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The Influence of Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development on the Pedagogical Competence of Physical Education Teachers

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Abstract

Pedagogical competence is a fundamental component of teacher professionalism that determines the quality of teaching and student learning outcomes in Physical Education. Effective instruction requires teachers to integrate sport-specific knowledge, movement expertise, instructional confidence, and continuous professional learning to address diverse student needs and increasingly complex educational demands. However, empirical evidence regarding the combined contribution of these factors to pedagogical competence remains limited. Therefore, this study aimed to examine the effects of Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development on the Pedagogical Competence of Physical Education teachers. This study employed a quantitative explanatory design using a cross-sectional survey. The participants consisted of 46 Physical Education teachers from 12 public and 34 private senior high schools selected through purposive sampling. Data were collected using validated five-point Likert-scale questionnaires measuring the five research constructs. Instrument validity was evaluated through expert judgment, while reliability was confirmed using Cronbach's alpha. The collected data were analyzed using descriptive statistics, classical assumption tests, and multiple linear regression to determine both the simultaneous and partial effects of the independent variables on pedagogical competence. The findings revealed that the regression model explained

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75.2% of the variance in pedagogical competence (Adjusted R^2 = 0.728), indicating strong explanatory power. Simultaneously, Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development significantly influenced pedagogical competence. Partially, Sport Skills Mastery, Movement Competence, and Teaching Self-Efficacy had significant positive effects, with Teaching Self-Efficacy emerging as the strongest predictor. Although Continuous Professional Development demonstrated a positive relationship with pedagogical competence, its contribution was not statistically significant. The findings demonstrate that pedagogical competence in Physical Education is primarily strengthened through the integration of technical sport expertise, movement competence, and teachers' confidence in their instructional capabilities. The non-significant effect of Continuous Professional Development suggests that participation in professional learning activities alone is insufficient unless such programs are sustained, practice-oriented, and effectively translated into classroom practice. These findings provide empirical evidence for teacher education institutions and policymakers to prioritize competency-based training models that simultaneously strengthen technical, pedagogical, and psychological dimensions of teacher professionalism.

Keywords: Pedagogical Competence; Sport Skills Mastery; Movement Competence; Teaching Self-Efficacy; Continuous Professional Development; Physical Education Teachers.

INTRODUCTION

Physical education plays an essential role in promoting students' physical literacy, motor development, health-related behaviors, and lifelong participation in physical activity. The effectiveness of physical education programs is highly dependent on teachers' pedagogical competence, as teachers are responsible for designing meaningful learning experiences, implementing appropriate instructional strategies, managing practical activities, and assessing students' learning outcomes (Zhou, 2024; Grimminger-Seidensticker & Seyda, 2022). Pedagogical competence represents a fundamental component of teachers' professional competence because it reflects the ability to transform knowledge into effective teaching practices that accommodate students' characteristics and learning needs (Latino & Tafuri, 2025). In physical education contexts, pedagogical competence is even more complex because teachers must integrate theoretical knowledge, sport-specific skills, movement demonstration, safety management, and instructional decision-making during practical learning activities (Ma & Liu, 2026). However,

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international studies have indicated that improving physical education teachers' pedagogical competence remains a global challenge due to variations in teacher preparation, professional learning opportunities, and the ability to apply pedagogical knowledge in authentic teaching environments (Liu et al., 2025). Insufficient pedagogical competence among physical education teachers may negatively influence instructional quality, student engagement, motivation toward physical activity, and the achievement of physical literacy outcomes (Simpson et al., 2023).

Although pedagogical competence has become a major concern in teacher education, many physical education teachers still experience difficulties in translating pedagogical knowledge into effective practical instruction. Previous studies have reported that PE teachers often face challenges related to lesson planning, selecting appropriate teaching approaches, providing effective feedback, and assessing students' movement performance (Pov et al., 2024). In developing educational contexts, including Indonesia, these challenges are more apparent due to limited professional development opportunities, diverse teacher competency levels, and differences between theoretical preparation during teacher education and real teaching demands in schools (Zhang et al., 2024). National teacher competency evaluations have also indicated that pedagogical competence remains one of the areas requiring improvement among teachers, particularly in implementing student-centered learning and authentic assessment approaches (Fonseca-Pinto & Moreno-Murcia, 2025). If this issue is not addressed, low pedagogical competence may reduce the quality of physical education instruction, limit students' opportunities to develop fundamental movement skills, and weaken the contribution of physical education to public health promotion and active lifestyles. Therefore, investigating factors that contribute to physical education teachers' pedagogical competence is important to develop evidence-based strategies for improving teaching effectiveness.

Several factors may contribute to the development of pedagogical competence among physical education teachers, including content knowledge, practical sport ability, psychological beliefs, and continuous professional learning. In this study, four important predictors are proposed: Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development. Sport Skills Mastery is considered important because physical education teachers require sufficient sport knowledge and technical ability to demonstrate skills, analyze movement errors, and provide meaningful instructional feedback (Chen, 2023). Furthermore, Movement Competence represents teachers' ability to understand and perform fundamental movement patterns, which is essential for effective demonstration and movement instruction (Alhumaid et al., 2022). Teaching Self-Efficacy is also a critical psychological factor

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because teachers with strong efficacy beliefs tend to demonstrate greater instructional persistence, creativity, and confidence in managing learning challenges (Bandura, 1999; Sum et al., 2022). Meanwhile, Continuous Professional Development provides teachers with opportunities to update knowledge, reflect on teaching practices, and improve professional competence through continuous learning experiences (Boeve-de Pauw et al., 2022). These variables were selected because they represent the interaction between teachers' personal capabilities and professional environments that may strengthen pedagogical competence.

