JMKSP (Jurnal Manajemen, Kepemimpinan, dan Supervisi Pendidikan)
Volume 10 (2) 2025, 992-1026
E-ISSN 2614-8021, P-ISSN 2548-7094

Implementation of Academic Supervision to Improve Teachers' Pedagogical Competence in Implementing *Deep Learning* (Multi Site Study: at SMK Tunas Bangsa and SMK Taman Bangsa)

Nuri Rizki Setiawan[1*], Maisyaroh[1], and Burhanuddin[1]
[1] Magister of Education Management State University of Malang, Indonesia

Corresponding author e-mail: nuri.rizki.2401328@students.um.ac.id

Article History: Received on July 26, 2025, Revised on September 27, 2025, Published on September 4, 2025

Abstract: This study aims to describe the implementation of academic supervision in enhancing teachers' pedagogical competence in the practice of deep learning. The research employed a multi-site study with a qualitative descriptive approach, involving various stakeholders related to the implementation of academic supervision in schools, including school supervisors, principals, vice principals, quality assurance teams, human resource development teams, and teachers. Data were collected through observations, interviews, and document analysis. The validity of the data was tested using source triangulation, while the data analysis followed the Miles and Huberman (1994) framework, which consists of three stages: (1) data reduction, (2) data display, and (3) conclusion drawing. The findings reveal that the implementation of academic supervision at SMK Tunas Bangsa and SMK Taman Bangsa has been systematically, holistically, effectively, and sustainably planned, executed, and followed up. This implementation has had a positive impact on improving teachers' pedagogical competence, particularly in applying deep learning.

Keywords: *Academic, supervision, pedagogical competence, teachers, deep learning*

A. Introduction

Teacher pedagogical competence reflects a teacher's ability to perform and fulfill their duties as an educator (Rukajat et al., 2024). Pedagogical competence demonstrates how teachers apply their abilities and skills to interact effectively and manage the classroom in accordance with established educational objectives (Setiawan et al., 2025). In line with this, König et al., (2021) stated that teachers play a crucial role in the learning process at schools. Without teachers' active participation and pedagogical competence, the essence of education cannot be realized. Regardless of how effective supervisors, principals, management, curricula, or facilities may be, if teachers remain stagnant and unwilling to embrace change, the expected quality of education will not be achieved (Tadeko & Fitrasari, 2024).

Based on the results of the 2018 survey on the world's secondary education system conducted by PISA (*Programme for International Student Assessment*) and released in 2019, Indonesia ranked 74th out of 79 participating countries. In other words, Indonesia was in the sixth lowest position. In addition, the Human Development Index has shown a decline over the years, and the quality of teachers in delivering effective learning remains relatively low (Adiputri, 2023; Domínguez-Castillo et al., 2021; Hilmi, 2024).

Similarly, Nasrulloh et al., (2021) stated that students experience considerable difficulty in understanding the lessons delivered by teachers in the classroom. Evidence shows that many teachers still rely solely on textbook content without providing contextual information or relevant examples that would facilitate student comprehension. The concern is that weak pedagogical competence among teachers may hinder the achievement of national education goals, which aim to develop students who are faithful, pious, noble in character, healthy, knowledgeable, capable, creative,

independent, and who grow into democratic and responsible citizens (Picardal & Sanchez, 2022; Quan, 2022; Rao et al., 2023).

Deep learning is an ennobling learning approach that emphasizes the creation of a *mindful, meaningful, and joyful* learning atmosphere through intellectual (thinking), ethical (reasoning), aesthetic (feeling), and kinesthetic (exercising) dimensions in a holistic and integrated manner (Li et al., 2022). In line with this, Niiniluoto, (2022) stated that the deep learning approach focuses on fostering a deeper understanding of subject matter through comprehensive learning experiences, in which students become more cognitively and emotionally engaged in classroom learning (Xu & Sze, 2024).

In this context, the *deep learning* model is considered one of the most relevant approaches to improving the quality of learning in schools. However, weak teacher pedagogical competence raises concerns that this model may not be implemented effectively, which in turn may lower students' competence and academic performance. Consistent with this, Chen et al., (2024) found that teacher pedagogical competence has a significant effect on students' learning motivation, contributing 36.9%, while the remaining influence is attributed to other factors. This finding is further supported by Mărincaș et al., (2025), who revealed that teachers with low pedagogical competence tend to struggle in applying the deep learning approach. As a result, the development of students' critical, creative, and analytical thinking skills becomes less than optimal.

To bridge these problems and gaps, academic supervision plays a crucial role as an instrument for professional coaching and mentoring of teachers in implementing deep learning. Effective academic supervision functions not merely as a control mechanism but more importantly as a means of developing teacher competence through reflective and collaborative approaches (Bogas, 2023;

Muhammad Jundi et al., 2024; Tang et al., 2023). When systematically designed and implemented based on democratic principles, supervision can help teachers identify weaknesses in their teaching practices and find solutions for improvement through discussions and continuous training (Antonio, 2007; Fan & Zhang, 2020; León-Jiménez et al., 2024). Several studies have shown that the implementation of academic supervision can significantly enhance teachers' pedagogical competence (Jacobsen et al., 2024; Setiawan et al., 2025). However, the effectiveness of academic supervision largely depends on the model and approach applied, as well as the specific school context. Therefore, it is essential to conduct comparative studies on the implementation of academic supervision across various educational units to obtain a more comprehensive understanding of best practices that can be replicated.

This study specifically examines the implementation of academic supervision in two leading vocational schools in Malang City, namely SMK Tunas Bangsa and SMK Taman Bangsa, both of which have received A accreditation and developed rapidly in their expertise programs. These schools are also actively engaged in various teacher professional development initiatives, including teaching factory-based learning, lesson study programs, and information technology-based training. Based on observations and interviews, it was found that the implementation of academic supervision involved multiple components and stakeholders, including school assistants, principals, assessors, fellow teachers, and other parties who collectively supported the supervision process.

Through a multisite study approach, this research aims to compare the models, strategies, and practices of academic supervision in enhancing teachers' pedagogical competence, particularly in implementing deep learning. Furthermore, the findings of this study are expected to contribute to the development of academic

supervision policies and serve as a reference for school supervisors, principals, and other stakeholders in designing effective teacher development strategies.

B. Methods

This research employs a qualitative descriptive approach, which aims to understand and describe social phenomena in depth through direct observation in a natural setting (Muhdhar et al., 2024; S. Suherman et al., 2020; Utari et al., 2024). A qualitative descriptive approach is particularly relevant because it enables researchers to analyze behaviors, practices, and phenomena that emerge in the daily lives of individuals or groups. The rationale for choosing this approach is that it allows the problems under study to be explored comprehensively and contextually based on factual and accurate data obtained from the field (Jannah, 2020; Puad & Ashton, 2023).

