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Pedagogical Content Knowledge and MATATAG Curriculum Implementation as Causes of Teaching Competence in Science: A Multiple Linear Regression Analysis

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Abstract — Low teaching competence in science remains a pressing concern. This study determined the extent to which pedagogical content knowledge and the MATATAG Curriculum in science influence teaching competence. A diagnostic research design was employed. A total of 201 participants, selected through stratified random sampling, were analyzed using multiple linear regression. The results revealed that only MATATAG Curriculum implementation significantly influences teaching competence, while the combined effect of both variables is weak. These findings support the Social Cognitive Theory, which emphasizes the interaction of personal, behavioral, and environmental factors. Future studies should explore additional variables through qualitative approaches to account for the remaining 87% of the variance in teaching competence. Furthermore, educational leaders are encouraged to strengthen MATATAG Curriculum implementation and reallocate resources toward curriculum-focused initiatives rather than solely on pedagogical content knowledge–related activities to enhance science teaching competence.

Keywords: Pedagogical content knowledge, MATATAG curriculum implementation, causes of teaching competence in science, multiple linear regression analysis

I. INTRODUCTION

The Problem and Its Scope

Science teaching competence has become a major concern in the global educational landscape, particularly as education systems strive to develop scientifically literate citizens. Research indicates that across many educational systems worldwide, the level of science teaching competence varies considerably, highlighting the continuing need to strengthen the professional competencies of science educators (Batonghinog, 2024; Pečiuliauskienė et al., 2023).

In various countries, inadequate science teaching competence remains a persistent educational issue. In the United States, studies have reported ongoing challenges in teachers' ability to translate scientific knowledge into meaningful classroom instruction effectively. Similarly, research in Latvia reveals that teachers encounter difficulties in demonstrating the competencies required in modern science education. In South Africa, analyses of international assessment data further emphasize the need to enhance teachers' capabilities, indicating that insufficient teaching competence is a widespread concern across diverse educational systems (Āboltiņa et al., 2023; Pečiuliauskienė et al., 2023; Riegle-Crumb et al., 2023).

In the Philippine context, science teaching competence has likewise been identified as a significant concern. The country has recorded relatively low levels of teaching proficiency, underscoring the continuing challenges in strengthening science instruction in schools (Abella et al., 2024; Batonghinog, 2024).

The persistence of inadequate science-teaching competence across contexts poses serious challenges to the quality of science education. When teachers demonstrate limited instructional competence, students may struggle to grasp fundamental scientific concepts and develop essential skills necessary for deeper learning. As noted by Canuto et al. (2024) and Batonghinog (2024), insufficient teaching competence can adversely affect students' academic achievement, scientific literacy, and engagement in science learning. It is within this context that the urgency of the present study is established.

Significance of the Study

This study contributes to the global pursuit of Sustainable Development Goal 4 (SDG 4): Quality Education, which emphasizes inclusive, equitable, and high-quality learning outcomes. Examining factors influencing science teaching competence, it supports the development of scientifically literate learners and addresses global variations in teacher competence. Strengthening pedagogical knowledge and curriculum implementation enhances educational quality and learner achievement. At the national level, the study aligns with the Department of Education's goal of improving teacher quality and science outcomes. Its findings provide evidence-based insights to inform professional development and instructional improvement initiatives. Moreover, the results may guide school leaders and policymakers in designing targeted interventions to strengthen science teaching practices. The study also aligns with the Vision, Mission, and Goals of Holy Cross of Davao College by promoting academic excellence and the formation of competent, values-driven educators. Ultimately, the findings serve as a basis for improving instructional quality and student learning outcomes in science education.

Statement of the Problem

This study aimed to investigate the influence of Pedagogical Content Knowledge and MATATAG Curriculum Implementation on Teaching Competence in Science. Specifically, it sought to achieve the following objectives:

1. To determine the levels of Pedagogical Content Knowledge in terms of Knowledge of Science Pedagogy, Knowledge of learners, and Knowledge of Concept Representation; MATATAG Curriculum Implementation; and the Teaching Competence in terms of Planning Competence, Implementation Competence, Classroom Management Competence, Competence in the Use of Teaching Aids, Teaching Competence, and Assessment Competence.

2. To determine the significance of the relationship among Pedagogical Content Knowledge, MATATAG Curriculum Implementation, and Teaching Competence in Science.