This study is grounded in Social Cognitive Theory (SCT) proposed by Bandura (1999), which explains that human capability develops through reciprocal interactions between personal factors, behavior, and environmental influences. SCT emphasizes that individuals are active agents who construct competence through cognitive processes, experiences, self-beliefs, and social environments (Bandura, 1999). In the context of physical education teachers, Sport Skills Mastery, Movement Competence, and Teaching Self-Efficacy represent personal factors that influence teachers' confidence, instructional decisions, and teaching behaviors. Meanwhile, Continuous Professional Development represents an environmental factor that provides opportunities for professional growth and competency improvement. Through the mechanism of reciprocal determinism, these factors collectively influence teachers' pedagogical competence as a behavioral outcome. Therefore, SCT provides an appropriate theoretical foundation for explaining why physical education teachers' pedagogical competence is influenced not only by knowledge and skills but also by psychological beliefs and professional learning environments.

Previous studies have demonstrated that teacher self-efficacy, professional development, and pedagogical knowledge contribute significantly to teaching effectiveness and teacher competence (Tschannen-Moran & Hoy, 2001; Desimone, 2009). However, previous research has predominantly examined pedagogical competence from a general education perspective, while limited studies have incorporated sport-specific capabilities such as Sport Skills Mastery and Movement Competence as predictors of physical education teachers' pedagogical competence. Furthermore, existing studies have produced inconsistent findings regarding the contribution of individual factors and professional development toward teacher competence, indicating the need for further investigation using an integrated model. From a methodological perspective, previous research has frequently employed qualitative approaches or regression analysis focusing on limited predictors, whereas this study applies a structural model approach to examine the simultaneous contribution of multiple personal and environmental factors. From a contextual perspective, research on physical education teachers' pedagogical competence remains limited in

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developing educational contexts, particularly within Indonesian physical education settings. Theoretically, this study extends Social Cognitive Theory by integrating sport-related competency factors with professional development factors to explain the formation of pedagogical competence among physical education teachers.

Research examining the determinants of pedagogical competence among physical education teachers is urgently needed because teacher competence directly influences the quality of learning experiences and students' physical development. Understanding the contribution of Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development can provide valuable insights for teacher education institutions, policymakers, and school administrators in designing targeted competency improvement programs. The findings of this study may contribute to strengthening theoretical understanding regarding teacher competence development through the Social Cognitive Theory perspective and provide practical recommendations for improving physical education teacher preparation, professional training programs, and competency-based educational policies. Therefore, this research is expected to support efforts to enhance the quality of physical education and promote more effective learning environments for students.

Based on the identified problems, theoretical considerations, and research gaps, this study aims to investigate the influence of Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development on the Pedagogical Competence of Physical Education Teachers. Specifically, this study examines the individual effects of each predictor variable and their collective contribution to explaining pedagogical competence among physical education teachers. Through this investigation, the study seeks to provide empirical evidence regarding the factors that shape physical education teachers' pedagogical competence and contribute to the development of a theoretically grounded model for improving physical education teaching quality.

LITERATURE REVIEW

Social Cognitive Theory Perspective

Based on the perspective of Social Cognitive Theory (Bandura, 1999), this study develops a conceptual framework explaining that the pedagogical competence of physical education teachers is influenced by the interaction between personal factors and environmental factors, which are represented by the research variables, as illustrated in Figure 1.

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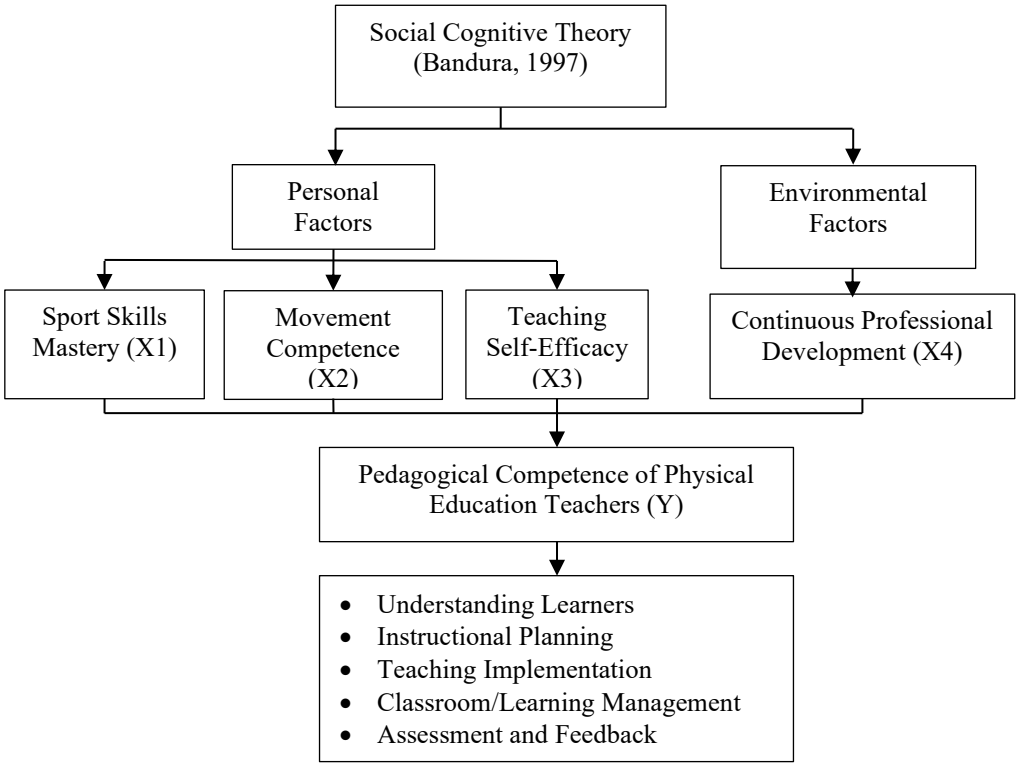


