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Analysis of Pedagogical Competencies Among In-service and Pre-service PPG Students as Primary School PJOK Teacher Candidates

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Abstract*—This study aims to identify differences in pedagogical competence and to identify areas of strength and areas for growth in developing pedagogical competence between In-service and Pre-service PPG students. This study employed a comparative research design. The study population consisted of In-service and Pre-service PPG students in the 2023/2024 academic year, totaling 147 In-service PPG students and 107 prospective PJOK teachers in the Pre-service PPG program. A random sampling technique was employed using Slovin's formula. The sample size for In-service PPG students was 113, and for Pre-service PPG students, it was 84. The research instrument comprised questions related to pedagogical competence. The reliability test of the instrument showed a Cronbach's Alpha value of 0.884 with a p-value of 0.179, indicating good reliability. The data analysis technique involved prerequisite tests and a t-test. The research results indicated that the p (2-tailed) value was 0.000, which is less than the alpha value of 0.05, leading to the rejection of H_0 and acceptance of H_1. This demonstrates a difference in the average pedagogical competence scores between Pre-service PPG students and In-service PPG students. The study concludes that there is a significant difference in pedagogical competence between Pre-service PPG students and In-service PPG students. Both Pre-service PPG and In-service PPG programs have their respective strengths and weaknesses. Pre-service PPG students are better prepared to enter the teaching profession due to the extensive training and longer study period provided by the Pre-service PPG program. However, areas for improvement identified in Pre-service PPG students include a lack of understanding of students' individual characteristics, interests, and talents.*

Keywords*—Competence: Pedagogy: Teachers: In-Service: Pre-Service.*

I. Introduction

Teachers play a pivotal role in shaping the quality of education and determining the competence of future human resources (John, 2021; Hartono & Wahjoedi, 2019). To fulfill this critical role, Law No. 14 of 2005 mandates that teachers in Indonesia must master four core competencies: pedagogical, personality, social, and professional. These competencies serve as essential standards to ensure that teachers can create effective, engaging, and inclusive learning environments.

In response to the growing demand for professional and competent educators, the Indonesian government implemented the Teacher Professional Education Program (Program Pendidikan Profesi Guru or PPG). This program is designed to prepare and certify graduates from both educational and non-educational backgrounds who aspire to become qualified teachers (Ministry of Education and Culture Regulation No. 87/2013). The PPG is divided into two tracks: the Pre-Service PPG, a one-year program for individuals who have not yet taught, and the In-Service PPG, a three-month program aimed at enhancing the competencies of practicing teachers.

Despite these efforts, significant challenges persist with regard to teachers' pedagogical competence. In many cases, both novice and experienced teachers struggle to implement student-centered learning, adapt teaching strategies to meet diverse learner needs, utilize assessments effectively, and integrate digital tools into instruction. These issues are particularly prevalent in the field of Physical Education (PE), where educators are expected to support students' physical, social, and emotional development through active and inclusive teaching approaches. The inability to meet these pedagogical demands often results in passive learning environments and diminished student engagement and achievement.

Previous studies (Sele & Sila, 2022; Utkir, 2022) have identified recurring issues such as limited understanding of instructional design, insufficient responsiveness to student diversity, and a lack of effective engagement strategies. However, while research on teacher competence and the effectiveness of PPG programs has increased, few studies have conducted comparative analyses between Pre-Service and In-Service PPG students. This gap is particularly notable in the context of Elementary School Physical Education, where effective teaching requires a unique blend of pedagogical sensitivity and physical engagement.

Given the distinct structures, durations, and participant profiles of the two PPG tracks, differences in the development of pedagogical competence are to be expected. Understanding these differences is essential for improving teacher preparation and informing curriculum development in professional teacher education programs.

Therefore, this study aims to: (1) identify differences in pedagogical competence between Pre-Service and In-Service Elementary School Physical Education PPG students, (2) analyze the extent of these differences, and (3) explore the strengths and weaknesses of each PPG program.

