

The Influence of Coaching and Individual Academic Supervision of School Principals on Teachers' Professionalism Competencies in Deep Learning

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ABSTRACT

The main purpose of this study is to evaluate the influence of the application of coaching and supervision of academic individuals by school principals on the professional ability of teachers to apply *Deep Learning* (deep learning) in the ranks of public schools in the Toroh District area, Grobogan Regency. The researcher applied a quantitative approach through the explanatory survey method. The subjects that became the population in this research involved all public school educators in Toroh District, Grobogan Regency, with a total of 394 individuals. The determination of the research sample resulted in a number of 198 respondents who were netted through the calculation of the Slovin formula and the application of the *simple random sampling* method. The main data collection instrument relies on the distribution of questionnaire questionnaires supported by documentation study techniques. Furthermore, the series of information analysis stages carried out include checking the analysis requirements, multiple linear regression testing, t-test, F-test, and evaluation of determination coefficients which are all processed with the help of the IBM SPSS program. Through this design, the research findings are projected to be able to prove that the variables of individual academic supervision and coaching initiated by the principal bring a positive and meaningful influence on improving teachers' professional competence in executing *Deep Learning*-based learning. Through academic individual supervision, teachers receive specific guidance relevant to their needs as well as constructive input to mature teaching design and practice. Overall, the output of this scientific study is expected to enrich theoretical treasures as well as make a practical contribution in the realm of educational supervision research

Keywords: Academic individual supervision, Teacher Professional Competence, Deep Learning

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INTRODUCTION

Improving the quality of education in the 21st century relies heavily on the existence of human resources who master high-level thinking skills, creativity, group synergy, and effective communication skills. At the basic education level, the success of internalizing all these competencies is in the hands of teachers who play an important role as the main facilitators in teaching and learning activities. The world organization UNESCO also emphasizes that continuous professional development programs for teachers have a very strong correlation with improving the quality of education globally. In line with this view, the orientation of education in Indonesia is now leading to the implementation of an Independent Curriculum that actively encourages the adoption of Deep Learning, which is a learning paradigm that emphasizes conceptual understanding, reflective reasoning, problem-solving, and active participation of students (Dahri et al., 2021; Ghamrawi et al., 2024; He et al., 2024)

Successful implementation of Deep Learning requires educators to have qualified competency capacity, both in mastering the substance of the material and in formulating, operating, and evaluating contextual teaching activities (Lillejord & Børte, 2020). However, some scientific studies report the phenomenon that teachers in public elementary schools still often face serious obstacles when developing stimulating learning scenarios 21st century skills and students' critical thinking skills (Lu et al., 2023). These barriers are suspected to arise because the professional support provided to teachers in adapting to this new paradigm transformation has not been optimal.

One of the important pillars that contributes to improving teachers' professional competence is coaching activities initiated by school principals. Through dialogue spaces built collaboratively and contemplatively, the coaching process is transformed into an effective form of professional mentoring to harness the best potential of individuals, stimulate the discovery of independent solutions, and encourage work productivity (Atkinson et al., 2022; Jones & Smith, 2022; Rakap & Balikci, 2023; Schachter et al., 2025; Yang et al., 2022). In the school ecosystem, these interventions make it easier for educators to critique their teaching methods, identify operational problems, and autonomously design corrective measures. The implementation of structured and consistent training has been shown to improve students' active involvement in the classroom, the professionalism of educators, and the overall quality of learning (Bragonzoni, 2023; Diller, 2024; Larson et al., 2025; Rosenberg, 2022).

In addition to training tools, another supporting tool that is no less important to accelerate the professional capacity of educators is academic individual supervision. The academic individual supervision agenda serves as a medium of personal assistance by the principal to teachers that includes the stages of direct review, providing feedback, reflective thinking, and preparing follow-up steps to improve the quality of teaching (Bagawan et al., 2023). Principals can optimize the efficiency of this competency improvement by directing individual supervision as a form of special support tailored to the needs map real every teacher. However, the reality in this field often shows that the implementation of academic supervision in many educational institutions is still stuck only in the formalities of fulfilling official documents, thus losing its main breakthrough power in improving the quality of learning (Arifin et al., 2023; Catling, 2022; Hodge, 2016; Lee et al., 2023; Wiyono et al., 2021).

Based on the findings of preliminary research in a number of public elementary schools in Toroh District, Grobogan Regency, there were signs that individual training activities and academic supervision carried out by school principals were not carried out ideally. Instead of triggering the continuous growth of teacher professionalism, the majority of the ongoing supervision agenda is still dominant in checking the completeness of teaching administration. At the same time, teachers face great challenges in formulating meaningful learning concepts based on Deep Learning that are adaptive to the growth of students' critical strength, creativity, cooperation, and communication. This clear gap shows the incompatibility between the ideal targets of macro education policies and the empirical reality of teacher professional development in this field.

The design of the solution offered in this scientific study is based on an empirical analysis of the importance of the influence of individual academic training and supervision on school principals on teachers' professional competence in the scope of Deep Learning learning. When the supervision of academic individuals is positioned as a permanent and planned professional support structure, training acts as a self-capacity driving force that prioritizes aspects of empowerment and independent reflective thinking. The simultaneous integration of these two managerial strategies is expected to strengthen teachers' skills in designing and implementing educational processes that are in line with Deep Learning principles.