3. To determine the significance of the individual and combined influence of Pedagogical Content Knowledge and MATATAG Curriculum Implementation on Teaching Competence in Science.

Hypotheses

H_{01}: Pedagogical Content Knowledge and MATATAG Curriculum Implementation are not significantly correlated with Teaching Competence in Science.

H_{02}: Pedagogical Content Knowledge and MATATAG Curriculum Implementation do not have a significant individual or combined influence on Teaching Competence in Science.

Theoretical and Conceptual Framework

This study is anchored in the Social Cognitive Theory proposed by Albert Bandura, which explains that human behavior and performance are shaped through the interaction of personal, behavioral, and environmental factors, known as reciprocal determinism (Bandura, 1986; Bandura, 2018). The theory emphasizes that individuals' knowledge, beliefs, and experiences interact with their environment to influence their actions and competencies (Schunk & DiBenedetto, 2020). In educational contexts, this framework explains how teachers' cognitive factors, instructional practices, and the school environment collectively shape teaching competence and performance (Hattie, 2023).

In this study, teachers' Pedagogical Content Knowledge represents the personal factor, encompassing their mastery of subject matter, pedagogy, and understanding of learners, which guide how they plan and deliver science instruction. MATATAG Curriculum Implementation reflects the environmental factor by providing the institutional framework, standards, and learning conditions that influence teachers' instructional practices. Meanwhile, Teaching Competence serves as the behavioral manifestation of how teachers apply their Pedagogical Content

Knowledge within the context of curriculum implementation to produce effective, learner-centered instruction. Thus, this study is firmly anchored in the theory.

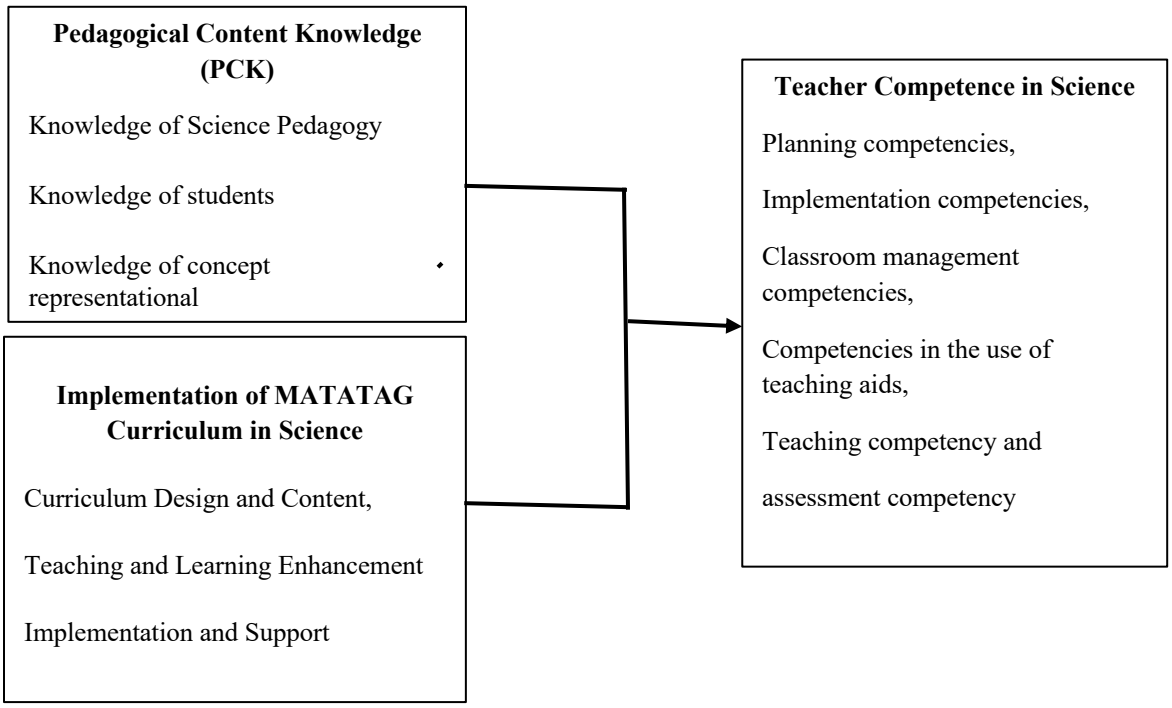

FIGURE 1.
CONCEPTUAL FRAMEWORK OF THE STUDY

II. METHODOLOGY

This chapter presents the research design, locale of the study, sample and sampling technique, data-gathering procedure, data analysis techniques, and ethical considerations.