II. Methods

This study employed comparative research, which aims to examine the differences in one or more variables between two or more distinct groups. Comparative research is defined as a method that seeks to determine whether significant differences

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exist in specific characteristics or variables across multiple groups, populations, or time periods (Creswell, 2012; Sugiyono, 2017). This approach is appropriate for identifying variations in pedagogical competence between Pre-service and In-service teacher candidates enrolled in the PPG (Teacher Professional Education) program.

A. Study Participants

The population of this study comprised all prospective Physical Education (PE) teachers enrolled in the Pre-service and In-service PPG programs at Yogyakarta State University in 2023. Specifically, there were 147 students in the In-service PPG program and 107 students in the Pre-service PPG program.

The sample was determined using random sampling and calculated through Slovin's formula with a 5% margin of error. Based on this calculation, the final sample included 113 In-service PPG students and 84 Pre-service PPG students, resulting in a total of 197 respondents.

B. Study Design and Instrumentation

This study adopted a comparative design to assess the pedagogical competencies of two groups of PPG students. Data collection was conducted online through Google Forms, which was distributed to participants during the data collection period from January to March 2024.

The data collection instrument was a pedagogical competence questionnaire developed based on five primary dimensions: (1) Understanding students, (2) Designing learning, (3) Implementing learning, (4) Evaluating learning outcomes, and (5) Conducting follow-up actions.

The questionnaire used a 4-point Likert scale, categorized as follows:

TABLE 1. 4-point Likert Scale Categories

Score	Category
1	Strongly Inappropriate
2	Inappropriate
3	Appropriate
4	Strongly Appropriate

Validity of the instrument was assessed through corrected item-total correlation analysis, using the criterion $r > 0.3$ as recommended by Azwar (2019). Of the initial 22 items, 2 were found to be invalid and were subsequently excluded, resulting in a final total of 20 valid items. The instrument's reliability was tested using Cronbach's Alpha**,** yielding a coefficient of 0.884, which indicates high internal consistency (Gliem & Gliem, 2003).

C. Data Analysis

Data analysis employed quantitative techniques, starting with the computation of descriptive statistics to summarize the characteristics of each group. Before hypothesis testing, assumption tests were conducted to determine the appropriateness of the selected statistical procedures.

The following statistical tests were used:

1) Normality Test – Performed using the Kolmogorov-Smirnov test to assess the distribution of the data.
2) Homogeneity of Variance Test – Conducted using Levene's test to examine whether the variances between the two groups were equal.
3) Hypothesis Testing – The independent samples t-test was used to determine whether significant mean differences existed between the Pre-service and In-service PPG students. If the assumption of normality was violated, the Mann-Whitney U test was employed as a non-parametric alternative.

All statistical analyses were conducted using IBM SPSS version 22, with a significance level set at $\alpha = 0.05$.

III. Result

This section presents the results of the study, focusing on the comparison of pedagogical competencies between Pre-service and In-service PPG participants. The analysis includes descriptive statistics, prerequisite tests, and hypothesis testing to determine whether significant differences exist between the two groups. The findings provide a foundational understanding of each group's strengths and areas for development.

A. Data Description

The pedagogical competence data for Pre-service PPG students are presented in Table 2, which includes descriptive statistics such as the mean, median, mode, standard deviation, minimum, and maximum values.

TABLE 2. Pre-service PPG Pedagogical Competence

		PPG Pre-Service
N	Valid	84
	Missing	113
Mean		64.9524
Median		64.0000
Mode		68.00
Std. Deviation		6.91411
Variance		47.805
Range		28.00
Minimum		51.00
Maximum		79.00
Sum		5456.00

The data show that the mean pedagogical competence score of Pre-service PPG students is 64.95 with a standard deviation of 6.91. The minimum and maximum scores are 51 and 79, respectively.