The type of research used is a multisite study (Magill & Blevins, 2020). A multisite study is conducted across more than one location simultaneously to compare, analyze, and obtain a more comprehensive understanding of the phenomenon under investigation (Bayuo et al., 2024). This study was carried out at SMK Tunas Bangsa and SMK Taman Bangsa, both accredited with grade A and actively engaged in teacher professional development programs.

The research subjects consisted of various stakeholders involved in academic supervision. The participants included 5 teachers, 2 principals, 2 vice principals, 2 school assistants, and 1 quality assurance staff member from each school, totaling 24 informants. The inclusion criteria required that teachers had a minimum of three years of teaching experience and had participated in academic supervision activities during the past year. Informants

who were on leave or not actively engaged in school supervision activities were excluded from the study.

The data collection techniques used were observation, in-depth interviews, and documentation. Observations focused on classroom teaching practices and supervision activities, while interviews explored participants' experiences and perceptions regarding academic supervision. Documentation included supervision reports, lesson plans, and related school policies.

To ensure data validity, this study employed source triangulation (Hidayat et al., 2023). As explained by Japar et al., (2024), triangulation involves cross-checking information from different sources and methods. In practice, data from teacher interviews were verified against classroom observations and analysis of supervision-related documents. This process was carried out iteratively at different stages of data collection to minimize subjectivity and strengthen credibility.

The data analysis technique followed the Miles and Huberman (1994) model, which consists of three interactive stages:

1. Data Reduction – sorting, coding, and selecting relevant information from field notes, interview transcripts, and documents;
2. Data Display – organizing the reduced data into narrative descriptions, matrices, or visual diagrams to illustrate the implementation of academic supervision;
3. Conclusion Drawing and Verification – interpreting the data, formulating patterns, and confirming findings through repeated cross-checking with the sources (Muhibbin et al., 2023; Rusilowati et al., 2024).

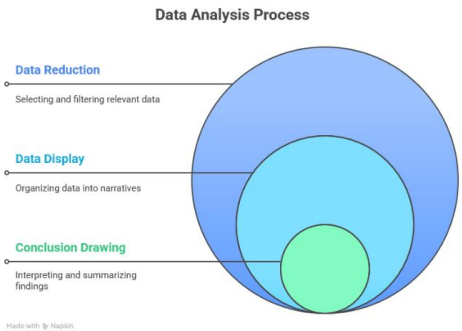

Figure 1. Data Analysis Process

Research procedures were divided into two stages:

1. Preliminary Research – obtaining research permits, preparing instruments, and arranging the research schedule;
2. Field Research – conducting observations, interviews, and documentation with school assistants, principals, and teachers, focusing on the planning, implementation, and follow-up stages of academic supervision.

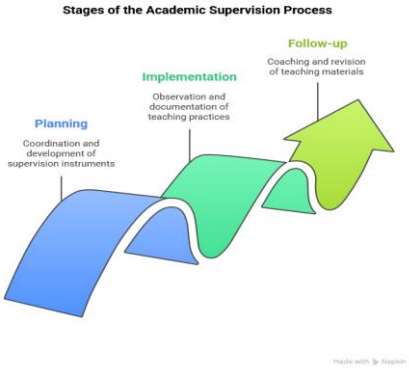

Figure 2. Stage of the Academic Superison Process

C. Results and Discussion

Academic supervision is a collaborative process that involves various parties with complementary roles and responsibilities. In the context of this research, the implementation of academic supervision at SMK Tunas Bangsa and SMK Taman Bangsa involves six main actors who play a role in planning, implementing, and following up on supervision. Each actor has a different contribution according to their tasks and level of involvement.

The following table summarizes the role of each actor in the academic supervision process and their level of involvement:

Table 1. Actors in academic supervision

Actors	Role in Academic Supervision	Level of Involvement
Teacher	Main subject being supervised; recipient of assistance and training	Center (core)
Assessor	Carry out supervision, class observation, reflection, give feedback	Very active
PSDM Team (Quality Assurance Team)	Technical coordinator of supervision, facilitator of assessors and reporter of supervision results	Coordinative-Facilitative
Head of Curriculum	Designing and socializing supervision activities	Planner-Communicator
Principal	Not directly involved, but receives reports and gives directions	Strategic coordinator
School assistant	Conduct random clinical supervision, advanced training	External-Technical Support

The findings presented in Table 1 illustrate the diverse roles of stakeholders in the implementation of academic supervision. Teachers occupy the central position as the primary subjects being supervised, while assessors take on the most active role in carrying out supervision activities. The PSDM team at SMK Tunas Bangsa functions as the technical manager, overseeing facilitation and reporting, whereas the Head of Curriculum plays a strategic role in supervision planning. At the leadership level, the principal acts as a director who receives and evaluates the results of supervision, while school assistants are more directly engaged in technical tasks, particularly in follow-up supervision and training, to ensure the sustainability of teacher development.

In connection with these findings, this study examines how academic supervision is implemented in two vocational schools SMK Tunas Bangsa and SMK Taman Bangsa both of which are recognized for their accreditation status and active involvement in teacher professional development programs. The following section presents the data obtained from observations, interviews, and documentation during the research process.

Table 2. Implementation of Academic Supervision at SMK Tunas Bangsa and SMK Taman Bangsa

Aspect	SMK Tunas Bangsa	SMK Taman Bangsa
Purpose of academic supervision	(1) Assistance and monitoring implementation of learning *deep learning* (2) Administrative requirements staffing and performance management according to applications in PMM	(1) Assistance and monitoring implementation of deep learning *deep learning* (2) Performance management according to the application in PMM and Ekinerja

	and Ekinerja	
Supervision Team	(1) Chaired by the Coordinator of Human Resources Improvement (PSDM) under the guidance of the Vice Principal for Curriculum. (2) 9 assessors and assist teachers who are allied or in the same field as the assessor.	(1) Chaired by the Head of the School Quality Assurance Team, which is equivalent to the Vice Principal in terms of coordination. (2) Assessors number 8 people and accompany teachers who are allied or in the same field as the assessor.
Implementation time	(1) Once per semester	(1) Twice per semester
Planning process	(1) Coordination of the Principal, Head of Curriculum, PSDM Team and Assessor Team (2) Communicate the purpose of academic supervision to the supervision team, then the Head of Curriculum conveys information related to the implementation of academic supervision to teachers at school (3) Preparing sheets related to supervision (carried out by the PSDM	(1) Coordination Principal, Quality Assurance Team, Waka Kurikulum, PSDM Team and Assessor Team (2) Communicate the purpose of academic supervision to the supervision team, then the Quality Assurance Team conveys information related to the implementation of academic supervision to teachers at school. (3) Preparing supervision sheets (carried out by the quality assurance team) (4) Coordinating with the