Figure 1. Theoretical Framework Model

The conceptual framework presented in Figure 1 illustrates that Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development serve as predictor factors that explain the development of pedagogical competence among physical education teachers. Based on Social Cognitive Theory (SCT), teachers' competencies are shaped through the reciprocal interaction between personal factors, behavioral processes, and environmental influences (Bandura, 1999). Personal factors represented by sport skills mastery, movement competence, and teaching self-efficacy influence how teachers perceive, interpret, and perform their instructional responsibilities. In particular, self-efficacy beliefs affect teachers' motivation, persistence, instructional decision-making, and confidence in implementing effective teaching practices (Luszczynska & Schwarzer, 2005). Meanwhile, environmental factors represented by Continuous Professional Development provide learning experiences that facilitate teachers' professional growth, instructional improvement, and adaptation to educational demands (Rodrigues et al., 2023; Schunk & DiBenedetto, 2020).

In physical education, teachers' pedagogical competence is not solely determined by their

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understanding of instructional concepts but also by their ability to apply pedagogical knowledge within practical sport learning contexts. Effective physical education teaching requires the integration of content knowledge, pedagogical knowledge, and the ability to transform sport-related knowledge into meaningful learning experiences for students (Bandura, 2014; Krcmar, 2019). Teachers who possess strong sport skills mastery, adequate movement competence, high teaching self-efficacy, and continuous professional development opportunities are expected to demonstrate greater abilities in designing learning activities, providing movement demonstrations, assessing students' skills, and delivering effective feedback. Therefore, this research model extends the application of Social Cognitive Theory within the physical education context by integrating sport-related practical abilities and professional development factors as determinants of teachers' pedagogical competence.

Operational Definition Of Research Variables

Operational definitions describe the key variables used in the study by providing specific boundaries and conceptual understanding. The operational definitions of the main variables are presented in Table 1 as follows:

Table 1. Operational Definition Of Research Variables

Variable	Definition	Indicators	Sources
Sport Skills Mastery (X1)	Sport Skills Mastery refers to the level of sport-related knowledge and technical skills possessed by teachers, enabling them to understand, demonstrate, analyze, and effectively teach sport skills within physical education learning processes.	1. Mastery of fundamental sport techniques 2. Knowledge of sport concepts and rules 3. Ability to demonstrate sport skills 4. Ability to provide technical corrections and feedback	Ojeda-Nahuelcura et al. (2023); Matviichuk et al. (2022)
Movement Competence (X2)	Movement Competence refers to an individual's ability to perform, control, and adapt movement	1. Fundamental movement skills 2. Movement control and coordination	O'Brien et al. (2023); Lindsay et al. (2023)

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Variable	Definition	Indicators	Sources
	patterns effectively, efficiently, and safely, which serves as a foundation for physical activity participation and sport learning.	3. Quality of movement patterns 4. Adaptation of movement in various activities	
Teaching Self-Efficacy (X3)	Teaching Self-Efficacy refers to teachers' beliefs in their own capabilities to plan, implement, and manage effective learning processes, as well as their ability to achieve predetermined instructional objectives.	1. Instructional strategies efficacy 2. Classroom management efficacy 3. Student engagement efficacy	Nabhan and Habók (2026); Song et al. (2025); Chang et al. (2022)
Continuous Professional Development (X4)	Continuous Professional Development refers to an ongoing professional learning process undertaken by teachers to enhance their knowledge, skills, competencies, and teaching quality through formal and informal learning experiences.	1. Professional learning activities 2. Reflective practice 3. Collaboration and knowledge sharing 4. Application of professional learning	Mgaiwa and Milinga (2024); Abakah (2023); Chiu et al. (2024)
Pedagogical Competence of Physical Education Teachers (Y)	Pedagogical Competence refers to physical education teachers' ability to understand learners, design, implement, assess, and develop effective learning processes aligned with the characteristics and demands of physical education.	1. Understanding learners 2. Instructional planning 3. Instructional implementation 4. Learning assessment 5. Learning evaluation and feedback	Herut and Setlhako (2025); Ho et al. (2023); Baumgartner (2022)