TABLE 3. In-service PPG Pedagogical Competence

		In-service PPG
N	Valid	113
	Missing	84
Mean		60.1062
Median		59.0000
Mode		59.00
Std. Deviation		6.42868
Variance		41.328
Range		29.00
Minimum		44.00
Maximum		73.00
Sum		6792.00

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The mean pedagogical competence score of In-service PPG students is 60.11 with a standard deviation of 6.43. The minimum and maximum scores are 44 and 73, respectively.

B. Prerequisite Tests

Normality testing was conducted using the one-sample Kolmogorov-Smirnov test. The results are shown in Table 4.

TABLE 4. Normality Test

No	Program Type	Test Result	Test Decision	Conclusion
1	Pre-service	0.086	>0.05	Normal
2	In-service	0.138	>0.05	Normal

The results indicate that both groups' data are normally distributed, as the significance values are greater than 0.05.

TABLE 5. Homogeneity Test

F	Sig.
1.820	0.179

As the significance value is greater than 0.05, it can be concluded that the variances are homogeneous.

C. Hypothesis Testing Results

After confirming normality and homogeneity, an independent t-test was conducted. The hypotheses tested were:

1) H_0: $\mu_1 = \mu_2$ (the mean score of the pedagogical competence questionnaire for Pre-service PPG participants is equal to the mean score for In-service PPG participants)
2) H_1: $\mu_1 \neq \mu_2$ (the mean score of the pedagogical competence questionnaire for Pre-service PPG participants is not equal to the mean score for In-service PPG participants)

Research Question: Is there a difference in pedagogical competence between Pre-service and In-service elementary school Physical Education PPG students?

The hypothesis testing results using SPSS are presented in the following table.

TABLE 6. Hypothesis Testing Results

Sig.	T-test	Test Decision	Description
0.05	0.000	H_0 rejected, H_1 accepted	There is a significant mean difference

The result shows a significant difference in pedagogical competence scores, with Pre-service PPG students scores higher than In-service PPG students.

TABLE 7. Comparison of Pedagogical Competence between Pre-service and In-service Elementary School PPG Students

No	Category	In-service	Pre-service
1	Mean(±SD)	64.9524± 6.91411	60.1062± 6.42868
2	Minimum value	44	51
3	Maximum value	73	79

The differences in the five core pedagogical competence dimensions will be discussed in the next section.

IV. Discussion

The results of this study indicate significant differences in the pedagogical competencies of Pre-service and In-service participants in the Elementary School PPG Program. These differences are evident across five key dimensions: understanding students, learning preparation, learning implementation, learning evaluation, and student development. The findings suggest that each program has unique strengths shaped by its structure, duration, and participant background. While Pre-service PPG tends to be stronger in theoretical foundations and structured preparation, In-service PPG demonstrates greater adaptability and contextual understanding derived from real teaching experience.

This section provides a detailed analysis and comparison of the two programs across the aforementioned dimensions. The discussion is also supported by relevant literature to contextualize the findings and reflect on their implications for the improvement of teacher education programs in Indonesia.

A. Understanding Students

In-service PPG participants demonstrate superior competency in recognizing students' characteristics, talents, and needs within authentic learning contexts. This is evident from their ability to comprehensively identify students' personal information, ranging from demographic profiles to psychological aspects such as learning styles and theories of child development (Fakhruriza, 2020). Many In-service participants reported close relationships with students, including familiarity with their family backgrounds, socio-economic conditions, strengths, weaknesses, and individual traits. This deep connection enables them to design more meaningful and responsive learning experiences.

In contrast, Pre-service PPG participants generally exhibit a more theoretical understanding of student characteristics, often limited to recognizing basic student identities without practical interaction. This reflects the lack of direct teaching experience, as most of their knowledge remains at the conceptual level. As noted by Magdalena. (2021), understanding students' characteristics is a crucial reference point for teachers in formulating effective instructional strategies. Only a few Pre-service participants provided responses indicating deeper insight into student diversity, suggesting that their pedagogical understanding has not yet reached a professionally applied level.