	Team) (4) Coordinating with the PKG (Teacher Performance Assessment) Assesor Team facilitated by the PSDM team.	PKG (Teacher Performance Assessment) Assessor Team facilitated by the quality assurance team.
Implementation process	(1) Academic supervision by the assessor team and facilitated by the PSDM team (2) Supervision is carried out by visiting classroom learning by bringing devices and reflecting together on the learning that has been carried out with *coaching/mentoring-based* reflection. (3) The school principal is not directly involved in the technical academic supervision. (4) School assistants are involved by randomly visiting classrooms and conducting clinical supervision to several fellow teachers. (5) The instrument of	(1) Academic supervision by a team of assessors and facilitated by the quality assurance team (2) Supervision is carried out by visiting classroom learning by bringing tools and reflecting together on the learning that has been carried out with *coaching mentoring-based* reflection (3) The school principal is not directly involved in the academic supervision technique (4) School assistants are involved by randomly visiting classrooms and conducting clinical supervision to several fellow teachers. (5) The instrument of supervision result is collected to PSDM for reporting.

	supervision results is collected to the PSDM team for reporting.	
Follow-up Process	(1) Feedback activities are provided by the assessor to teachers with joint reflection and discussion as well as improvement and revision of *deep learning-based learning* tools (2) Follow-up assistance (*coaching / mentoring*) is carried out on an ongoing basis (3) Coaching, training program and monitoring of teacher development on an ongoing basis	(1) Feedback activities are provided by the assessor to teachers with joint reflection and discussion as well as improvement and revision of *deep learning learning* tools. (2) Further assistance (*coaching / mentoring*) is carried out on an ongoing basis (3) Continuous coaching, training and monitoring of teacher development program

Based on the data above, it can be explained that there are several aspects that are an important part of the implementation of academic supervision at SMK Tunas Bangsa and SMK Taman Bangsa. In the first aspect, namely the purpose of academic supervision where both SMK Tunas Bangsa and SMK Taman Bangsa that the implementation of this supervision aims in two ways, namely the first is to provide assistance and monitor the implementation of *deep learning and* the second is as a requirement for personnel administration and performance management according to the application in PMM and Ekinerja. This is in line

with the interview conducted with Mrs. IP who is the PSDM coordinator of SMK Tunas Bangsa who said that:

> *"Academic supervision activities are part of the main duties of the PSDM team. Regarding the purpose of supervision, namely to provide assistance and monitor how the learning process, especially the latest deep learning-based learning, is carried out. This is important as part of the learning quality improvement program and provides assistance to teachers if they experience difficulties / obstacles in implementing learning in the classroom. We also routinely carry out this monitoring as part of personnel administration. Several applications related to staffing such as the PMM and Ekinerja BKN applications require performance monitoring, evaluation and supervision activities which are an integral part of performance management. We will later report this to the principal and school assistants who have the main tasks and functions in improving teacher performance".*

This explanation is supported by Mrs. Teacher AF, who is part of the quality assurance team at SMK Taman Bangsa, who said that:

> *"Supervision at SMK Taman Bangsa is carried out in accordance with the regulations and guidelines that have been compiled together. In supervision activities, there will definitely be mentoring and monitoring activities for teachers carried out by the school quality assurance team. This is important in order to monitor the competence and quality of teachers. Especially with this deep learning program, we will aggressively carry out mentoring activities. The implementation of this supervision is also part of employee performance management which will later be reported to related*

> *parties such as school principals, school assistants and the government that covers this matter. We optimally utilize the PMM and Ekinerja BKN platforms in the implementation of supervision".*

Regarding the supervision team involved in this supervision activity, after observing the archives and school documents, it was found that the implementation and management of academic supervision activities at SMK Tunas Bangsa will be organized by the Human Resources Improvement Coordinator (PSDM) under the guidance of the Vice Principal for Curriculum and the team that assists in it. The number of assessors (senior teachers) who assist in the implementation of supervision totals 9 people and assist teachers who are allied or in the same field as the assessor. This is different from the implementation of supervision at SMK Taman Bangsa, where the implementation of supervision activities is chaired by the Chairperson of the School Quality Assurance Team, which is equivalent to the Deputy Principal. The number of assessors is 8 people and accompanies teachers who are allied or in the same field as the assessor. This is supported by the results of an interview with Mrs. IP who said that:

> *"Assessors have a very crucial and important role in the implementation of academic supervision activities in schools. The existence of assessors is very helpful in assisting and monitoring teacher performance. The number of assessors at SMK Tunas Bangsa is 9 people. has several important criteria such as length of service, competence, ability to supervise, competence in implementing learning and other important factors. In addition, the assessors we choose must assist teachers who are allied or in the same field as the assessor so that their credibility can be maintained".*

Based on the results above, data can be obtained that the time for implementing supervision varies in each school. At SMK Tunas Bangsa, the implementation of supervision activities is carried out once per semester, while at SMK Taman Bangsa it is carried out twice per semester. The timing of supervision is a very important part because it will prepare various technical matters that greatly support the achievement of the objectives of the implemented academic supervision.

In the next aspect, namely the implementation of academic supervision which begins with planning activities. Based on the results of interviews and field observations, it is found that there are several planning activities carried out at SMK Tunas Bangsa, namely starting from 1) coordination of the Principal, Head of Curriculum, PSDM Team and Asessor Team, then communicating the objectives of academic supervision to the supervision team, 2) Waka Curriculum conveys information related to the implementation of academic supervision to teachers at school. 3) The PSDM team prepares sheets related to supervision in accordance with existing guidelines. 4) Coordinating with the PKG (Teacher Performance Assessment) Assessment Team facilitated by the PSDM team. This is different from the planning of supervision implementation at SMK Taman Bangsa which is facilitated by the school quality assurance team in coordination with related parties. Based on the results of an interview with the Head of Curriculum of SMK Tunas Bangsa, it was stated that:

> "*Planning supervision activities is very important, this is because through this implementation, we will ensure the various facilities needed in the implementation of this supervision. We carry out coordination and collaboration well. We have involved related parties such as the PSDM Team, the Assessor Team, in this planning".*

This is in line with the statement of Mr. RA as a teacher at SMK Taman Bangsa, who said that:

> *"The supervision planning process is very important for me as a teacher, this is because all information related to supervision activities will be informed at this stage. Before I am supervised, I am always given assistance by my assessor. Then I was told the purpose of the supervision. The quality assurance team facilitates very well in planning academic supervision activities related to deep learning".*

The next aspect is the implementation of supervision. Based on the results of interviews and field observations, it was found that there were several planning activities carried out at both SMK Tunas Bangsa and SMK Taman Bangsa, namely 1) Academic supervision by a team of assessors and facilitated by the PSDM team at SMK Tunas Bangsa, while at SMK Taman Bangsa it is facilitated by the school's quality assurance team, 2) Academic supervision is carried out by visiting classroom learning by bringing devices and reflecting together on the learning that has been carried out with *coaching/mentoring-based* reflections. 3) The principal is not directly involved in the technicalities of academic supervision, 4) School assistants are involved by visiting classrooms randomly and conducting clinical supervision to several fellow teachers, 5) The instrument of supervision results is collected to the PSDM team as reporting.