The research areas of academic guidance and training actions have been extensively studied by previous researchers. Through a consistent evaluation and feedback scheme, it was found that instructional training programs have succeeded in reforming the quality of teacher pedagogy for the better (Lu et al., 2023). In addition, other research proves that the application of coaching has a significant impact on the advancement of teaching techniques and the professionalism of educators (Kadroon, 2023). In line with that, academic supervision actions

by school leaders have also been confirmed to have a positive impression on teachers' maturity in designing and implementing learning (Toh et al., 2022). However, the existing treasure trove of literature still examines the topic of academic supervision and training activities as two separate entities. The urgency of this research is based on the momentum of the implementation of the Independent Curriculum which pays great attention to the concept of *Deep Learning*. The policy requires educators to have professional capacity to develop and actualize innovative, reflective, and substantive learning in order to foster 21st century skills in students. Nevertheless, the real contribution of the coaching agenda and academic individual supervision to strengthening teachers' professional competence is not considered to be optimal. Facts on the ground show that these interventions are still often stuck in administrative formalities and have not touched the practical aspects in the classroom optimally.

As a strategic effort to escalate teachers' professional competencies in the Deep Learning learning ecosystem, this research integrates two aspects of professional coaching, namely coaching and academic individual supervision by school principals, into a new and innovative conceptual model. In addition, the operational basis of this research is based on the dynamics of the implementation of the Independent Curriculum which places Deep Learning as a crucial instructional instrument to boost the potential of students. On this basis, the output of this research is projected to be able to contribute theoretical scientific novelty to the methodology of developing the professional capacity of elementary school teachers in adopting Deep Learning learning.

The main target of the implementation of this research is to analyze the real contribution of coaching variables and individual supervision actions. Academic principals play a role in strengthening teachers' professional abilities in implementing Deep Learning learning methods in the scope of public elementary schools in the Toroh District area, Grobogan Regency. Specifically, the planned set of assessment flows includes three main focuses. The first focus is to dissect the significance of the impact of coaching activities led by school principals for increasing the professional capacity of teachers in the context of Deep Learning. The next step is directed to examine how the intervention of academic individual supervision by school leaders can affect the professional competence of educators in the same learning model. Finally, this research will measure the amount of influence produced simultaneously by the combination of coaching programs and academic individual supervision on teachers' professional competence in adopting Deep Learning principles. Through all stages of scientific investigation, the researcher intends to construct a new empirical model that is able to accurately map the pattern of dynamic relationships between coaching, academic individual supervision, and educator professional competence in order to formulate a more applicable teacher development strategy formulation in supporting the successful implementation of the Independent Curriculum.

Scientific treasures in the field of education management are projected to receive valuable theoretical contributions from the output of this study, especially those closely related to the expansion of teachers' professional competency theories, personalized academic supervision methods, and school principal coaching instruments. In addition to the theoretical aspect, the novelty of this study lies in presenting an objective portrait of empirical data regarding the level of effectiveness of combining academic individual supervision and coaching approaches to accelerate the internalization of Deep Learning concepts at the level of basic educational institutions. This kind of integrative topic is considered very crucial considering its existence which so far has been very rarely explored in depth in the discussion stage or previous academic literature.

The output of this scientific study can be used as a practical instrument for school principals in formulating individual coaching and supervision agendas that have a high level of effectiveness, reflection-based, and run continuously. Through the application of these findings, the capacity of understanding as well as the technical skills of educators in designing and actualizing Deep Learning-based learning models is expected to develop significantly. In addition, the data and conclusions from this research have the potential to be a strategic reference for education authorities and policy makers in formulating various programs to

accelerate teacher competencies while strengthening the pillars of instructional leadership at the elementary school level.

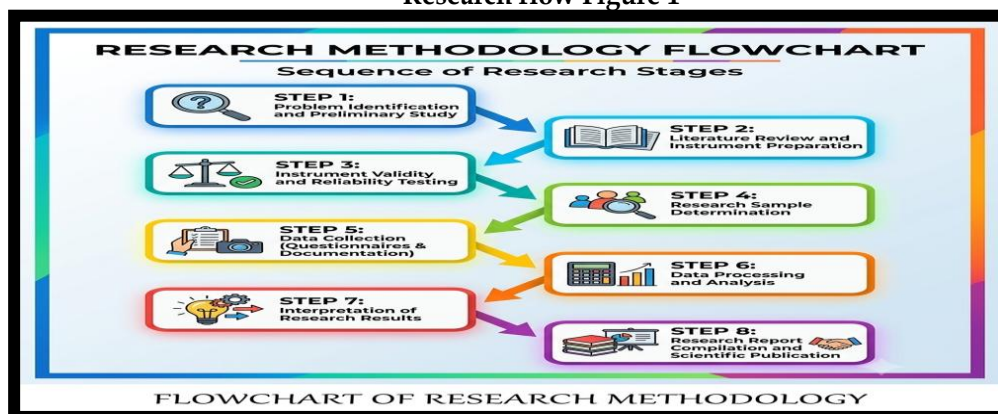
Academically, this study provides a strong stimulus for the implementation of future follow-up research that focuses on the development of teacher professional models by relying on coaching methods and academic supervision at various levels of educational institutions. The theories and facts produced in this study can also be positioned as the basic foundation in designing new intervention frameworks, compiling operational manuals, and initiating large-scale experimental research. These steps are very important to empirically test the extent of the efficiency of individual coaching programs and academic supervision actions in boosting instructional quality and achieving student learning achievement in the future.

METHOD

The methodological design applied in this scientific study relies on a quantitative approach with an explanatory survey design. The selection of quantitative methods is based on the need for research to apply statistical testing in dissecting the interaction and contribution between variables objectively. Through an explanatory survey approach, the researcher intends to comprehensively describe the extent of the influence of the principal's coaching actions and the individual academic supervision of the principal on teacher professionals in implementing Deep Learning learning in public elementary schools in Toroh District, Grobogan Regency. In the analysis process of this study, three types of interrelated variables were determined, namely Coaching from the Principal which functions as the First Free Variable (X1), Individual academic supervision of the Principal as the Second Free Variable (X2), and Teacher's Professional Competence in Deep Learning as the Bound Variable (Y).