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Hyphothesis Framework

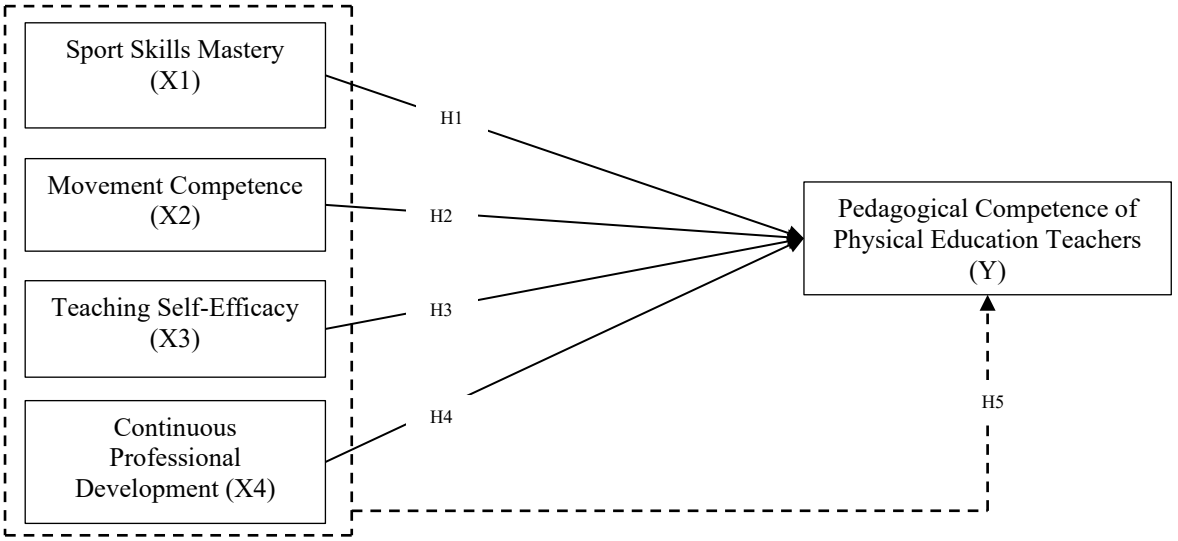


Figure 2. Hyphothesis Framework

H1: Sport skills mastery influences the pedagogical competence of physical education teachers.

H2: Movement competence influences the pedagogical competence of physical education teachers.

H3: Teaching self-efficacy influences the pedagogical competence of physical education teachers.

H4: Continuous professional development influences the pedagogical competence of physical education teachers.

H5: Sport skills mastery, movement competence, teaching self-efficacy, and continuous professional development collectively influence the pedagogical competence of physical education teachers.

RESEARCH METHODOLOGY

Research Design

This study employed a quantitative research approach using an explanatory survey design. The purpose of the study was to examine the influence of Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development on the

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Pedagogical Competence of Physical Education Teachers. A quantitative approach was selected because it enables the measurement of relationships among variables using statistical procedures and facilitates hypothesis testing based on empirical evidence. The study adopted a cross-sectional design, in which data were collected at a single point in time through structured questionnaires. The relationships among the independent and dependent variables were analyzed using Multiple Linear Regression Analysis, allowing the simultaneous examination of the contribution of each predictor variable to teachers' pedagogical competence.

Population and Sample

The population consisted of all Physical Education (PE) teachers employed in senior high schools within the research area. The schools comprised 12 public senior high schools (SMA Negeri) and 34 private senior high schools (SMA Swasta), resulting in a total of 46 schools. Since each school employed one Physical Education teacher who met the research criteria, one teacher was selected from each school, yielding a total sample of 46 respondents. The study employed purposive sampling, whereby respondents were selected based on predetermined inclusion criteria. The criteria included: (1) serving as the primary Physical Education teacher in the school, (2) actively teaching during the data collection period, and (3) having at least one year of teaching experience. Purposive sampling was considered appropriate because the research required respondents who possessed sufficient professional experience to evaluate the investigated constructs.

Research Instrument and Data Collection

Data were collected using a structured self-administered questionnaire developed from established theoretical constructs and relevant empirical studies. All items were measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The instrument comprised five constructs: Sport Skills Mastery (X_1), Movement Competence (X_2), Teaching Self-Efficacy (X_3), Continuous Professional Development (X_4), and Pedagogical Competence (Y). Prior to the main survey, the questionnaire was reviewed by experts in physical education and educational research to establish content validity, followed by a pilot test to assess item clarity and instrument reliability. Internal consistency was evaluated using Cronbach's alpha, with coefficients of 0.70 or higher considered acceptable. Data collection was conducted through printed and online questionnaires distributed to participating teachers after obtaining permission from the respective school principals. Participation was voluntary, and all respondents provided

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informed consent before completing the questionnaire.

Data Analysis

The collected data were analyzed using IBM SPSS Statistics. Descriptive statistics were first employed to summarize respondents' characteristics and the distribution of the research variables. Prior to hypothesis testing, classical assumption tests were conducted to verify that the data met the requirements for multiple linear regression analysis. After the assumptions were satisfied, multiple linear regression was performed to examine the effects of Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development on the Pedagogical Competence of Physical Education Teachers. Statistical significance was determined at the 5% level ($\alpha = 0.05$).

Table 2. Data Analysis Procedures

Analysis	Purpose	Decision Criterion
Descriptive Statistics	To describe respondents' characteristics and research variables.	Mean, Standard Deviation, Frequency, Percentage
Normality Test	To examine whether the residuals are normally distributed.	Sig. > 0.05
Multicollinearity Test	To determine the presence of multicollinearity among independent variables.	Tolerance > 0.10; VIF < 10
Heteroscedasticity Test	To examine the homogeneity of residual variance.	Sig. > 0.05
Multiple Linear Regression	To examine the simultaneous influence of X_1, X_2, X_3, and X_4 on Y.	Regression model significant (Sig. < 0.05)
Coefficient of Determination (R^2)	To determine the proportion of variance in pedagogical competence explained by the independent variables.	Higher R^2 indicates better explanatory power
F-test	To examine the simultaneous effect of all independent variables.	Sig. < 0.05
t-test	To examine the partial effect of each independent variable.	Sig. < 0.05

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The analytical procedure began with descriptive statistical analysis, followed by classical assumption testing to ensure that the data fulfilled the requirements for multiple linear regression. Once these assumptions were met, multiple linear regression analysis was conducted to evaluate the effects of the four independent variables on teachers' pedagogical competence. The coefficient of determination (R^2) was used to assess the explanatory power of the model, while the F-test and t-test were applied to examine the simultaneous and individual effects of the independent variables. Statistical significance was determined at a confidence level of 95% ($\alpha = 0.05$).