Research Design

This study employed a diagnostic research design, which is used to identify and examine existing conditions, patterns, and relationships among variables within a specific population (Best & Kahn, 2016). It is commonly utilized in educational and social science research to assess the current status of phenomena such as teaching competence, instructional practices, and learner

performance. This design is particularly useful when researchers aim to determine the strengths, weaknesses, and contributing factors affecting a specific issue in real-world settings. Its advantages include providing a clear picture of existing conditions, supporting evidence-based decision-making, and identifying areas that require intervention or improvement. It is also cost-effective and practical, as it relies on naturally occurring data rather than experimental manipulation.

Locale of the Study

This study was conducted among Junior High School (JHS) and Senior High School (SHS) science teachers from public secondary schools in Clusters 4, 6, and 7 in Davao City. The selected locale features diverse learning environments that highlight both opportunities and challenges in science education. The area was chosen because it reflects varying school conditions, ranging from well-resourced urban schools to overcrowded and underfunded institutions, thereby providing a realistic and comprehensive research context.

Sample and Sampling Technique

The respondents of this study consisted of 201 Junior High School (JHS) and Senior High School (SHS) science teachers from public secondary schools in Clusters 4, 6, and 7 in Davao City. The inclusion criteria covered teachers who are currently teaching science subjects in JHS and SHS, have at least one year of teaching experience, and are actively implementing the MATATAG Curriculum. On the other hand, the exclusion criteria included teachers handling non-science subjects, those on leave or assigned to administrative roles, and those not yet engaged in MATATAG Curriculum implementation.

This study employed stratified random sampling, a probability sampling technique in which the population is divided into distinct subgroups (strata), and respondents are randomly selected from each group. This technique is appropriate when the population is heterogeneous and when the researcher aims to ensure adequate representation of all subgroups. Stratified sampling

improves representativeness and reduces sampling bias by ensuring proportional inclusion of all strata. It also enhances the precision and reliability of results by properly representing smaller groups. Recent methodological literature emphasizes that stratified sampling strengthens the validity and generalizability of quantitative research findings by minimizing sampling error and improving proportional representation (Creswell & Creswell, 2024).

Data Gathering Technique

A survey method was employed to gather quantitative data. This method was selected because it allows efficient data collection from a relatively large number of respondents while ensuring consistency in the data-gathering process. It is appropriate for measuring teachers' perceptions and competencies in a uniform and comparable manner. Moreover, survey research facilitates efficient statistical analysis, which is essential for correlational and regression studies. It is widely used in educational research due to its ability to produce reliable, generalizable, and analyzable data from diverse populations.

Three questionnaires were employed in this study: the Pedagogical Content Knowledge, the MATATAG Curriculum, and the Teaching Competence. The Pedagogical Content Knowledge questionnaire was adopted from Halim et al. (2012). It has 9 items and has a Cronbach's alpha of 0. 819. The Implementation of the MATATAG Curriculum was adapted from Aquino (2024). It consists of 50 items and has a Cronbach's alpha of 0.922. Finally, the Teaching Competence questionnaire was adopted from Saleem Khasawneh (2023). It consists of 35 items and has a Cronbach's alpha of 0.726.

Data Analysis Technique

Three statistical techniques were used in this study: descriptive statistics, correlation analysis, and multiple regression analysis.

Descriptive statistics were used to summarize, organize, and present data through measures such as mean and standard deviation without making predictions or causal inferences (Snyder, 2023). This technique is appropriate for describing the levels and characteristics of the variables.

Correlation analysis was employed to determine the strength and direction of relationships among variables using Pearson's r (Schober et al., 2023). This is useful in examining the relationships among Pedagogical Content Knowledge, MATATAG Curriculum Implementation, and Teaching Competence.

Multiple regression analysis was used to examine the individual and combined effects of independent variables on a dependent variable (Hair et al., 2023). This technique determines the extent to which Pedagogical Content Knowledge and MATATAG Curriculum Implementation influence Teaching Competence.