The parties involved as subjects in the implementation of this research are educators who serve in public elementary school institutions within the scope of Toroh District, Grobogan Regency. The target population recorded in this study amounted to 394 teachers. In order to obtain an accurate representation of the subjects of the total population, the process of determining the sample size was calculated through the Slovin formula combined with the Simple Random Sampling drawing technique, so that the final sample number was 198 respondents. The construction of the chart below provides a structured visualization of the operational stages of the research scheme.

Research flow Figure 1



Untuk mengurai pentingnya dampak program pelatihan dan supervisi akademik individu para kepala sekolah terhadap kapasitas kompetensi profesional para pendidik dalam ekosistem Deep Learning, studi ini menjalankan pendekatan kuantitatif melalui metode survei penjas. Penggunaan metodologi kuantitatif ini bertujuan untuk menguji secara objektif hubungan antar variabel sekaligus menghasilkan kesimpulan yang dapat digeneralisasi secara luas melalui instrumen pengukuran numerik dan pengujian statistik (Stanley & Jarrell, 2005) Sementara itu, model survei penjelasan diterapkan karena memiliki kemampuan yang andal dalam memetakan dan menjelaskan hubungan timbal balik yang terbentuk antara variabel tidak terikat dan terikat berdasarkan data yang dikumpulkan dari responden (Caprioli, 2004)

Kelompok individu yang menjadi target studi ini mencakup semua guru di sekolah dasar negeri di Distrik Toroh, Kabupaten Grobogan, dengan total 394 individu. Penentuan ukuran sampel menghasilkan perhitungan 198 pendidik yang dijangkau melalui strategi pengambilan sampel acak sederhana, sebuah teknik pengambilan sampel yang memastikan setiap anggota populasi memiliki probabilitas yang sama untuk terlibat sebagai unit representatif dalam studi (Tejada & Punzalan, 2012).

Proses pengumpulan data di lapangan bergantung pada kombinasi instrumen kuesioner dan teknik dokumentasi. Distribusi kuesioner digunakan untuk mengumpulkan data empiris terkait pelaksanaan pelatihan prinsipal, kegiatan supervisi individu akademik, dan tingkat kompetensi profesional guru dalam konteks pengajaran Deep Learning. Di sisi lain, metode studi dokumentasi diterapkan untuk memperoleh data pendukung yang valid mengenai profil sekolah dan file lengkap administrasi penelitian lainnya.

Pembuatan alat penelitian didasarkan pada indikator terukur dari setiap variabel, menggunakan model skala Likert dengan empat opsi jawaban. Sebelum kuesioner ini diberikan kepada responden sebenarnya, peneliti terlebih dahulu memeriksa validitas dan keandalan untuk memastikan bahwa setiap pernyataan dalam instrumen dapat mengukur variabel penelitian secara presisi, konsisten, dan andal (Borsboom et al., 2004).

Serangkaian analisis data dimulai dengan pemeriksaan prasyarat yang terdiri dari tes normalitas, tes multikolinearitas, dan tes heteroscedasticity. Setelah semua prasyarat ini terpenuhi, pengaruh pelatihan kepala sekolah dan supervisi individu akademik terhadap kompetensi profesional guru dalam pelaksanaan Deep Learning dianalisis melalui pengujian hipotesis menggunakan rumus regresi linier ganda, t-test, F-test, dan pengukuran koefisien penentuan. Semua langkah komputasi dilakukan dengan bantuan perangkat lunak IBM SPSS. (Hawkins, 1981)

The main orientation of this quantitative stage is to dissect the extent to which the professional competence of public elementary school teachers in Toroh District, Grobogan Regency, in implementing Deep Learning learning is significantly influenced by the actions of academic individual supervision and coaching coaching from the principal. The quantitative design with this explanatory survey scheme is carried out systematically. The information collection relied on questionnaires and supporting document files obtained from 198 teacher respondents who were selected through a random testing mechanism.

The authenticity and validity of the information in this study is ensured through the application of a triangulation strategy which includes elements of source, method, and time. The source triangulation process is carried out by comparing and cross-checking data obtained from students, teachers, and school principals. In order to maintain the consistency of the data collected, the triangulation aspect of the method is realized by combining the findings of direct observation, in-depth interviews, and analysis of written documents. Meanwhile, to eliminate potential temporal bias, time triangulation is applied through scheduling data collection at several different moments. The researcher also underwent a verification process by participants (member verification) by asking the informants to reassess the suitability of the data interpretation results to ensure the accuracy of the meaning. In addition, an audit trail is neatly arranged to document each phase of research operations, so that all data produced is proven to be accurate, reliable, and able to represent real phenomena in the field.

The conclusion formulation of this research is constructed in stages based on the results of data processing that have been completed. In the initial phase, the researcher formulated a tentative conclusion that was sourced directly from the findings in the field. The series of findings was then revalidated through the process of matching the databases that had been collected and through an in-depth discussion agenda with key informants. In order to strengthen conceptual coherence academically, the researcher also correlates the results of the empirical analysis with relevant theories and scientific ideas. Furthermore, the final conclusion formulation is designed by integrating important fact propositions as well as the results of in-depth thematic interpretation. The pattern of presentation of the research outputs is deliberately aligned with the main orientation of the study while prioritizing the significance of its applicative contribution in the practical context in the field.

RESULTS AND DISCUSSION

1. This study aims to analyze the extent to which the professionalism of teachers, especially in applying the concept of deep knowledge search at the elementary school level in Toroh District, Grobogan Regency, is influenced by the personal academic guidance and supervision provided by the principal. All quantitative databases that have been collected in this research are processed statistically to determine the results of hypothesis testing. Before stepping into the hypothesis test stage, the researcher first carried out a series of prerequisite tests for data analysis which included normality testing, multicollinearity testing, and heteroscedasticity testing to ensure the validity of the regression model.