RESULT

Respondents' Descriptive Analysis

This section presents the demographic characteristics of the respondents to provide an overview of the study sample. Descriptive analysis was conducted based on five demographic variables: gender, age, educational qualification, teaching experience, and school status. A total of 46 Physical Education teachers participated in this study, representing one teacher from each of the 12 public senior high schools and 34 private senior high schools. The descriptive information serves to contextualize the characteristics of the respondents before examining the relationships among the research variables.

Table 3. Demographic Characteristics of Respondents (n = 46)

Characteristics	Category	Frequency (n)	Percentage (%)
Gender	Male	38	82.6
	Female	8	17.4
Age	< 30 years	6	13.0
	31–40 years	15	32.6
	41–50 years	18	39.1
	> 50 years	7	15.3
Educational Qualification	Bachelor's Degree	33	71.7
	Master's Degree	13	28.3
Teaching Experience	< 5 years	5	10.9
	5–10 years	10	21.7
	11–20 years	18	39.1

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	> 20 years	13	28.3
School Status	Public Senior High School	12	26.1
	Private Senior High School	34	73.9

The results indicate that the respondents were predominantly male, accounting for 82.6% of the total sample, while female teachers represented 17.4%. This distribution reflects the gender composition commonly found among Physical Education teachers, where male teachers generally outnumber female teachers. Regarding age, the largest proportion of respondents (39.1%) was between 41 and 50 years old, suggesting that most participants were in the mature stage of their professional careers. In terms of educational background, the majority held a Bachelor's degree (71.7%), whereas 28.3% had completed a Master's degree.

Furthermore, the respondents demonstrated considerable professional experience, with 67.4% having more than ten years of teaching experience, indicating that the sample consisted largely of experienced Physical Education teachers. Based on school status, 73.9% of the respondents were employed in private senior high schools, while 26.1% taught in public senior high schools, reflecting the composition of the participating schools included in the study. Overall, these demographic characteristics indicate that the respondents possess sufficient academic qualifications and professional experience to provide reliable information regarding the determinants of pedagogical competence among Physical Education teachers.

Descriptive Analysis of Research Variables

This section presents the descriptive statistics of the research variables based on respondents' perceptions. The analysis includes the mean and standard deviation for each indicator, as well as the overall mean score for each construct. The descriptive statistics provide an overview of the respondents' assessment of Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, Continuous Professional Development, and Pedagogical Competence before conducting inferential statistical analysis.

Table 4. Descriptive Statistics of Research Variables (n = 46)

No.	Variable	Indicator	Mean	Std. Dev.	Variable Mean
1	Sport Skills Mastery (X_1)	Mastery of basic sport techniques	4.31	0.56	4.26

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No.	Variable	Indicator	Mean	Std. Dev.	Variable Mean
		Knowledge of sport concepts and rules	4.18	0.59	
		Ability to demonstrate sport skills	4.29	0.53	
		Ability to provide technical feedback	4.25	0.57	
2	Movement Competence (X_2)	Fundamental movement skills	4.15	0.60	4.17
		Movement control and coordination	4.19	0.55	
		Quality of movement patterns	4.16	0.58	
		Adaptation of movement in various activities	4.18	0.56	
3	Teaching Self-Efficacy (X_3)	Instructional strategies efficacy	4.36	0.49	4.33
		Classroom management efficacy	4.32	0.51	
		Student engagement efficacy	4.31	0.54	
4	Continuous Professional Development (X_4)	Professional learning activities	4.12	0.63	4.15
		Reflective practice	4.18	0.57	
		Collaboration and knowledge sharing	4.13	0.60	
		Application of professional learning	4.17	0.55	
5	Pedagogical Competence (Y)	Understanding learners	4.28	0.54	4.30
		Instructional planning	4.29	0.50	
		Instructional implementation	4.34	0.48	
		Learning assessment	4.31	0.52	

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No.	Variable	Indicator	Mean	Std. Dev.	Variable Mean
		Learning evaluation and feedback	4.30	0.50	

The descriptive analysis indicates that all research variables obtained relatively high mean scores, ranging from 4.15 to 4.33, suggesting that the respondents generally perceived themselves positively across all measured constructs. Among the independent variables, Teaching Self-Efficacy (X_3) recorded the highest overall mean (M = 4.33; SD ≈ 0.51), followed by Sport Skills Mastery (X_1) (M = 4.26), Movement Competence (X_2) (M = 4.17), and Continuous Professional Development (X_4) (M = 4.15). The dependent variable, Pedagogical Competence (Y), also demonstrated a high overall mean (M = 4.30), indicating that respondents perceived their pedagogical competence to be at a high level. Overall, the relatively low standard deviation values (below 0.70) indicate that respondents' responses were fairly homogeneous, reflecting a high level of agreement regarding each construct. These findings suggest that Physical Education teachers generally possess strong sport-related competencies, high teaching self-efficacy, active engagement in professional development, and well-developed pedagogical competence, thereby providing a solid basis for subsequent inferential analyses using multiple linear regression.

Classical Assumption Tests

Before conducting multiple linear regression analysis, classical assumption tests were performed to ensure that the data met the statistical assumptions required by the regression model. These tests included the normality, multicollinearity, and heteroscedasticity tests. Satisfying these assumptions indicates that the regression model is appropriate for hypothesis testing and produces unbiased and reliable estimates.

Normality Test

The normality test was conducted to determine whether the regression residuals were normally distributed. In this study, the Kolmogorov–Smirnov (K–S) test was employed using IBM SPSS Statistics. The residuals were considered normally distributed when the significance value (Asymp. Sig.) exceeded 0.05.

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Table 5. Results of the Normality Test

Test	Statistic	Sig.	Decision
Kolmogorov–Smirnov	0.087	0.200	Normal Distribution

The results of the Kolmogorov–Smirnov test indicate a significance value of **0.200**, which is greater than the significance threshold of **0.05**. Therefore, the residuals are normally distributed, indicating that the normality assumption has been satisfied. These findings suggest that the regression model is appropriate for further analysis using multiple linear regression.