Based on the observation, it was also found that the assessor Mr. IF from SMK Tunas Bangsa conducted academic supervision activities by visiting the class taught by the LN model teacher. In this activity, the assessor checks the teaching device documents that have been prepared, after checking, he continues with lesson observation activities carried out by the model teacher. Then after the lesson ended, continued with reflection activities on the learning that had

been carried out with *coaching/mentoring-based* reflection discussing the results of the learning that had been carried out. Assessor IF provided some input and suggestions related to *deep learning* that had been carried out.

The same thing was done by Asessor DI who is a teacher at SMK Taman Bangsa who assisted Mr. RA by checking the teaching device documents that had been prepared, after checking, he continued with lesson observation activities carried out by the model teacher. Then after the learning ended, continued with reflection activities on the learning that had been carried out with a *coaching/mentoring-based* reflection discussing the results of the learning that had been carried out. The DI assessor provides some input and suggestions related to the *deep learning* that has been carried out.

The next aspect is follow-up. The follow-up aspect focuses on reflection. The activities carried out include: 1) feedback activities provided by the assessor to the teacher with joint reflection and discussion as well as improvement and revision of *deep learning*-based learning tools, 2) further assistance (*coaching/mentoring*) is carried out on an ongoing basis, 3) coaching programs, training and monitoring of teacher development on an ongoing basis. The three activities are carried out with different patterns in each school. At SMK Tunas Bangsa, the follow-up pattern is to collect all the instruments that have been filled in by the assessors, then analyzed and improved together, facilitated by the PSDM team. The results of academic supervision are reported to the principal to coordinate improvements. After completing the activity, it is continued with coaching, training and monitoring of teacher development such as training on *deep learning* models, PJBL, Gamefication learning, etc. which will be filled by school assistants in turn.

This is somewhat different from the follow-up implementation at SMK Taman Bangsa, where the process begins by collecting all

instruments completed by the assessors, followed by joint analysis and improvement with the quality assurance team. The results of academic supervision are then reported to the principal, who coordinates further improvements with the quality assurance team. After these activities, teacher development continues through coaching, training, and monitoring, which are carried out in coordination with the MGMPS for each subject. This process is further reinforced by additional material provided by school assistants and other competent parties who serve as resource persons during the activities. Overall, the results indicate that the implementation of academic supervision covering planning, execution, and follow-up runs effectively and fosters a conducive environment by involving relevant stakeholders.

Building on these findings, the qualitative data analysis identified dominant keywords from interviews with various actors engaged in academic supervision at SMK Tunas Bangsa and SMK Taman Bangsa. To illustrate the frequency and significance of these keywords, a word cloud visualization was employed, highlighting the central themes that emerged from the interviews.

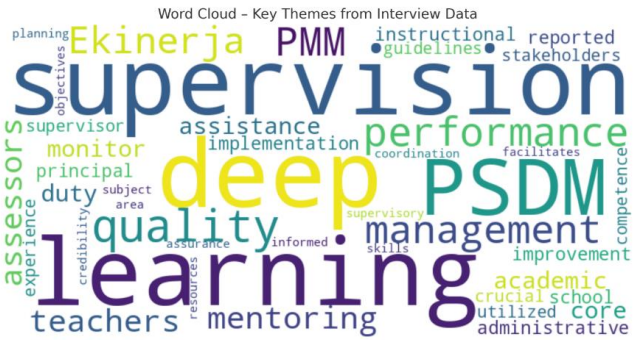

Figure 3. Key Themes from Interview Data

Figure 3 shows that the words "supervision," "learning," and "deep" are the most dominant words, indicating that the main focus of academic supervision is directed at strengthening *learning*

practices based on *deep learning*. The words "PSDM," "mentoring," and "assessors" also appear in large sizes, reflecting the important role of the HR development team and teacher mentoring in program implementation.

In addition, the words "performance," "quality," "PMM," and "Ekinerja" indicate that supervision is not only teaching-oriented but also closely related to teacher performance management and administrative reporting through a national digital platform. The presence of the words "management," "monitor," "training," and "support" also emphasizes that the supervision process runs as a systematic effort that is integrated with education quality management at the education unit level.

This visualization strengthens the narrative that academic supervision in the two schools is structured, collaborative and based on teachers' professional needs. In addition to the keyword analysis, the main themes that emerged from the in-depth interviews with principals, teachers, assessors and the quality assurance team were organized in the form of thematic mapping. This visualization helps explain the main focus of the actors' attention in the implementation of *deep learning-based* academic supervision.

Figure 4. Themes from Interview Data

Figure 4 shows the four main themes that emerged from analyzing the interviews with key informants: *teacher performance*, *principal leadership*, *professional development* and *evaluation process*. The theme of *teacher performance* occupies a central position because academic supervision is primarily aimed at improving the quality of teaching and teachers' competencies in implementing learning, especially those based on *deep learning*. The *principal leadership* theme shows the important role of the principal as a strategic director and facilitator in creating an effective supervision environment. Furthermore, *professional development* underlines the function of supervision as a means of increasing teacher capacity through training, reflection and coaching, not merely as a control tool. The *evaluation process* theme emphasizes that supervision has been integrated with performance appraisal systems through platforms such as PMM and Ekinerja, making it part of broader performance management. The four themes as a whole reflect that the practice of academic supervision in schools is not only procedural but also transformative, with an orientation towards fostering and strengthening the quality of education in a sustainable manner.

Based on the results of the research, it was found that the purpose of academic supervision in the two schools studied was firstly to provide assistance and monitor the implementation of *deep learning* and secondly as a requirement for personnel administration and performance management according to the application in PMM and Ekinerja. Various informants believe that the implementation of this supervision will improve their pedagogical competence, especially in *deep learning*. In supervision activities, assessors provide continuous assistance and adjust the needs of the teachers being assisted.

This is in line with Estaji & Ghiasvand, (2022) dan Nisa et al., (2024), who said that supervision can develop teacher

professionalism, namely the ability possessed by teachers which is the result of cognitive work to carry out tasks, besides that through supervision, coaching activities or activities carried out by a professional to assist teachers and other education personnel in improving teaching materials, methods and evaluation by stimulating, coordinating and assisting continuously so that teachers become more professional in improving the achievement of school goals. This statement is reinforced by Ngwenya, (2020) which says that continuous academic supervision is scientifically proven to improve teacher competence in compiling Teaching Modules / RPPs at SMP Negeri 1 Waibakul. This is evidenced by the increase in the number of good teacher lesson plans from 52% to 85% after academic supervision. In addition, the number of lesson plans collected also increased from 67% to 100%.