1) Normality test

The data processing procedure in this study relies on the use of the Statistical Product and Service Solutions (SPSS) application version 25. Given the sample size in this research of more than 100 respondents, the normality testing of the data was analyzed using the Kolmogorov-Smirnov method. The status of the data dissemination can be detected by paying close attention to the acquisition of significance values listed in the Kolmogorov-Smirnov output column. The characteristics of the data distribution are categorized as normal distribution if the significance index shows a number above 0.05. On the other hand, if the significance value is below 0.05, it can be concluded that the data is not distributed normally. The formulation of statistical hypotheses for normality testing is mapped as follows.

H0: data from a normally distributed sample.

H1: data are not derived from a normally distributed sample.

The criteria used to reject or not reject H0 based on P-value are as follows.

If the *P-value* < α , then H0 is rejected.

If the *P-value* $\geq \alpha$, then H0 is accepted.

The results of the normality test calculation can be seen in the following table.

Normality Test Table 1

DATA NORMALITY TEST REPORT		
One-Sample Kolmogorov-Smirnov Test		
N (Sample Size)		Unstandardized Residual 159
Normal Parameters ^{a,b} [cite: a,b]	Mean	.0000000
	Std. Deviation	3.55798489
Most Extreme Differences	Absolute	.073
	Positive	.068
	Negative	-.073
Kolmogorov-Smirnov Z		1.186
Asymp. Sig. (2-tailed)		Sig. .120
a. Test distribution is Normal		
b. Calculated from data.		

Based on the data collected from filling out the questionnaire, the acquisition of a significance value in the normality test showed a number of 0.120. The index is proven to be larger when compared to the standard value $\alpha = 0.05$ listed in the normality test output table. These statistical findings provide evidence that the null hypothesis (H₀) is declared acceptable. Therefore, it can be said that all the data in this study has been distributed normally.

2) Multicollinearity Test

Multicollinearity testing was performed with the intention of identifying whether there were significant signs of linear relationships among independent variables in the regression model. In the context of this research, the use of the test is intended to ensure the status of the

relationship between coaching variables and academic individual supervision so as not to interfere with the objective assessment of teachers' competencies in the implementation of Deep Learning. The data presentation in the table below explains the details of the number acquisition from the results of the multicollinearity test.

Multicollinearity Test Table 2

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Based on the multicollinearity analysis, the tolerance and VIF numbers — 0.651 (> 0.01) and 1.536 (< 10), respectively — indicate that this regression model is free of multicollinearity.

3) Heteroscedasticity Test

Referring to the multicollinearity test output, a tolerance index of 0.651 was obtained, which means that the minimum limit of 0.01 has been exceeded. In line with these results, the acquisition of a VIF score was recorded at 1.536 which means it is below the maximum limit of 10. This series of statistical indicators proves that the regression model developed in this study is completely free from the problem of multicollinearity.

Heteroscedasticity Test Table 3

Heteroscedasticity Test Coefficients						
Coefficients ^a						
Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1	(Constant)	4.403	.805		5.461	.212
	Coaching (X1)	-.056	.011	-.348	-4.781	.118
	Academic Individual Supervision (X2)	.022	.023	.071	.983	.327

a. Dependent Variable: Absolute Residuals

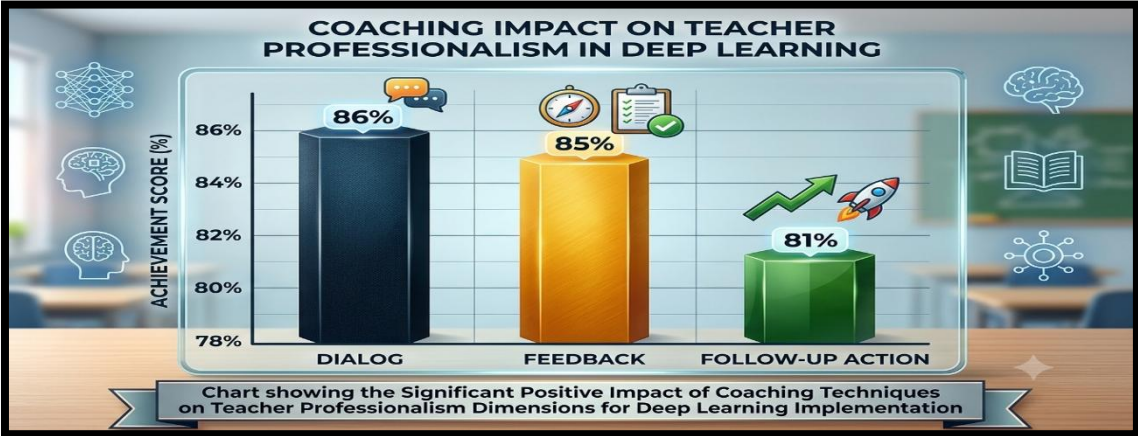
COMPREHENSIVE HETEROSCEDASTICITY ANALYSIS

The exposure of the information contained in the table shows that the significance value for the X_1 variable is 0.119, while for the X_2 variable is 0.327. Looking at these values, it can be concluded that the regression model in this study shows no signs of heteroscedasticity symptoms. This desired state occurs because the significance index of the heteroscedasticity test is always above the standard threshold, which is 0.05.

The Influence of Coaching on Teachers' Professionalism Competencies in Deep Learning at SDN Toroh.

2. The implementation of testing on the first hypothesis is directed to dissect the extent of the influence of coaching activities on the escalation of teachers' professional competencies in applying the Deep Learning method. The details of the empirical data obtained from the results of the questionnaire distribution are visually presented in the Figure.