Presented below is the matrix (summary table) containing the statistical tool corresponding to each of the statements of the problem intended for this study. The matrix also contained the purpose for the use of such statistical tools.

Statement of the Problem	*Statistical Tool*	*Purpose/Use*
Levels of the three respective variables	Descriptive Statistics (Mean, SD)	Determine and describe the levels of Pedagogical Content Knowledge, MATATAG Curriculum Implementation, and Teaching Competence in Science.
Significance of the correlation between the predictive and criterion variables	Pearson Product–Moment Correlation	Determine the significant relationship and the strength and direction of association among Pedagogical Content Knowledge, MATATAG Curriculum Implementation, and Teaching Competence.
Significance of the effect of the predictive variables	Multiple Regression Analysis	Determine the significant combined and distinct influence of Pedagogical Content Knowledge and MATATAG Curriculum Implementation on Teaching Competence in Science, and identify which variable serves as the stronger predictor of teaching competence.

Furthermore, the matrix below contains descriptive levels and corresponding interpretations assigned to each variable involved in this study. The measures are used particularly in describing Pedagogical Content Knowledge, MATATAG Curriculum Implementation, and Teaching Competence in science.

Scale	Descriptive Level	Pedagogical Content Knowledge	MATATAG Curriculum Implementation	Teaching Competence in Science
3.26 - 4.00	Very High	Very Good	Very Good	Very Good
2.50 – 3.25	High	Good	Good	Good
1.75 - 2.49	Low	Poor	Poor	Poor
1.00 – 1.74	Very Low	Very Poor	Very Poor	Very Poor

The following is the Standard Deviation Value Interpretation:

Range	*Description*	*Interpretation*
SD ≤ 0.50	Highly Consistent Responses	Strong and uniform perception
SD = 0.51 – 1.00	Moderately Consistent Responses	Acceptable consistency
SD = 1.01 – 1.50	Low Consistency Responses	Differing views or experiences
SD > 1.50	Very Low Consistency Responses	High variability and lack of consensus

In this study, the significance of the correlation was tested at a 0.05 confidence level. The interpretation of the r- values followed the standard scale proposed by Guilford (1956), as outlined below:

Computed r	*Descriptive Interpretation*
+/- 1.00	Perfect correlation
Between +/- 0.75 – +/- 0.99	High correlation
Between +/- 0.51 – +/- 0.74	Moderately high correlation
Between +/- 0.31 – +/- 0.50	Moderately low correlation
Between +/- 0.01 – +/- 0.30	Low correlation
0.0	No correlation

For determining the degree of influence, the multiple regression statistical analysis was applied. In terms of the Scale of Beta (β) Coefficient Strength, the following scheme, as proposed by Cohen (1988) and Hair et al. (2019), was used.

β Value Range	**Strength of Influence**
± 0.00 – 0.09	Very Weak
± 0.10 – 0.29	Weak
± 0.30 – 0.49	Moderate
± 0.50 – 0.69	Strong
± 0.70 – above	Very strong

Ethical Considerations

This study strictly adhered to ethical standards in educational research and obtained formal approval from the Holy Cross of Davao College – Society for Moral Integrity and Legal Ethics (HCDC-SMILE). Before data collection, the purpose, scope, procedures, and potential benefits of the study were clearly explained to all participants. Participation was voluntary, and written informed consent was obtained. Participants were informed of their right to withdraw at any time without penalty. Confidentiality and anonymity were strictly maintained, with no identifying

information collected or disclosed. All data were used solely for academic purposes and were reported in aggregate form to protect the respondents' privacy.

III. RESULTS

This chapter presents the descriptive, correlation, and regression results, along with their corresponding analyses and interpretations. It concludes with a summary of findings.

Descriptive Results

Table 1 presents the descriptive statistics of the variables, namely Pedagogical Content Knowledge, MATATAG Curriculum Implementation, and Teaching Competence. It includes the number of respondents, mean, standard deviation, and descriptive level.