The implementation of academic supervision activities at SMK Tunas Bangsa will be organized by the Human Resources Improvement Coordinator (PSDM) under the guidance of the Vice Principal for Curriculum and the team that assists in it. The number of assessors (senior teachers) who help implement supervision totals 9 people and assist teachers who are allied or in the same field as the assessor. This is different from the implementation of supervision at SMK Taman Bangsa, where the implementation of supervision activities is chaired by the Head of the School Quality Assurance Team, which is equivalent to the Deputy Principal. The number of assessors is 8 people and accompanies teachers who are allied or in the same field as the assessor.

This is in accordance with the regulation Permendikbud No. 15/2018 on Fulfilling the Workload of Teachers, Principals, and School Supervisors in Article 2 Paragraph (2) which says that school principals carry out managerial duties, entrepreneurial development, and supervision of teachers and education personnel. This implies that the principal is fully responsible as the main supervisor. If the number of teachers to be supervised is very large, the principal can delegate the implementation to the vice principal

or senior teachers in the form of a formal supervision team with the number adjusting to the needs in the school.

This also applies to the timing of supervision where article 2 paragraph (3) states that the principal's workload is fully to carry out these tasks, including academic supervision at least twice a school year to each teacher. This shows that although the implementation time of supervision at SMK Tunas Bangsa and SMK Taman Bangsa still fulfills the applicable rules, namely at least twice a school year.

Planning academic supervision in schools is a very important initial stage in the implementation of supervision to improve the quality of learning and teacher professionalism. This is in line with the thoughts of Hidayati et al., (2025) who say that supervision planning is an important foundation to ensure supervision activities run systematically, according to teacher needs, and have a direct impact on improving the quality of learning.

The findings related to academic supervision planning at SMK Tunas Bangsa and SMK Taman Bangsa are 1) Academic supervision is conducted by a team of assessors and facilitated by the PSDM team at SMK Tunas Bangsa, while at SMK Taman Bangsa it is facilitated by the school quality assurance team, 2) Academic supervision is carried out by visiting classroom learning by bringing devices and reflecting together on the learning that has been carried out with *coaching/mentoring-based* reflections. 3) The principal is not directly involved in the technicalities of academic supervision, 4) School assistants are involved by visiting classrooms randomly and conducting clinical supervision to several fellow teachers, 5) The instrument of supervision results is collected to the PSDM team as reporting

In this planning activity, it has been carried out systematically and the involvement of related parties such as the PSDM team and the

quality assurance team, both of which have a share and role in the implementation of supervision and performance management. The principals and school assistants also provide direction and input related to the implementation of academic supervision but are not fully involved in the technical implementation of academic supervision. The planning of academic supervision refers to the Ministry of Education and Culture's guidelines which state that Planning for academic supervision is carried out to ensure that the implementation of supervision runs systematically, purposefully and sustainably to improve the quality of learning in schools.

In line with this, Dimyati et al., (2019) said that a well-planned and collaboratively implemented supervision approach can increase the intensity and quality of learning carried out by teachers. Good academic supervision planning is a strategic step that determines the success of supervision in improving the quality of education in schools. In line with this, Noor & Sofyaningrum, (2020), state that the academic supervision planning process needs to prepare supervision tools such as a complete list of supervisors and supervised teachers, annual, monthly, and weekly learning activities, classroom visit schedules, and supervision instruments that have been developed. Planned academic supervision should be implemented properly. The supervision team needs to make preparations, scheduling and socialization in advance to the teachers who will be supervised. In addition, supervisors also need to choose the right supervision techniques and instruments so that the target of improving teachers' pedagogical skills can be achieved as expected.

The implementation of academic supervision is the core stage in the supervision process which aims to guide and assist teachers in improving the quality of learning. This activity is carried out by the supervision team systematically based on a previously prepared plan. In line with this, A. Suherman et al., (2020) say that the implementation of academic supervision is a series of activities

involving classroom observation, discussion of observation results, and provision of training or coaching to improve teacher competence in carrying out learning. This is in line with the research of Yuliana et al., (2023) which says that at the implementation stage the supervision team reviews the learning administration, reviews the lesson plan, observes the implementation of learning, and supervises the assessment of learning outcomes then continues by reviewing the completeness of the learning outcomes assessment instrument.

The findings on the implementation of academic supervision activities in the two schools studied are. 1) Academic supervision by a team of assessors and facilitated by the PSDM team at SMK Tunas Bangsa, while at SMK Taman Bangsa it is facilitated by the school quality assurance team, 2) Academic supervision is carried out by visiting classroom learning with tools and reflecting together on the learning that has been carried out with *coaching/mentoring-based* reflection. 3) The principal is not directly involved in the technicalities of academic supervision, 4) School assistants are involved by visiting classrooms randomly and conducting clinical supervision to several fellow teachers, 5) The instrument of supervision results is collected to the PSDM team as reporting. In addition, the findings of the study show that the assessors in both schools checked the teaching tool documents that had been prepared, after checking, they continued with lesson observation activities carried out by the model teacher. Then after the lesson is concluded, continued with reflection activities on the learning that has been carried out with *coaching/mentoring-based* reflection discussing the results of the learning that has been carried out. The assessor provides some input and suggestions related to the *deep learning* that has been carried out.

The implementation of academic supervision is in line with the theory presented by Cansoy et al., (2025) who say that the implementation of academic supervision is a stage where the

supervisor observes and evaluates the teaching and learning process in the classroom, then conducts dialog or reflection with the teacher, provides feedback, and plans follow-up to improve the quality of learning. This is in line with the research of Nisa et al., (2024) which states that the implementation of academic supervision during learning is carried out either directly meeting face-to-face with the teacher. The process of providing feedback is carried out by means of discussion with the learning supervisor. This was added by Hossain et al., (2024) in his study examining the effect of coaching-based academic supervision on teacher performance at UPT SPF SD Negeri 3 Kasimpureng.

The implementation of supervision is carried out through a *coaching* strategy that involves intensive mentoring, joint reflection, and continuous development of teacher competencies. The results showed that this approach was effective in improving teacher performance in learning management. The results of the research and reference sources show that the scope of implementation of academic supervision is checking planning files, observing and evaluating the teaching and learning process in the classroom, then conducting dialog or reflection with teachers (Cansoy et al., 2025; Hidayati et al., 2025; Noor & Sofyaningrum, 2020).

Academic supervision follow-up is an important step to ensure that the results of supervision can be implemented effectively to improve the quality of *deep learning*. In line with this, Wulandari & Arifin, (2020) says that academic supervision follow-up is a systematic activity after the implementation of observations to ensure that teachers understand the results of supervision and are able to implement learning improvements. This can take the form of reflective discussions, training, *coaching*, and continuous monitoring. The findings on follow-up activities in this study are 1) feedback activities are given by the assessor to teachers through reflection and joint discussion as well as improvement and revision

of learning tools based on *deep learning,* 2) further assistance (*coaching/mentoring*) is carried out on an ongoing basis, 3) coaching programs, training and monitoring of teacher development on an ongoing basis.