Coaching Impact Grap 1



The data presented in the Figure indicates that the role of the principal as a coach in facilitating the dialogue space has a very strong influence on the achievement of teacher professionalism competence with an amount of 86%. This percentage figure proves that the quality of educators' competencies will experience a significant increase if school principals are able to organize coaching programs effectively. This includes proficiency in building two-way communication, distributing constructive feedback, and formulating concrete follow-up steps to mature deep learning practices by teachers in the classroom.

To confirm the correctness of the initial hypothesis, the researcher performed a t-test designed to measure the individual impact of each independent variable on the bound variable. The presentation of data in the following table shows the results of the t-test analysis which is used as a reference to assess how much the role of coaching in influencing the professional skills possessed by teachers.

Linear Regression Test Table 4

The figure is an infographic titled "Linear Regression T-Test Table". It features a table with the following data:

Linear Regression T-Test Table					
Sequence of Coefficient Analysis					
Coefficients ^a					
Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta		
1 (Constant)	42.721	2.762		15.463	.000
Coaching (X1)	.047	.028	-.086	1.668	.003

^a a. Dependent Variable: [Presumed dependent variable name, e.g., Performance]

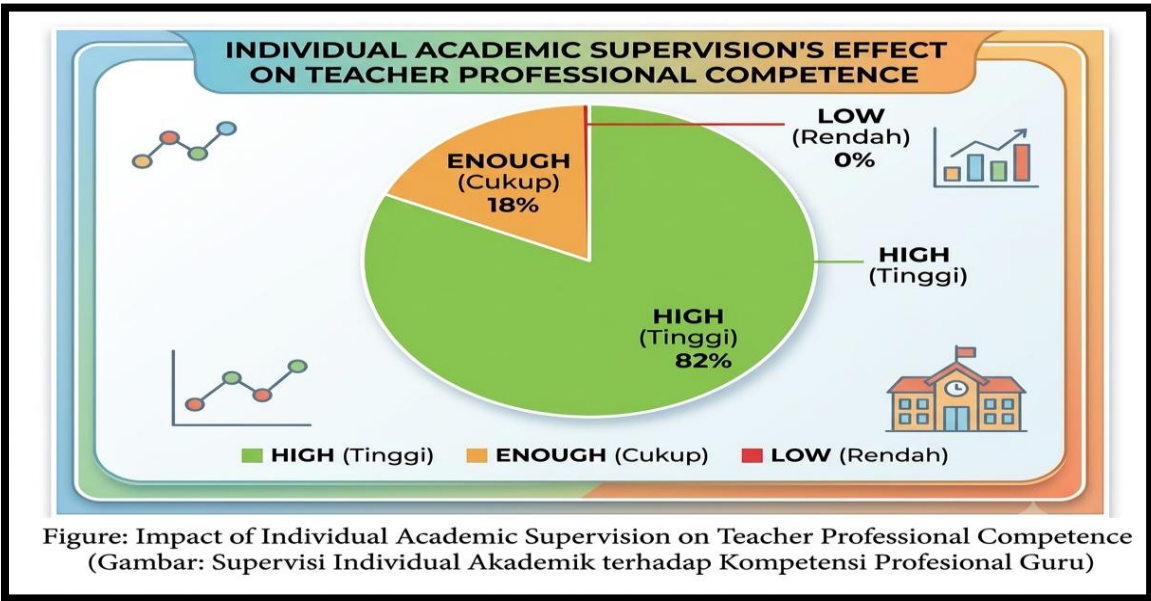
The results of the t-test analysis showed that coaching activities had a significant influence on teachers' professional abilities, with a significance value of 0.003 (less than the limit of 0.05). Based on these findings, school principals are expected to apply the right methods in creating

positive interactions in the school environment. In actualizing their role as a coach, school leaders also need to initiate intensive dialogue spaces, distribute feedback, as well as conduct periodic evaluations of the realization of follow-up programs together with each teacher.

The Influence of Academic Individual Supervision on the Professional Competence of Elementary School Teachers in Korwil Toroh Grobogan.

3. The impact of academic individual supervision on teachers' professional competence was examined in the second hypothesis test. The following image shows the results of the questionnaire.

Individual Academic Supervision of Teachers' Professional Competencies Grab 2



The data visualization in the Figure shows that the majority of educators, as many as 86%, stated that academic individual supervision interventions contribute a massive impact to strengthening teachers' professional competence. This figure is based on the argument that the implementation of academic individual supervision that is held consistently and on a scheduled basis is able to escalate the capacity of a teacher to present in-depth learning in the classroom.

In order to dissect the degree of partial influence of each independent variable on the bound variable in answering the second hypothesis, the researcher operated a t-test. The summary of data in the table below presents the output of the t-test analysis which functions as a measuring instrument to measure the contribution of the influence of the principal's individual academic supervision on teacher competency achievement.

Linear Regression T Test Table 5

LINEAR REGRESSION T-TEST TABLE					
Analysis of Model Coefficients					
Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta β	
1	(Constant)	42.721	2.762		.000
	Individual Academic	.617	.041	.785	.000

Referring to the results of the t-test analysis which showed a significance value of 0.000 (which is below the limit of 0.05), it can be proven that the application of individual supervision

a. Dependent Variable: [Dependent variable name, e.g., Academic Performance]

in academia has a significant influence on the achievement of professional competencies possessed by teachers.

The effect of individual academic supervision and coaching on the professional competence of elementary school teachers in the Toroh Regional Coordination Unit, Grobogan.