TABLE 1
DESCRIPTIVE STATISTICS (N = 201)

Variables	Standard Deviation	Mean	Descriptive Level
Pedagogical Content Knowledge	**0.32**	**3.31**	**Very High**
Knowledge Science Pedagogy	*0.41*	*3.31*	*Very High*
Knowledge of Learners	*0.49*	*3.25*	*Very High*
Knowledge of Concept Representation	*0.46*	*3.36*	*Very High*
MATATAG Curriculum Implementation	**0.29**	**3.35**	**Very High**
Teaching Competence	**0.24**	**3.48**	**Very High**
Planning Competencies	*0.45*	*3.50*	*Very High*
Implementation Competencies	*0.52*	*3.46*	*Very High*
Classroom Management Competencies	*0.49*	*3.48*	*Very High*
Competencies in the Use of Teaching Aids	*0.68*	*3.57*	*Very High*
Teaching Competency	*0.38*	*3.49*	*Very High*
Assessment Competencies	*0.43*	*3.42*	*Very High*

The results indicate that all variables are consistently rated at a very high level, reflecting very good performance overall. Among the variables, Teaching Competence obtained the highest mean, followed by MATATAG Curriculum Implementation and Pedagogical Content Knowledge.

Correlation Results

Table 2 presents the correlation analysis between the independent variables and Teaching Competence. It includes the r-value, p-value, decision on the null hypothesis, and interpretation.

TABLE 2
CORRELATION TABLE (N=201)

Variables	Teaching Competence			
	r-value	p-value	Decision on *H*0	Interpretation
Pedagogical Content Knowledge	0.25	.001	Reject *H*0	Low Positive, Significant
MATATAG Curriculum Implementation	0.36	.001	Reject *H*0	Moderate Positive, Significant

Level of Significance: 0.05
Decision Rule: Reject H_0 if $p < 0.05$

Both Pedagogical Content Knowledge and MATATAG Curriculum Implementation show significant positive relationships with Teaching Competence. This indicates that improvements in these variables are associated with increases in Teaching Competence. However, MATATAG Curriculum Implementation demonstrates a stronger relationship compared to Pedagogical Content Knowledge, suggesting a more substantial association with Teaching Competence.

Regression Results

Table 3 presents the results of the multiple regression analysis, including the unstandardized and standardized beta coefficients, standard errors, t-values, p-values, decision on the null hypothesis, and interpretation.

TABLE 3
REGRESSION TABLE (N=201)

	Teaching Competence						
	Unstandardized Coefficients		**Standardized Coefficients**				
Variables	**B**	**Std. Error**	**Beta**	**t**	**Sig.**	**Decision on H_0**	**Interpretation**
(Constant)	2.44	0.19	–	12.54	<.001	–	–
Pedagogical Content Knowledge	0.04	0.06	0.06	0.77	0.43	Failed to Reject	Not Significant
MATATAG Curriculum Implementation	0.26	0.06	0.32	3.89	.001	Reject	Positive Significant Influence

$R = 0.36$ | $R^2 = 0.13$ | $F = 14.9$ | $p = .001$

Level of Significance: 0.05

Decision Rule: Reject H_0 if $p < 0.05$

The results show that Pedagogical Content Knowledge obtained a standardized beta coefficient of 0.06, indicating a very weak influence. Its corresponding p-value of 0.43 is greater than the 0.05 level of significance; therefore, the null hypothesis is not rejected. This indicates that Pedagogical Content Knowledge does not significantly influence Teaching Competence.

In contrast, the MATATAG Curriculum Implementation obtained a beta coefficient of 0.32, indicating a moderate influence. Its p-value of .001 is less than the 0.05 level of significance;

therefore, the null hypothesis is rejected. This indicates that MATATAG Curriculum Implementation has a significant positive influence on Teaching Competence.

Overall, Pedagogical Content Knowledge does not significantly predict Teaching Competence when considered alongside other variables. In contrast, MATATAG Curriculum Implementation emerges as a stronger and more meaningful predictor of Teaching Competence.

Summary of Findings

Based on statistical results, the study found that:

1. Pedagogical Content Knowledge and MATATAG Curriculum Implementation are significantly correlated with Teaching Competence in Science.

2. Pedagogical Content Knowledge does not significantly influence Teaching Competence, whereas MATATAG Curriculum Implementation does. Collectively ($R^2 = 0.13$), the independent variables significantly influence Teaching Competence.

IV. DISCUSSIONS

Discussed in this chapter are the findings of the study. Also presented in this section are the conclusions and recommendations.