The three activities are carried out with different patterns in each school. At SMK Tunas Bangsa, the follow-up pattern is to collect all the instruments that have been filled in by the assessors, then analyzed and improved together, facilitated by the PSDM team. The results of academic supervision are reported to the principal to coordinate improvements. After completing the activity, it is continued with coaching, training and monitoring of teacher development such as training on *deep learning* models, PJBL, Gamefication learning, etc. which will be filled by school assistants in turn (Chung, 2023; Ouahi et al., 2024; Wu, 2023; Zhang et al., 2023).

This is somewhat different from the implementation of the follow-up at SMK Taman Bangsa where the implementation of the follow-up begins by collecting all the instruments that have been filled in by the assessors, then analyzing and improving together with the quality assurance team. The results of academic supervision are reported to the principal to coordinate improvements with the quality assurance team. After completing the activity, coaching, training and monitoring of teacher development is continued by returning to MGMPS in each subject. In addition, this is reinforced by additional material provided by school assistants and other competent parties who become resource persons at the activities held.

The implementation of this follow-up is in line with Espinosa et al., (2024) view that the follow-up process in academic supervision should be carried out by fostering teachers' reflection, commitment and willingness to improve learning practices. Principals and supervisors should not only deliver the results of supervision, but

should be instructional leaders who are able to inspire and facilitate continuous improvement through dialog, professional guidance and collaboration.

In line with this, Campuzano, (2023) said that follow-up or evaluation of academic supervision is an activity in the context of providing *feedback* on the results of observations and assessments made when observing and following teacher activities during teaching in the classroom. The form of follow-up academic supervision carried out by the principal can be in the form of encouragement, reinforcement, direction and guidance, coaching, and providing solutions to problems faced by teachers while teaching in the classroom. The results of the research and reference sources show that the scope of follow-up academic supervision includes the delivery of constructive feedback, reflective discussions, and improvement planning with teachers. The aim is to help teachers understand the strengths and weaknesses in the learning process and design appropriate improvements.

D. Conclusions

This study, conducted at SMK Tunas Bangsa and SMK Taman Bangsa in rural Indonesia, highlights how academic supervision can be systematically, structurally, and sustainably implemented to strengthen teachers' pedagogical competence, particularly in applying deep learning. Unlike much of the existing literature that focuses on urban or well-resourced contexts, this research provides new insights into how supervision strategies can be adapted to schools with limited infrastructure yet strong communal collaboration. By situating the analysis in a rural setting, this study addresses a significant gap in the global literature on educational leadership and supervision, demonstrating how contextually grounded practices can yield meaningful improvements in teaching quality.

The findings reveal several key aspects. First, the objectives, supervision teams, and implementation timelines were carefully determined in line with existing guidelines, with slight variations across schools that did not detract from the core goals of supervision. Second, planning processes in both schools demonstrated a commitment to tailoring supervision programs to teacher needs, supported by strong coordination among principals, school assistants, and related stakeholders. Third, implementation included classroom observations, document checks, and coaching sessions that emphasized intensive mentoring, reflection, and continuous competency development. Finally, follow-up activities such as coaching, peer-teaching assistance, and workshops on deep learning created sustainable opportunities for teacher growth. Together, these processes ensured that supervision was systematic, holistic, and impactful.

The contribution of this study lies in showing that academic supervision, when embedded in rural school ecosystems, can transcend resource limitations and create a culture of reflective, sustainable teacher development. Practically, the results provide valuable lessons for school leaders seeking to design supervision models that are context-responsive and for policymakers aiming to strengthen professional development frameworks in diverse educational settings. Furthermore, this study offers researchers outside Indonesia comparative insights into how supervision strategies can be localized without losing their effectiveness. In doing so, it advances both theoretical and practical understanding of academic supervision as a lever for enhancing deep learning in global education.

E. Acknowledgement

Author should present list of Acknowledgement at the end. Any financial or nonfinancial support for the study should be acknowledged.

References

Adiputri, R. D. (2023). The Influence of Global Education in Indonesia: PISA Tests, Different Conceptions of National Assessment and the Policymaking Process. In *Education and Power in Contemporary Southeast Asia*. https://doi.org/10.4324/9781003397144-4

Antonio, D. M. S. (2007). Creating better schools through democratic school leadership. *International Journal of Leadership in Education*, *11*(1), 43–62. https://doi.org/10.1080/13603120601174311

Bayuo, J., Wong, F., Li, Y., Lu, W., & Wong, A. (2024). Framing the Multi-Centre Qualitative Research Design as a Novel Methodology for Nursing and Healthcare Research: Reflections and A Methodological Discussion. *Journal of Advanced Nursing*. https://doi.org/10.1111/jan.16548

Bogas, P. (2023). Greater diversification of activities, greater integration of student profiles. In *Handbook of Research on Coping Mechanisms for First-Year Students Transitioning to Higher Education* (pp. 265–278). IGI Global. https://doi.org/10.4018/978-1-6684-6961-3.ch016

Campuzano, M. E. P. (2023). Effects of School Supervision on Quality in Primary and Lower Secondary Level. *Revista Electronica de Investigacion Educativa*, *25*. https://doi.org/10.24320/REDIE.2023.25.E16.4538

Cansoy, R., Kılınç, A. Ç., & Türkoğlu, M. E. (2025). Barriers to school principals' effective instructional supervision practices: evidence from a centralised educational context. *Educational Studies*, *51*(1), 114–131. https://doi.org/10.1080/03055698.2024.2322942

Chen, A., Li, W., & Fu, W. (2024). Unleashing digital superheroes: Unravelling the empathy factor in digital competence and online teacher autonomy support. *British Journal of Educational Technology*, *55*(4), 1790–1810. https://doi.org/10.1111/bjet.13433

Chung, K. S. (2023). Deep Learning-Based Adaptable Learning Analytics Platform for Non-verbal Virtual Experiment/Practice Learning Contents. In Y. X.-S., S. R.S., D. N., & J. A. (Eds.), *Lecture Notes in Networks and Systems: Vol. 693 LNNS* (pp. 683–690). Springer

Science and Business Media Deutschland GmbH. https://doi.org/10.1007/978-981-99-3243-6_55

Dimyati, M., Supriyati, Y., & Akbar, M. (2019). Analysis of the effect of supervision, self- efficacy, and work commitments on teacher's professionality (Case study: Junior high school in east Jakarta-Indonesia). *International Journal of Innovative Technology and Exploring Engineering*, *8*(6), 99–103.

