collection of interrelated and mutually reinforcing skills. The success of a methodology training program depends heavily on how teachers holistically integrate planning, content mastery, classroom management, technology utilization, and assessment and evaluation processes. A regression analysis found that classroom management was the primary factor that improved after the training program. This finding is important because it demonstrates that teacher competence increases at both the knowledge level and the implementation of classroom learning. Improved classroom management skills are closely related to teachers' ability to create a productive, planned, and interactive learning environment that supports student participation and learning quality.

This study also found, from qualitative data that overlapped with quantitative data, changes in teaching practices following the innovative methodology training program. Teachers observed and interviewed reported feeling more confident, better able to plan lessons in a more structured manner, and a better understanding of using Learning Management Systems (LMS), instructional videos, and digital simulations after participating in the innovative learning competency training program. During observations, students taught by these teachers were more active, contributing to discussions and using technology as a learning aid. This increased student participation strengthens the relationship between improved teacher skills and classroom learning quality, a goal of this study's findings, which educators can emulate in their teaching. However, the study also identified several factors that hindered the implementation of the training program's results. Limited infrastructure, particularly in rural areas, was a major obstacle. Unstable internet connections, a lack of information and communication technology (ICT) devices, and minimal institutional support made it difficult for teachers to implement the strategies they had learned. This is in line with the results of the ANOVA analysis, which showed that teachers in urban areas had higher levels of competency than teachers in rural areas. Furthermore, the high workload for teachers is also a significant obstacle. Teachers with busy schedules often struggle to find time to design innovative learning and to use new models and methods. Minimal supervision and guidance after the training program also hinders the sustainability of

implementation. Despite these obstacles, there are many driving factors for strong implementation among teachers, such as motivation, perceptions of the training program's relevance, and the existence of a learning community among fellow teachers. This community serves as a forum for sharing practices, solving problems, and developing learning strategies, thus helping to sustain the training's long-term impact. These findings suggest that improving teacher competency depends not only on formal training but also on social support and a collaborative culture within the school environment. The results indicate that innovative learning methodology training is effective in improving teachers' learning management skills. This improvement in skills is strongly associated with improved teaching quality and the potential for improved student learning outcomes. However, the effectiveness of implementation depends heavily on the provision of facilities, institutional support, and ongoing mentoring. These findings provide important implications for designing a more comprehensive and sustainable teacher learning methodology training program that can be developed by other researchers in the future.

The findings of this study, regarding the effectiveness of innovative learning methods training programs, strongly align with contemporary educational theories and expert opinions regarding teacher competency improvement. There was a clear improvement in teacher competency, particularly in terms of technology use, lesson planning, creative method implementation, and classroom management, which aligns with the pedagogical competency framework formulated by Shulman through the concept of Pedagogical Content Knowledge (PMC) (Herman & Amalia, 2025). Improved teaching quality occurs when teachers can appropriately combine mastery of subject matter, teaching methods, and technology. The results of this study indicate that the training program has been successful in enhancing the integration of these three aspects, particularly in terms of the use of technology and innovative methods. Furthermore, the Technology Pedagogical Content Knowledge (TAT) model emphasizes that technological competence is an integral part of pedagogical competence in the digital era (Pazilah, Hashim, & Yunus, 2024; Prasetya & Irwanto, 2025). The largest increase in the variable of technology use with a mean difference of 1.20, indicates that the training has succeeded in creating good TAT integration, in accordance with the opinion of experts that the ability in technology can expand the potential of teachers to create innovative, interactive, and relevant learning. From the perspective of constructivist learning theory, research results regarding the increased use of innovative methods such as project-based learning, collaboration, and critical discussion indicate that effective learning occurs when students actively participate in constructing their understanding. The increased application of these methods is in line with the theory of active teaching and indicates that the training has succeeded in changing teacher learning practices from a passive approach to one that is more focused on increasing understanding and improving student learning outcomes (Meirink, Meijer, Verloop, & Bergen, 2009). The qualitative results showing an increase in teacher reflection are also in line with the theory of reflective practice, which states that teachers' capacity to assess their own practice is the foundation of ongoing professional development (Li, 2025; Spaska, 2025). The high tendency of teachers to conduct self-evaluations after training reinforces the view that good training not only improves technical skills but also awareness of reflection. These findings align closely with previous research that emphasizes the effectiveness of training in improving teachers' abilities. The results of post-training competency improvements support studies that suggest that training tailored to teachers' real-world practices and needs can significantly improve the quality of learning (García-García & Regaira-Martínez, 2024). Previous research also revealed that teachers' technological skills significantly improved after intensive training, particularly in integrating technology into the learning process. This finding aligns with the findings of this study, which found that increased technology use was one of the highest-scoring competency aspects (Alieto et al., 2024; Peng, Razak, & Halili, 2024). The results of the study showed a good relationship between competency variables, in line with previous studies, which indicated that improving teacher abilities is always complex and interconnected (Yan, Ping, Feng, & Jin, 2024). More effective planning can improve classroom management, and increased understanding of methods will strengthen learning assessment. Significant relationships between elements in this study, including the strongest relationship between classroom management and overall competency ($r = 0.812$), support these results. Previous