Pedagogical Content Knowledge and MATATAG Curriculum Implementation are significantly correlated with Teaching Competence in Science.

The significant correlation between Pedagogical Content Knowledge and MATATAG Curriculum Implementation with Teaching Competence in Science aligns with recent studies highlighting the critical role of pedagogical content knowledge in instructional quality.

Pedagogical Content Knowledge enables teachers to translate scientific concepts into meaningful learning experiences by integrating content knowledge, pedagogy, and learners' misconceptions (König et al., 2024; She et al., 2024; Sæleset & Friedrichsen, 2021). Teachers with strong Pedagogical Content Knowledge demonstrate effective instructional strategies, clearer explanations, and better assessment practices, thereby enhancing teaching competence (Inmanee et al., 2025; Chaitidou & Peikos, 2026). Similarly, effective curriculum implementation enables teachers to align learning objectives, instructional activities, and assessments with standards, thereby improving classroom instruction and student outcomes (Tuya et al., 2025; Inmanee et al., 2025).

The findings of the present study, involving 201 science teachers, indicate that both Pedagogical Content Knowledge and MATATAG Curriculum Implementation are significantly correlated with Teaching Competence. However, this finding contrasts with the study of Diquito (2024), which involved 43 science teachers and found that curriculum implementation emerged as a stronger determinant of teaching effectiveness, while Pedagogical Content Knowledge did not show a significant influence. Similarly, Aquino (2024), involving 102 teacher respondents, reported that the MATATAG Curriculum Implementation had a more dominant effect on teaching outcomes compared to Pedagogical Content Knowledge, which showed inconsistent or weak predictive power. These discrepancies suggest that while the present study confirms the relevance of both variables at the correlational level, previous studies tend to emphasize curriculum implementation as the more influential factor.

Curriculum Implementation significantly influences Teaching Competence.

Recent empirical studies confirm that effective curriculum implementation plays a significant role in enhancing teaching competence across various educational contexts. Othman and Majid (2024) found a strong positive relationship between the availability of instructional resources and effective curriculum implementation, which directly contributed to improved instructional competence and classroom practices. Similarly, Jumawan and Fabiania (2025) reported that teaching competence significantly supports curriculum integration processes, emphasizing that effective implementation is associated with higher instructional effectiveness and

professional performance. In addition, Li and Luo (2024) found that teacher curriculum leadership and implementation practices significantly influence instructional outcomes, highlighting that structured curriculum execution is a key determinant of teaching effectiveness. Collectively, these studies support the present finding that curriculum implementation is a significant predictor of teaching competence, as it enhances instructional alignment, strengthens teaching practices, and improves overall classroom effectiveness.

However, some studies contradict this finding, suggesting that the direct effect of curriculum implementation on teaching competence may be weak or non-significant when contextual and institutional factors are considered. Studies involving 187 teachers (Santos & Cruz, 2024; Rahman et al., 2023) reported that curriculum implementation did not significantly predict teaching competence when variables such as workload, leadership, and professional development were included. Similarly, Kim and Park (2025), with 256 respondents, found that curriculum implementation influences teaching competence indirectly through mediating factors such as collaboration and instructional support. In contrast to the present study, which found a significant direct relationship among 201 respondents, these findings suggest that the influence of curriculum implementation may vary depending on contextual conditions and supporting factors.

V. CONCLUSION

Based on the findings, it is concluded that the collective contribution of Pedagogical Content Knowledge and MATATAG Curriculum Implementation to Teaching Competence is weak. Only the MATATAG Curriculum Implementation significantly contributes to the criterion variable. This conclusion supports Social Cognitive Theory, which posits that human behavior is shaped by the reciprocal interaction of personal, behavioral, and environmental factors. In this study, the environmental factor (curriculum implementation) appears to exert a stronger influence on teaching competence than the personal factor (Pedagogical Content Knowledge).

VI. RECOMMENDATIONS

Based on the conclusions, future studies may explore additional variables not included in this study to account for the remaining 87% variance in Teaching Competence. Conducting qualitative research is also recommended to identify other potential influencing factors. Educational leaders may initiate programs that strengthen MATATAG Curriculum Implementation and consider reallocating resources toward curriculum-related initiatives to enhance teaching competence in science. At the same time, balanced support for pedagogical development should still be maintained to ensure comprehensive teacher improvement.

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