Domínguez-Castillo, J., Arias-Ferrer, L., Sánchez-Ibáñez, R., Egea-Vivancos, A., García-Crespo, F. J., & Miralles-Martínez, P. (2021). A competence-based test to assess historical thinking in secondary education: Design, application, and validation. *Historical Encounters*, *8*(1), 30–45. https://doi.org/10.52289/hej8.103

Espinosa, J. L., Rodríguez, A. D. V, Bravo, A. V, Vázquez-Armenta, G., & Lopez, M. (2024). We're all in this together: How peer-assisted learning makes everyone strong. In t*he Lifelong Learning Journey of Health Professionals: Continuing Education and Professional Development* (pp. 147–163). IGI Global. https://doi.org/10.4018/978-1-6684-6756-5.ch008

Estaji, M., & Ghiasvand, F. (2022). Classroom Supervision and Professionalism: Matches and Mismatches in the Perceptions of Novice and Experienced Teachers. *Applied Research on English Language*, *11*(3), 1–36. https://doi.org/10.22108/ARE.2022.131707.1817

Fan, G., & Zhang, L. (2020). Education governance and school autonomy: The progressive reform of K-12 school in China. In *Handbook of Education Policy Studies: School/University, Curriculum, and Assessment, Volume 2* (pp. 55–93). Springer Singapore. https://doi.org/10.1007/978-981-13-8343-4_3

Hidayat, I. M., Siregar, E. S., Hasibuan, S. A., Ika Purnama Sari, & Anggraini, Y. (2023). THE IMPLEMENTATION OF CLASSPOINT IN LEARNING ENGLISH: A CASE STUDY AT SMK MUHAMMADIYAH 3 KARANGANYAR ON ELEVENTH GRADE IN ACADEMIC YEAR 2021/2022. *JISAE: Journal of Indonesian Student Assessment and Evaluation*, *9*(2). https://doi.org/10.21009/jisae.v9i2.36808

Hidayati, W., Raharjo, T. J., & Sutarto, J. (2025). Effectiveness of Academic Supervision Models in Improving Teacher Performance in Kindergarten Schools. *Perspektivy Nauki i Obrazovania*, *73*(1), 718–731. https://doi.org/10.32744/pse.2025.1.46

Hilmi, I. (2024). Teacher Competencies, The Shortage of School Resources and Mathematics Achievement Based on PISA 2018 Indonesia. *Mathematics Education Journal*, *18*(2), 245–258. https://doi.org/10.22342/jpm.v18i2.pp245-258

Hossain, M. N., Long, Z. A., & Seid, N. (2024). Emotion Detection Through Facial Expressions for Determining Students' Concentration Level in E-Learning Platform. In Y. X.-S., S. Sherratt, N. Dey, & A. Joshi (Eds.), *Lecture Notes in Networks and Systems: Vol. 1012 LNNS* (pp. 517–530). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/978-981-97-3556-3_42

Jacobsen, M., Friesen, S., & Becker, S. (2024). LEARNING DOCTORAL SUPERVISION IN EDUCATION: A CASE STUDY OF ON-THE-JOB DEVELOPMENT OF EFFECTIVE MENTORING PRACTICES. *International Journal of Doctoral Studies*, *19*. https://doi.org/10.28945/5375

Jannah, M. (2020). The implementation of character education on the tarbiyah and teachers training faculty at the state Islamic University Indonesia (morality reinforcement approach). *International Journal of Innovation, Creativity and Change*, *12*(12), 1–24. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85084446652&partnerID=40&md5=f6a269f54887412faae0256a3d9e5626

Japar, M., Sumantri, M. S., & Heldy, R. P. P. (2024). Analysis of Character Education Values: School-Based Character in Indonesia. *Educational Administration: Theory and Practice*, *30*(1), 334–347. https://doi.org/10.52152/kuey.v30i1.665

König, J., Blömeke, S., Jentsch, A., Schlesinger, L., née Nehls, C. F., Musekamp, F., & Kaiser, G. (2021). The links between pedagogical competence, instructional quality, and mathematics achievement in the lower secondary classroom. *Educational Studies in Mathematics*, *107*(1), 189–212. https://doi.org/10.1007/s10649-020-10021-0

León-Jiménez, S., Segovia-Aguilar, B., & del Mar García-Cabrera, M. (2024). Dialogic Pedagogical Gatherings: Evolution of Teacher Training for Social Impact. *HSE Social and Education History*, *13*(3), 188–206. https://doi.org/10.17583/hse.15141

Li, C., Huang, C., & Yang, H. (2022). Development of artificial intelligence application in oral clinical diagnosis and treatment. *Journal of*

Prevention and Treatment for Stomatological Diseases, *30*(11), 821–826. https://doi.org/10.12016/j.issn.2096-1456.2022.11.010

Magill, K. R., & Blevins, B. (2020). Theory–praxis gap: Social studies teaching and critically transformational dialogue. *Teachers College Record*, *122*(7), 179–204.

Mărincaș, A., Trif, S., & Opre, N.-A. (2025). The Relationship Between Students' Perception of Teacher Enthusiasm and Learning Motivation: The Mediating Role of Basic Psychological Needs. *Cognition, Brain, Behavior. An Interdisciplinary Journal*, *29*(1), 137–158. https://doi.org/10.24193/cbb.2025.29.07

Muhammad Jundi, Dalle, M., & Safwan Rehan. (2024). Cultivating Unity, Soft Skills, and Arabic Proficiency among Students: A Comprehensive Exploration of Mukhayyam al-Lughah al-Arabiyah Program. *LISANIA: Journal of Arabic Education and Literature*, *8*(1), 58–82. https://doi.org/10.18326/lisania.v8i1.58-82

Muhdhar, M. H. I. A., Maharani, O. N., Abdillah, R. R., Ilma, S., & Mardiyanti, L. (2024). Analysis of critical thinking skills of SMAN 7 Malang students. In H. Habiddin & T. Ronceviv (Eds.), *AIP Conference Proceedings* (Vol. 3106, Issue 1). American Institute of Physics. https://doi.org/10.1063/5.0215533

Muhibbin, A., Patmisari, P., Naidu, N. B. M., Prasetiyo, W. H., & Hidayat, M. L. (2023). An analysis of factors affecting student wellbeing: Emotional intelligence, family and school environment. *International Journal of Evaluation and Research in Education*, *12*(4), 1954–1963. https://doi.org/10.11591/ijere.v12i4.25670

Nasrulloh, I., Rahadian, D., Hamdani, N. A., Imania, K. A. N., & Rikaldi, P. B. R. (2021). A comparative study: Multimedia interactive use on contextual and cooperative approaches in increasing mathematical understanding. In K. I., W. I., J. null, & A. C.U. (Eds.), *Journal of Physics: Conference Series* (Vol. 1987, Issue 1). IOP Publishing Ltd. https://doi.org/10.1088/1742-6596/1987/1/012015

Ngwenya, V. C. (2020). School-based supervision enhances the professional development of teachers. *South African Journal of Education*, *40*(3), 1–10. https://doi.org/10.15700/saje.v40n3a1744