The following series of tests is applied to test the truth of the third hypothesis, which focuses on analyzing the contribution of the influence of individual academic supervision variables and coaching actions on the achievement of teachers' professional competencies:

1. Simultaneous F Test

The measurement of the level of influence produced jointly by all independent variables on the bound variables was analyzed by operating the F test. In the context of this research, the test was used to measure the simultaneous impact of the academic individual supervision program and coaching activities on the quality of teachers' professional competence. The data presentation in the following table describes the output obtained from the results of the analysis of the F test.

F-Test Table 6

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To see the results of the analysis of the F test, the significance value is 0.00 (below the threshold of 0.05). The output of this statistic means that the variables of Coaching (X₁) and Individual Academic Supervision of Principals (X₂) are proven to make a real contribution to the improvement of teachers' professional competence in organizing deep learning.2. Determination Coefficient TestDetermination coefficient testing is a statistical analysis method applied to measure how much the regression model is able to explain the variations that occur in dependent variables. The data presentation in the table below explains the details of the output obtained from the results of the determination coefficient test.

Determination Coefficient Test Table 7

TEST OF COEFFICIENT OF DETERMINATION				
MODEL SUMMARY				
Model	R ^a	R Square	Adjusted R Square	Std. Error of the Estimate
1	.737	.843	.540	5.213
Based on the data presented in the table, the determination coefficient, represented by the R-Square value, is 0.843, giving a strong indication that the variation in the level of teachers'				

professional competence in the context of deep learning is simultaneously influenced by the actions of coaching and individual academic supervision of the principal with a contribution of 84.3%. Meanwhile, the remaining percentage of 15.7% was determined by the contribution of other factors outside the focus of this study or caused by external variables that were not accommodated in the regression equation model.

DISCUSSION

The main excellence and novelty of this research lies in the simultaneous integration of coaching guidance and individual academic supervision by school principals which is specifically focused on strengthening teachers' professional competence in implementing Deep Learning at the elementary school level. Most of the previous literature has separately examined only conventional supervision of general teaching performance, without linking the individual coaching interventions of school leaders with teachers' pedagogical skills in designing Deep Learning. By empirically exploring the impact of this customization intervention in the Korwil Toroh area, Grobogan Regency, this study provides an original contribution in the form of an instructional leadership coaching model that is clearly able to explain the variation in improving teachers' Deep Learning competencies up to 84.3%.

The results of the regression test clearly prove that coaching and individual academic supervision, both partially and simultaneously, have a significant effect on improving teachers' professional competence in applying Deep Learning. Partially, coaching recorded a contribution of 86% ($p=0.003$), while individual academic supervision provided an equivalent strong influence ($p=0.000$). Simultaneously, the two interventions chosen by the principal produced a dominant influence with a determination coefficient value (R^2) of 0.843, which means that 84.3% of the variation in teachers' Deep Learning competencies was determined by the combination of these two variables. These findings are particularly relevant for education practitioners and policymakers, as they provide empirical evidence that school leaders can no longer rely solely on formal administrative supervision. Principals must transform their roles into adaptive individual coaches and supervisors to encourage the creation of deep learning practices in the classroom.

The findings of this study align with and reinforce previous studies that affirm the crucial role of instructional leadership in teacher capacity building, while expanding the scope of its focus in the context of Deep Learning. The findings show a significant influence of coaching partially ($p=0.003$) in line with research (Kraft et al., 2018) and (Crabtree & Titu, 2022) which proves that individual-based coaching-based coaching approaches consistently transform pedagogical practices and improve educators' self-efficacy. Similarly, the effectiveness of individual supervision ($p=0.000$), these findings support the argument (Chen et al., 2021) regarding the importance of personalized academic supervision to enhance teacher professional competence. However, the fundamental difference in this study compared to studies (Liu & Hallinger, 2018) that generally examine school leadership or coaching on general teaching performance—lies in the direct integration of the two coaching strategies which specifically measured the impact on teachers' readiness to implement Deep Learning at the elementary school level. The combination of simultaneous contributions of 84.3% in this study empirically proves that the synthesis between coaching and individual academic supervision is the main predictor in driving the transformation of deep learning in the classroom.

The consistency between the findings of this study and previous studies is basically driven by the similarity of psychological and pedagogical mechanisms in the process of teacher capacity development. When principals position themselves as adaptive individual coaches and supervisors, teachers receive feedback that is personalized, targeted, and relevant to real challenges in the classroom. This individualized approach has been universally proven to be effective in reducing resistance to change, triggering critical reflection, and building teachers' self-efficacy in adopting new teaching approaches.

On the other hand, there are some fundamental differences that distinguish this study from previous studies, especially in the bound variables and the scale of their interventions:

- 1) Focus on Bound Variables: While previous research mostly measured general instructional performance or the quality of classroom management, this study specifically targeted the competencies of applying Deep Learning (deep learning).
- 2) Population Characteristics and Context: Previous studies often take the setting of secondary schools or educational environments in developed countries, while this study focuses on the elementary school level in the Korwil Toroh area, Grobogan Regency.
- 3) Combination Approach Model: Much of the literature examines coaching and supervision as two separate instruments. This study actually combined the two into one simultaneous regression model that was empirically proven to explain the variation in teacher competence up to 84.3%.

This methodological variation emphasizes that the effectiveness of coaching and supervision is not rigid, but can be flexibly adapted at the basic education level to encourage the implementation of a deep learning-oriented curriculum.

This research makes a significant theoretical and practical contribution in advancing the literature on educational leadership, especially in the context of the transformation of the Deep Learning-oriented curriculum at the elementary school level. Theoretically, this study succeeded in filling the research gap by integrating individual academic coaching and supervision into a predictive model that specifically measures teachers' deep learning competencies—a domain that has not been explored empirically in rural areas or buffer areas such as Korwil Toroh, Grobogan Regency. Practically, this research offers a new perspective for school leaders and education policymakers: top-down administrative oversight is no longer sufficient to trigger substantial pedagogical change. This study proves that the combination of empowering coaching dialogue and targeted individual guidance is a tested instructional leadership instrument that is able to accelerate teachers' readiness to deliver deep, meaningful, and contextual learning experiences for students.