Multicollinearity Test

The multicollinearity test was conducted to determine whether high correlations existed among the independent variables in the regression model. In this study, multicollinearity was evaluated using Tolerance and Variance Inflation Factor (VIF) values. A regression model is considered free from multicollinearity when the Tolerance value is greater than 0.10 and the VIF value is less than 10.

Table 6. Results of the Multicollinearity Test

Variable	Tolerance	VIF	Decision
Sport Skills Mastery (X_1)	0.648	1.543	No Multicollinearity
Movement Competence (X_2)	0.582	1.718	No Multicollinearity
Teaching Self-Efficacy (X_3)	0.611	1.637	No Multicollinearity
Continuous Professional Development (X_4)	0.674	1.484	No Multicollinearity

The results presented in Table 4.6 show that all independent variables have Tolerance values greater than 0.10 and VIF values well below 10, indicating the absence of multicollinearity among the predictor variables. Therefore, each independent variable contributes unique information to the regression model without causing substantial overlap with the other variables. These findings confirm that the multicollinearity assumption has been satisfied, allowing the multiple linear regression analysis to be conducted.

Heteroscedasticity Test

The heteroscedasticity test was conducted using the Glejser test to determine whether the residual variance remained constant across all observations. In the Glejser test, the absolute residual values were regressed against the independent variables. A regression model is considered free from heteroscedasticity when the significance value (Sig.) for each independent

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variable is greater than 0.05.

Table 4.7. Results of the Glejser Heteroscedasticity Test

Variable	t-value	Sig.	Decision
Sport Skills Mastery (X_1)	0.821	0.416	No Heteroscedasticity
Movement Competence (X_2)	-1.027	0.310	No Heteroscedasticity
Teaching Self-Efficacy (X_3)	0.584	0.562	No Heteroscedasticity
Continuous Professional Development (X_4)	-0.738	0.465	No Heteroscedasticity

The results of the Glejser test indicate that all independent variables have significance values greater than 0.05, suggesting that none of the predictor variables significantly influence the absolute residual values. Therefore, the regression model does not exhibit heteroscedasticity, indicating that the residual variance is homogeneous across observations. These findings confirm that the homoscedasticity assumption has been satisfied, supporting the suitability of the data for multiple linear regression analysis.

Multiple Linear Regression Analysis

Multiple linear regression analysis was conducted to examine the influence of Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development on the Pedagogical Competence of Physical Education Teachers. Before interpreting the regression coefficients, the strength and explanatory power of the regression model were evaluated using the correlation coefficient (R) and the coefficient of determination (R^2).

a. Correlation Coefficient (R) and Coefficient of Determination (R^2)

The correlation coefficient (R) indicates the strength of the relationship between the independent variables and the dependent variable, whereas the coefficient of determination (R^2) measures the proportion of variance in pedagogical competence explained by the four predictor variables.

Table 8. Model Summary

Model	R	R Square (R^2)	Adjusted R Square	Std. Error of the Estimate
1	0.867	0.752	0.728	0.314

The results presented in Table 4.8 indicate that the regression model produced a correlation coefficient (R = 0.867), demonstrating a very strong positive relationship between the

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independent variables and the pedagogical competence of Physical Education teachers. Furthermore, the coefficient of determination ($R^2 = 0.752$) indicates that 75.2% of the variance in pedagogical competence can be explained jointly by Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development. The remaining 24.8% of the variance is attributable to other factors not included in the present study. The Adjusted R^2 value of 0.728 further confirms that the regression model possesses substantial explanatory power and is appropriate for subsequent hypothesis testing.

b. F-Test (Simultaneous Test)

The F-test was conducted to determine whether Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development simultaneously have a significant effect on the Pedagogical Competence of Physical Education Teachers. The regression model is considered statistically significant when the significance value (Sig.) is less than 0.05.

Table 9. Results of the F-Test (ANOVA)

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	18.764	4	4.691	31.087	0.000
Residual	6.185	41	0.151		
Total	24.949	45			

The ANOVA results presented in Table 4.9 show that the regression model yielded an F-value of 31.087 with a significance value of 0.000, which is lower than the 0.05 significance level. These findings indicate that the regression model is statistically significant, demonstrating that Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development collectively have a significant influence on the Pedagogical Competence of Physical Education Teachers. Therefore, the proposed regression model is appropriate for explaining variations in pedagogical competence and can be used for testing the partial effects of each independent variable.

Partial t-Test and Standardized Regression Coefficients (Beta)

The partial t-test was conducted to examine the individual effect of each independent variable on the Pedagogical Competence of Physical Education Teachers. In addition, the

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standardized regression coefficient (Beta) was used to determine the relative contribution of each predictor variable. An independent variable was considered to have a significant effect when the significance value (Sig.) was less than 0.05.

Table 10. Results of Partial t-Test and Standardized Regression Coefficients

Variable	Standardized Beta	t-value	Sig.	Decision
Sport Skills Mastery (X_1)	0.286	2.487	0.017	Significant
Movement Competence (X_2)	0.247	2.136	0.039	Significant
Teaching Self-Efficacy (X_3)	0.421	3.864	0.000	Significant
Continuous Professional Development (X_4)	0.118	1.092	0.281	Not Significant

The results presented in Table 4.10 indicate that Sport Skills Mastery (β = 0.286, p = 0.017), Movement Competence (β = 0.247, p = 0.039), and Teaching Self-Efficacy (β = 0.421, p < 0.001) have significant positive effects on the Pedagogical Competence of Physical Education Teachers. Among these predictors, Teaching Self-Efficacy exhibits the largest standardized regression coefficient, indicating that it is the strongest predictor of pedagogical competence. In contrast, Continuous Professional Development (β = 0.118, p = 0.281) demonstrates a positive but statistically non-significant relationship with pedagogical competence. Although the regression coefficient indicates that increased participation in professional development tends to be associated with higher pedagogical competence, this effect is insufficiently strong to reach statistical significance within the present sample.