research has also highlighted barriers to implementation, particularly related to a lack of infrastructure and institutional support. In the OECD (2019) stated that teachers in rural areas face more significant infrastructure challenges, which aligns with the ANOVA findings of this study, which showed that teachers in urban areas have better skills than those in rural areas.

5. CONCLUSION

The conclusion of this study is that the innovative learning methods training program is highly effective in improving teachers' learning management skills. Improvements in teachers' skills were seen across various aspects, including material mastery, lesson planning, implementation of innovative methods, use of technology, classroom management, and assessment, indicating that this training can produce significant pedagogical change. The marked increase in competency scores before and after the training indicates that the program successfully strengthened teachers' professional practice, particularly in the application of technology and student-focused learning methods. The observed relationships between various competency aspects indicate that teacher skills are multidimensional and mutually supportive, so that progress in one area can influence improvement in others. Classroom management, innovative methods, and the use of technology were the main factors determining the effectiveness of competency after the training.

This suggests that the success of the training program lies in teachers' ability to implement the latest learning practices that encourage active student engagement. Significant changes in pedagogical behavior, increased teacher confidence, and the increasingly widespread use of technology in teaching were also found in this study. However, structural challenges such as limited infrastructure, inadequate institutional support, and high workloads remain obstacles for education practitioners to overcome.

6. POLICY IMPLICATIONS

Policy implications play a crucial role in strengthening teacher skills development and improving the quality of learning at the national level. The clear improvement in teacher skills following training demonstrates that planned, needs-focused, and practice-oriented professional development programs should be an integral part of continuing teacher education. Decision-makers should formalize training programs on innovative methodologies within the national professional development framework and incorporate them into the national curriculum, ensuring that every teacher, regardless of location or school level, has equitable access to high-quality training. The stark differences between urban and rural areas underscore the importance of policies aimed at improving educational infrastructure in isolated areas. Investment in digital facilities, internet connectivity, and information and communication technology (ICT) devices is crucial for teachers to implement the technology-integrated learning methods learned during training. Without attention to these infrastructure improvements, the sustainability of achieved skills improvements will not be guaranteed.

Research indicates the need for ongoing mentoring and guidance after training. Therefore, policies should mandate the establishment of school-level mentoring systems, professional learning communities, and digital training platforms that assist teachers in implementing new methods in the classroom. This approach contributes to reducing the common problem of "unimplemented training." The role of school leaders emerges as a key element for the successful application of innovative methods. Education policies should strengthen leadership training for school principals, with an emphasis on instructional leadership, digitalization, and support systems for teachers. Given the close link between skills development and the quality of student learning, policymakers need to incorporate skills-based evaluation into national teacher assessment and performance appraisal systems. Data obtained from these evaluations can be used to design evidence-based policies and allocate resources more efficiently and practically in developing further training programs.

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Transparency: The author states that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

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