Niiniluoto, I. (2022). Concepts, Experts, and Deep Learning. In *Frontiers Collection: Vol. Part F902* (pp. 577–586). Springer VS. https://doi.org/10.1007/978-3-030-92192-7_31

Nisa, K., Imron, A., Sobri, A. Y., Hariyadi, R., Anggara, R. A., Risaldi, D., Azizah, F., Attamimi, M. R., & Nada Salym, A. Q. (2024). Increasing teacher professionalism through the implementation of digital academic supervision in Indonesian secondary school: Personal learning networks as mediator. *Journal of Infrastructure, Policy and Development*, *8*(8). https://doi.org/10.24294/jipd.v8i8.6420

Noor, I. H. M., & Sofyaningrum, E. (2020). The academic supervision of the school principal: A case in Indonesia. *Journal of Educational and Social Research*, *10*(4), 81–93. https://doi.org/10.36941/JESR-2020-0067

Ouahi, M., Khoulji, S., & Kerkeb, M. L. (2024). Analysis of Deep Learning Development Platforms and Their Applications in Sustainable Development within the Education Sector. In S. K., G. O., & K. M.L. (Eds.), *E3S Web of Conferences* (Vol. 477). EDP Sciences. https://doi.org/10.1051/e3sconf/202447700098

Picardal, M. T., & Sanchez, J. M. P. (2022). Effectiveness of Contextualization in Science Instruction to Enhance Science Literacy in the Philippines: A Meta-Analysis. *International Journal of Learning, Teaching and Educational Research*, *21*(1), 140–156. https://doi.org/10.26803/ijlter.21.1.9

Puad, L. M. A. Z., & Ashton, K. (2023). A critical analysis of Indonesia's 2013 national curriculum: Tensions between global and local concerns. *Curriculum Journal*, *34*(3), 521–535. https://doi.org/10.1002/curj.194

Quan, L. (2022). An Analysis of the Influence of Different Ways of Context Construction on the Teaching Effect of Intensive Reading and Extensive Reading for English Majors. *Advances in Multimedia*, *2022*. https://doi.org/10.1155/2022/6833203

Rao, N., Li, Q., Murphy, S., & Chu, S. L. (2023). The Context for Contextualizing - Design Implications for Adaptive Teacher Support Systems for More Relevant Instruction. In C. M., C. N.-S., K. R., R. G., S. D.G., & T. A. (Eds.), *Proceedings - 2023 IEEE International Conference on Advanced Learning Technologies, ICALT 2023* (pp. 71–73). Institute of Electrical and Electronics Engineers Inc. https://doi.org/10.1109/ICALT58122.2023.00027

Rukajat, A., Gusniar, I. N., Abas, T. T., Nurkhalizah, E., & Bachruddin, R. (2024). Utilizing Information and Communication Technology in Scalable Management Strategies for TeacherDevelopment. *EAI*

Endorsed Transactions on Scalable Information Systems, *11*(2), 1–11. https://doi.org/10.4108/eetsis.4444

Rusilowati, A., Hidayah, I., Nugrahani, R., Abidin, Z., Hutagalung, F. D., Sofchah, T., & Ariyanti, S. W. (2024). Child-Friendly School And Its Relationship With The Merdeka Curriculum In Forming The Students' Character Through Science Learning. *Jurnal Pendidikan IPA Indonesia*, *13*(1), 137–146. https://doi.org/10.15294/jpii.v13i1.44482

Setiawan, D., Triyono, M. B., Nurtanto, M., Majid, N. W. A., & Hamid, M. A. (2025). Assessing pedagogical competence of productive teachers in vocational secondary schools: a mixed approach. *Journal of Education and Learning*, *19*(2), 792–804. https://doi.org/10.11591/edulearn.v19i2.21930

Suherman, A., Komariah, A., Kurniady, D. A., Rahyasih, Y., & Karnati, N. (2020). The improvement of teaching effectiveness through supervising academic practice with the grow me please model. *International Journal of Innovation, Creativity and Change*, *12*(5), 411–422. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85084406387&partnerID=40&md5=3615be5dd963da664c038f8510a6c8a2

Suherman, S., Zafirah, A., Agusti, F. A., & Usman, R. (2020). The Effectiveness of AR-Geometry Interactive Book in Increasing Students' Mathematical Reasoning Skill. *Journal of Physics: Conference Series*, *1554*(1). https://doi.org/10.1088/1742-6596/1554/1/012075

Tadeko, N., & Fitrasari, D. (2024). TPACK e-learning development for increasing pedagogical competence in science's teacher. In S. A., R. U., S. M., & R. K. (Eds.), *AIP Conference Proceedings* (Vol. 3058, Issue 1). American Institute of Physics. https://doi.org/10.1063/5.0201247

Tang, J., Zhang, P., & Zhang, J. (2023). DESIGN AND IMPLEMENTATION OF INTELLIGENT EVALUATION SYSTEM BASED ON PATTERN RECOGNITION FOR MICROTEACHING SKILLS TRAINING. *International Journal of Innovative Computing, Information and Control*, *19*(1), 153–162. https://doi.org/10.24507/ijicic.19.01.153

Utari, R., Wijayanti, W., Abduljabar, C. S., Niron, M. D., Rahmawati, T., & Wibowo, U. B. (2024). A Comparative Study of Middle School's

Ethical Climate in Indonesia. *Ethics in Progress*, *15*(1), 26–54. https://doi.org/10.14746/eip.2024.1.2

Wu, Y. (2023). Methods for Predicting Student Learning Behavior in Inclusive Education Scenarios with Deep Learning. *ACM International Conference Proceeding Series*, 1002–1006. https://doi.org/10.1145/3644523.3644704

Wulandari, S. A., & Arifin, Z. (2020). Digital pedagogical competence evaluation of teachers and strategies of school principals. In A. E.A., S. A., W. H.S., M. null, & H. M. (Eds.), *Journal of Physics: Conference Series* (Vol. 1469, Issue 1). Institute of Physics Publishing. https://doi.org/10.1088/1742-6596/1469/1/012075

Xu, S., & Sze, S. (2024). Enhancing University Performance Evaluation through Digital Technology: A Deep Learning Approach for Sustainable Development. *Journal of the Knowledge Economy*. https://doi.org/10.1007/s13132-024-01928-7

Yuliana, L., Setiawan, J., & Fadli, M. R. (2023). The performance of vocational high school principal's learning supervision in Indonesia. *International Journal of Evaluation and Research in Education*, *12*(3), 1486–1496. https://doi.org/10.11591/ijere.v12i3.24995

Zhang, J., Wu, J., Sun, X., Yang, Y., & Zhou, M. (2023). Technology-Enabled Project-Based Learning: Let Every Child Embrace "Good Learning." In *Lecture Notes in Educational Technology: Vol. Part F1761* (pp. 93–99). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/978-981-99-6225-9_11