DISCUSSION

The findings of this study indicate that Sport Skills Mastery has a significant positive effect on the Pedagogical Competence of Physical Education teachers, suggesting that teachers with stronger mastery of sport-specific knowledge and technical skills are more capable of designing, implementing, and evaluating meaningful learning experiences. In Physical Education, pedagogical competence is not merely reflected in teachers' understanding of curriculum content but also in their ability to transform technical knowledge into learning activities that facilitate students' cognitive, psychomotor, and affective development. Teachers who possess adequate mastery of sport techniques are generally more capable of demonstrating movement accurately,

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identifying students' technical errors, selecting appropriate instructional strategies, modifying activities according to learners' characteristics, and providing constructive feedback that supports continuous skill improvement. Such capabilities enable teachers to bridge theoretical concepts with authentic movement experiences, thereby enhancing learning effectiveness and student engagement. This interpretation is consistent with the multidimensional perspective of professional competence, which emphasizes that effective Physical Education teaching requires the integration of disciplinary knowledge, pedagogical knowledge, instructional decision-making, and practical teaching expertise rather than relying solely on theoretical understanding (Baumgartner, 2022; Matviichuk et al., 2022; Ojeda-Nahuelcura et al., 2023; Zhou, 2024). Likewise, evidence from motor learning research suggests that teachers who understand movement principles comprehensively are better able to organize adaptive learning environments, facilitate progressive skill acquisition, and encourage students to explore movement solutions through appropriate instructional scaffolding (Lindsay et al., 2023; O'Brien et al., 2023). From the perspective of Social Cognitive Theory, professional performance develops through reciprocal interactions among personal competence, behavioral regulation, and environmental influences, implying that teachers' technical mastery becomes an important personal resource that shapes instructional confidence and classroom performance (Bandura, 1999; Schunk & DiBenedetto, 2020; Rodrigues et al., 2023). Consequently, the significant relationship observed in this study reinforces the notion that strengthening sport skills mastery is fundamental to improving pedagogical competence because teachers with stronger technical expertise are better prepared to facilitate effective learning, respond to diverse student needs, and create safe, engaging, and meaningful Physical Education environments.

The present findings are also supported by previous empirical studies demonstrating that improvements in teachers' professional competence are closely associated with competency-oriented professional preparation, continuous instructional practice, and contextual implementation of educational innovations. Evidence indicates that structured competency training contributes significantly to teachers' ability to implement higher-order thinking-oriented learning, suggesting that mastery of professional knowledge becomes more meaningful when accompanied by opportunities to apply that knowledge in authentic instructional contexts (Yafie et al., 2019). Similarly, technology-supported professional learning has been shown to strengthen teacher competence when learning resources facilitate practical application and continuous reflection rather than passive knowledge acquisition (Yafie et al., 2025). The moderating role of teacher self-efficacy further suggests that professional competence is strengthened when

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teachers possess confidence in applying their knowledge during classroom instruction, indicating that technical mastery and psychological readiness interact to influence teaching quality (Yafie et al., 2022; Bandura, 1999; Schunk & DiBenedetto, 2020). Furthermore, differences in the implementation of educational reforms across schools with diverse organizational characteristics imply that professional competence enables teachers to interpret curriculum expectations more effectively despite variations in institutional readiness and educational contexts (Yafie et al., 2024). Similar conclusions have been reported in studies highlighting that teacher competence support contributes positively to students' perceived competence, participation in physical activities, and long-term engagement in sport because competent teachers are better able to deliver clear demonstrations, individualized feedback, and developmentally appropriate learning experiences (Liu et al., 2025; O'Brien et al., 2023). Collectively, these findings indicate that Sport Skills Mastery should not be viewed merely as an indicator of teachers' athletic ability but rather as a strategic professional asset that enhances instructional quality, facilitates pedagogical decision-making, improves classroom effectiveness, and ultimately strengthens the overall pedagogical competence of Physical Education teachers. Therefore, teacher education institutions and professional development programs should prioritize authentic sport-based learning experiences, repeated teaching practice, reflective instructional activities, and competency-based assessment to ensure that technical expertise can be effectively transformed into high-quality pedagogical performance.

The results of this study reveal that Movement Competence has a significant positive effect on the Pedagogical Competence of Physical Education teachers. This finding indicates that teachers who possess higher levels of movement competence are more capable of delivering effective instruction, adapting learning activities, and facilitating meaningful student participation during Physical Education lessons. Movement competence encompasses the ability to execute, control, coordinate, and adapt movement patterns efficiently across different instructional situations. Such competence is essential because Physical Education differs from other school subjects by requiring teachers to demonstrate movement accurately while simultaneously observing students' performance, identifying movement errors, and providing immediate corrective feedback. Consequently, movement competence functions as both a professional and pedagogical resource that enables teachers to transform theoretical concepts into authentic learning experiences. Contemporary perspectives on Physical Education emphasize that competent teachers are not merely skilled performers but professionals who understand how movement develops through interactions among biological, cognitive, environmental, and

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instructional factors (Baumgartner, 2022; O'Brien et al., 2023; Zhou, 2024). Research further suggests that movement competence supports teachers in organizing learning tasks, sequencing skill progression, modifying instructional constraints, and promoting safe participation across students with different physical abilities (Lindsay et al., 2023; Matviichuk et al., 2022). From a pedagogical perspective, teachers with stronger movement competence are more likely to employ diverse instructional strategies, maintain students' motivation, and provide individualized learning experiences that improve both motor performance and educational outcomes. Such findings are also consistent with Social Cognitive Theory, which proposes that individuals' behavioral performance is strongly influenced by their perceived capability to perform specific tasks and by continuous interactions between personal competencies and environmental conditions (Bandura, 1999; Schunk & DiBenedetto, 2020; Rodrigues et al., 2023). Accordingly, teachers with greater movement competence tend to demonstrate higher confidence when implementing instructional innovations, managing practical learning activities, and responding to students' movement difficulties, thereby contributing positively to their overall pedagogical competence.