The findings of this study bring substantive implications as well as directions for development at three main levels: Practical and Policy Implications: The results of this study confirm the need to reorient the role of school principals from just formal administrators to instructional leaders who are proficient in carrying out the function of coaches. The Education Office at the regional level needs to develop a structured individualized mentoring-based leadership training program for school principals. This training does not only focus on technical evaluation instruments, but also on the skills of building reflective dialogue, providing constructive feedback, and preparing a follow-up plan oriented to Deep Learning strategies. Academic and Theoretical Implications: Academically, this study strengthens the theoretical framework of instructional leadership by proving that individual coaching and academic supervision variables are the dominant predictors (84.3%) in improving teachers' professional competence in the era of curriculum transformation. Future Research Suggestions: Researchers are further advised to expand the scope of the sample to a wider geographic area with varying socio-demographic characteristics. Future research can also use a mixed methods approach or experimental design to explore qualitatively how the coaching interaction process takes place in the field, as well as measure the direct impact of the teacher's Deep Learning competence on learning outcomes and higher-order thinking skills of students.

CONCLUSION

Based on the overall results of the research findings presented, it can be concluded that coaching activities through coaching by school principals make a real contribution in intervening in the achievement of teachers' professional competencies in the implementation of Deep Learning. Viewed from the perspective of respondents, the "conversation" aspect in the principal's coaching scheme has proven to have a massive impact on strengthening professional competence. This indicator was approved by 86% of the total 189 educators who have the status of Civil Servants (PNS) in the coordination area of Toroh District. In line with this, as many as 81% of teachers agree that the "follow-up" function in coaching programs is able to trigger the escalation of their professional competence, while another 85% of teachers affirm that the "feedback" dimension plays a crucial role in strengthening these professional skills.

Statistical validation through t-test analysis reinforced these findings, by producing a significance value of 0.003 (below the alpha level of 0.05) which empirically confirmed the significant influence of the principal's coaching actions on teacher professionalism competence. In addition, the dimension of teachers' professional competence is also positively intervened by the implementation of academic individual supervision measures. 86% of educators assessed that their teaching skills are highly determined by the effectiveness of the academic individual supervision agenda. Quantitative confirmation is shown through the acquisition of t-test outputs that produce a significance number of 0.000 (smaller than the standard of 0.05), which means that the professional capacity of teachers is significantly influenced by the academic individual supervision program. In the final analysis stage, the accumulation of teachers' professional competence in organizing deep learning was proven to be intervened in a better direction through a simultaneous combination of investment in academic individual supervision and coaching actions from school principals.

Testing the relationship between the dependent variable and the two independent variables yielded a double correlation coefficient index ($R_{y.12}$) of 0.843. Based on these results, a determination coefficient (R^2) of 0.711 was obtained, which shows that the variables of principal coaching and academic individual supervision collectively contributed 84.30% to the variance of professional competence possessed by teachers. This assessment was strengthened by the output of the analysis through a simultaneous F test which confirmed that the growth of teachers' professional competence in the framework of Deep Learning was significantly driven by the positive contribution of the Principal's Individual Academic Supervision variable (X_2) as well as the Coaching action by the Principal (X_1).

REFERENCES

- Arifin, S., Sutarna, S., Aryani, S. A., Prayitno, H. J., & Waston, W. (2023). Improving the professional teacher competence through clinical supervision based on multicultural values in Pesantren. *Nazhruna: Jurnal Pendidikan Islam*, 6(3), 386–402. <https://doi.org/10.31538/nzh.v6i3.4037>
- Atkinson, A., Watling, C. J., & Brand, P. L. P. (2022). Feedback and coaching. *European Journal of Pediatrics*, 181, 441–446. <https://doi.org/10.1007/s00431-021-04118-8>
- Bagawan, Atikah, Douglas, S. N., & Gerde, H. K. (2023). Components of effective supervision and training for paraeducators. *Intervention in School and Clinic*, 58(4), 264–272. <https://doi.org/10.1177/10534512221093778>
- Borsboom, D., Mellenbergh, G. J., & Van Heerden, J. (2004). The concept of validity. *Psychological Review*, 111(4), 1061–1071. <https://psycnet.apa.org/doi/10.1037/0033-295X.111.4.1061>
- Bragonzoni, L., et al. (2023). Influence of coaching on effectiveness, participation, and safety of an exercise program for postmenopausal women with osteoporosis: A randomized trial. *Clinical Interventions in Aging*, 18, 143–155. <https://doi.org/10.2147/CIA.S389967>
- Caprioli, M. (2004). Feminist IR theory and quantitative methodology: A critical analysis. *International Studies Review*, 6(2), 253–269. <https://doi.org/10.1111/j.1521-9488.2004.00398.x>
- Catling, C., et al. (2022). Group clinical supervision for midwives and burnout: A cluster randomized controlled trial. *BMC Pregnancy and Childbirth*, 22, 309. <https://doi.org/10.1186/s12884-022-04657-4>
- Chen, Y. M., Chen, K. M., Chang, C. C., Chen, M. C., & Yang, L. Y. (2021). The individualized supervision strategy and effectiveness under the strength perspective: a pilot study for the case management model of the high-care elderly in communities. *BMC Health Services Research*, 21(1), 546. <https://doi.org/10.1186/s12913-021-06574-2>
- Crabtree, L., & Titu, P. (2022). What will we teach the teachers? Grappling with racism in a professional development setting. *Cultural studies of science education*, 17(3), 899–906. <https://doi.org/10.1007/s11422-022-10119-2>

- Dahri, N. A., Vighio, M. S., Bather, J. D., & Arain, A. A. (2021). Factors influencing the acceptance of mobile collaborative learning for the continuous professional development of teachers. *Sustainability*, 13(23), 13222. <https://doi.org/10.3390/su132313222>
- Diller, S. J. (2024). Ethics in digital and AI coaching. *Human Resource Development International*, 27(4), 584–596. <https://doi.org/10.1080/13678868.2024.2315928>
- Ghamrawi, N., Shal, T., & Ghamrawi, N. A. (2024). Cultivating teacher leadership: Evidence from a transformative professional development model. *School Leadership & Management*, 44(4), 413–441. <https://doi.org/10.1080/13632434.2024.2328056>
- Hawkins, D. M. (1981). A new test for multivariate normality and homoscedasticity. *Technometrics*, 23(1), 105–110. <https://doi.org/10.1080/00401706.1981.10486244>
- He, P., Guo, F., & Abazie, G. A. (2024). School principals' instructional leadership as a predictor of teacher's professional development. *Asian Journal of Second and Foreign Language Education*, 9, 63. <https://doi.org/10.1186/s40862-024-00290-0>
- Hodge, A. (2016). The value of coaching supervision as a development process: Contribution to continued professional and personal wellbeing for executive coaches. *International Journal of Evidence Based Coaching and Mentoring*, 14(2), 87–106. <https://search.informit.org/doi/10.3316/informit.556900689190678>
- Jones, J., & Smith, H. A. (2022). A comparative study of formal coaching and mentoring programmes in higher education. *International Journal of Mentoring and Coaching in Education*, 11(2), 213–231. <https://doi.org/10.1108/IJMCE-03-2021-0054>
- Kadroon, T. (2023). Using coaching and mentoring supervision of lesson study to enhance classroom research competencies: A multi-case study. *International Journal for Lesson and Learning Studies*, 12(4), 330–342. <https://doi.org/10.1108/IJLLS-05-2023-0055>
- Kraft, M. A., Blazar, D., & Hogan, D. (2018). The effect of teacher coaching on instruction and achievement: A meta-analysis of the causal evidence. *Review of educational research*, 88(4), 547–588. <https://doi.org/10.3102/0034654318759268>
- Larson, K. E., Myers, L., & Hirsch, S. (2025). Using mixed-reality simulation and coaching in special education courses to improve communication skills with paraeducators. *Journal of Special Education Technology*. Advance online publication <https://doi.org/10.1177/01626434251403025>
- Lee, J., Ahn, S., Henning, M. A., et al. (2023). Micromanagement in clinical supervision: A scoping review. *BMC Medical Education*, 23, 563. <https://doi.org/10.1186/s12909-023-04543-3>
- Lillejord, S., & Børte, K. (2020). Trapped between accountability and professional learning? School leaders and teacher evaluation. *Professional Development in Education*, 46(2), 274–291. <https://doi.org/10.1080/19415257.2019.1585384>
- Liu, S., & Hallinger, P. (2018). Teacher development in rural China: How ineffective school leadership fails to make a difference. *International Journal of Leadership in Education*, 21(6), 633–650. <https://doi.org/10.1177/0013161X18769048>
- Lu, W., Vivekananda, G. N., & Shanthini, A. (2023). Supervision system of English online teaching based on machine learning. *Progress in Artificial Intelligence*, 12(2), 187–198. <https://doi.org/10.1007/s13748-021-00274-y>
- Rakap, S., & Balikci, S. (2023). Training preservice teachers to use evidence-based practices: Effects of coaching with performance feedback on teacher and child outcomes. *Learning and Instruction*, 86, 101755. <https://doi.org/10.1016/j.learninstruc.2023.101755>
- Rosenberg, B. M., et al. (2022). A novel peer-to-peer coaching program to support digital mental health: Design and implementation. *JMIR Mental Health*, 9(1), e32430. <https://doi.org/10.2196/32430>
- Schachter, R. E., Knoche, L. L., Lu, J., Goldberg, M. J., Wernick, P. D., Piasta, S. B., & Lancaster, H. S. (2025). A meta-analysis of the effectiveness of coaching and the contribution of coaching processes to learning outcomes for early childhood teachers and children.

- Early Childhood Research Quarterly, 72, 156-169.
<https://doi.org/10.1016/j.ecresq.2025.02.014>
- Stanley, T. D., & Jarrell, S. B. (2005). Meta-regression analysis: A quantitative method of literature surveys. *Journal of Economic Surveys*, 19(3), 299-308.
<https://doi.org/10.1111/j.0950-0804.2005.00249.x>
- Tejada, J. J., & Punzalan, J. R. B. (2012). On the misuse of Slovin's formula. *The Philippine Statistician*, 61(1), 129-136.
https://psai.ph/docs/publications/tps/tps_2012_61_1_9.pdf
- Toh, R. Q. E., Koh, K. K., Lua, J. K., et al. (2022). The role of mentoring, supervision, coaching, teaching and instruction on professional identity formation: A systematic scoping review. *BMC Medical Education*, 22, 531. <https://doi.org/10.1186/s12909-022-03589-z>
- Wiyono, B. B., Rasyad, A., & Maisyaroh. (2021). The effect of collaborative supervision approaches and collegial supervision techniques on teacher intensity using performance-based learning. *SAGE Open*, 11(2), 21582440211013779.
<https://doi.org/10.1177/21582440211013779>
- Yang, W., Huang, R., Su, Y., Zhu, J., Hsieh, W. Y., & Li, H. (2022). Coaching early childhood teachers: A systematic review of its effects on teacher instruction and child development. *Review of Education*, 10(1), e3343. <https://doi.org/10.1002/rev3.3343>