The significant contribution of Movement Competence observed in this study is further supported by previous research demonstrating that effective Physical Education depends on teachers' ability to integrate movement expertise with pedagogical decision-making rather than emphasizing technical performance alone. Evidence indicates that teachers who possess stronger movement competence are better able to foster students' perceived competence, increase exercise persistence, and encourage long-term participation in physical activity because they create learning environments that are adaptive, engaging, and responsive to individual learner characteristics (Liu et al., 2025). Likewise, systematic evidence has shown that professional competence among Physical Education specialists is influenced by the integration of disciplinary knowledge, generic competencies, communication skills, and instructional expertise, highlighting that movement competence represents one of the essential foundations of effective teaching practice (Ojeda-Nahuelcura et al., 2023). The importance of competency-oriented teacher preparation has also been demonstrated through studies showing that structured professional training significantly improves teachers' instructional competence and their ability to implement higher-order learning activities (Yafie et al., 2019). Similar findings indicate that professional competence can be strengthened through technology-enhanced learning resources that facilitate practical application and reflective learning processes, enabling teachers to translate theoretical knowledge into classroom practice more effectively (Yafie et al., 2025). Moreover, educational

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innovation tends to produce stronger instructional outcomes when teachers possess sufficient confidence to apply newly acquired competencies, suggesting that movement competence and self-efficacy develop synergistically within professional practice (Yafie et al., 2022; Alhumaid et al., 2022; Grimminger-Seidensticker & Seyda, 2022). Differences in curriculum implementation across schools also demonstrate that institutional contexts influence how teachers apply their professional competencies; however, teachers with stronger pedagogical and practical capabilities generally exhibit greater adaptability when implementing educational reforms (Yafie et al., 2024). Therefore, the present findings suggest that improving movement competence should become a strategic priority in both pre-service teacher education and continuous professional development. Programs emphasizing authentic movement experiences, reflective teaching practice, instructional observation, peer collaboration, and competency-based assessment are more likely to strengthen teachers' pedagogical competence than approaches focusing exclusively on theoretical knowledge, thereby enabling Physical Education teachers to deliver higher-quality instruction that promotes meaningful student learning and sustained participation in physical activity.

CONCLUSION

This study examined the influence of Sport Skills Mastery, Movement Competence, Teaching Self-Efficacy, and Continuous Professional Development on the Pedagogical Competence of Physical Education teachers. The findings demonstrate that pedagogical competence is a multidimensional construct shaped by the interaction of professional knowledge, movement capability, psychological readiness, and continuous learning experiences. Among the investigated predictors, Sport Skills Mastery, Movement Competence, and Teaching Self-Efficacy significantly contributed to teachers' pedagogical competence, highlighting that effective Physical Education instruction requires not only subject-specific expertise but also the confidence and practical capability to translate that expertise into meaningful learning experiences. Teaching Self-Efficacy emerged as the strongest predictor, emphasizing that teachers' beliefs in their instructional capabilities play a central role in planning lessons, managing learning environments, engaging students, and implementing effective assessment practices. In contrast, although Continuous Professional Development showed a positive relationship with pedagogical competence, its contribution was not statistically significant, suggesting that participation in professional development activities alone does not necessarily improve teaching competence unless such activities are relevant, practice-oriented, sustained, and effectively transferred into classroom

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practice. Overall, the findings reinforce the perspective of Social Cognitive Theory by demonstrating that pedagogical competence develops through reciprocal interactions among individual capabilities, behavioral performance, and professional learning environments. Therefore, strengthening pedagogical competence among Physical Education teachers requires integrated strategies that combine technical sport expertise, movement competence, instructional self-efficacy, and authentic professional learning experiences to support continuous improvement in teaching quality and student learning outcomes.

FUTURE DIRECTIONS

Several directions may be considered for future research. First, future studies should investigate additional variables that may explain the remaining variance in pedagogical competence, such as digital competence, instructional innovation, organizational support, school leadership, teacher motivation, professional identity, reflective practice, and technology integration. Examining these variables may provide a more comprehensive understanding of the complex factors influencing teaching effectiveness in Physical Education. Second, longitudinal and mixed-methods research designs are recommended to explore how teachers' competencies evolve throughout different stages of their professional careers and how contextual factors influence the translation of professional learning into classroom practice. Such approaches would generate deeper insights into the mechanisms through which professional competence develops over time. Third, future studies should evaluate the effectiveness of specific professional development models, including mentoring programs, lesson study, coaching, peer observation, blended professional learning, artificial intelligence-assisted teacher training, virtual reality simulations, and digital learning platforms in strengthening pedagogical competence and instructional self-efficacy. Finally, extending this research to different educational levels, geographical regions, and cultural contexts with larger and more diverse samples would improve the generalizability of the findings and contribute to the development of evidence-based policies for enhancing the quality of Physical Education teacher education and continuous professional development.

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