B. Learning Preparation

Pre-service PPG participants show a high level of proficiency in preparing learning components in a systematic and comprehensive manner. They are adept at developing educational documents such as academic calendars, syllabi, Learning Outcomes, Learning Objective Flows, semester and annual programs, lesson plans, modules, student worksheets, and instructional media. This structured preparation aligns with best practices in education systems such as those in Japan, which emphasize planning depth and instructional coherence (Rurisman., 2024).

In contrast, In-service PPG participants focus more on practical aspects and learning innovation. Their preparation

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emphasizes teacher consistency, assessment strategies, and adaptive instruction, highlighting the necessity for educators to be creative and responsive to diverse classroom situations (Shihab, 2023). While Pre-service participants tend to follow a more formalized and holistic model, In-service participants approach preparation with flexibility and pragmatism. Both demonstrate strong pedagogical competence, albeit with different orientations—one toward completeness and structure, the other toward practical adaptability.

C. Learning Implementation

Pre-service PPG participants typically follow a structured approach that aligns with the Independent Curriculum. Their instructional design includes clear stages—introduction, core activities, and conclusion—while emphasizing the teacher's multifaceted roles as facilitator, motivator, guide, and evaluator. They apply varied and interactive teaching methods and exhibit flexibility in responding to dynamic classroom conditions. This indicates their understanding of the need for differentiated instruction within a structured framework (Mantra, 2022).

On the other hand, In-service PPG participants demonstrate a broader repertoire of instructional strategies and media, which they adapt based on students' needs and classroom realities. They align their teaching methods with curriculum guidelines while considering student interests and learning preferences. Motivation, guidance, and continuous assessment are integral aspects of their practice (Ermianto, 2022). The variety and responsiveness observed in this group reflect their pedagogical agility, grounded in actual classroom experience.

D. Learning Evaluation

Both Pre-service and In-service PPG participants show strong competence in evaluating learning. Pre-service participants tend to adopt a holistic approach, evaluating cognitive, affective, and psychomotor domains through various methods such as written tests, projects, observations, and discussions. They emphasize the importance of constructive feedback to support student learning and development.

Meanwhile, In-service PPG participants emphasize adaptability in assessment, tailoring evaluation methods to student characteristics. Their evaluation strategies include cognitive and performance-based assessments, portfolios, interviews, and diagnostic tools. These methods are typically employed to measure students' comprehension and engagement, with adjustments made to accommodate individual needs and contextual realities. The diversity in their assessment tools reflects a practical understanding of classroom complexity.

E. Student Development

Pre-service PPG participants adopt a comprehensive strategy for student development by identifying individual interests, talents, and learning needs. They aim to create supportive learning environments that promote both academic and personal growth. Their efforts include providing feedback, encouragement, and holistic support that reflects a developmental approach to education.

In-service PPG participants, by contrast, implement practical and diversified strategies such as organizing extracurricular programs, competitions, and talent development initiatives. They utilize diagnostic tools—including intelligence, interest, and personality tests—to guide their efforts. Their approaches are often rooted in day-to-day interactions and focus on nurturing students' strengths in real-world contexts. This pragmatic orientation reflects their familiarity with the diverse backgrounds and potentials of their students.

F. Pre-service PPG

Pre-service PPG demonstrates several key advantages in preparing future educators. The program exhibits mature readiness due to more a comprehensive preparation with longer learning duration and intensive time to deepen teaching theory and practice. The well-structured curriculum makes students more focused on developing pedagogical and professional competencies, while the holistic learning preparation employs systematic and a comprehensive approaches to creating complete learning tools. These strengths position pre-service PPG graduates with solid theoretical foundations and structured approaches to education.

However, pre-service PPG faces significant limitations that affect its practical effectiveness. The program shows limited practical understanding of students due to minimal teaching experience, with understanding remaining at theoretical level rather than applied knowledge. There is a notable lack of contextual experience in applying effective classroom management strategies in real contexts due to limited or less varied teaching practice. Additionally, graduates face application constraints in designing adaptive and differentiated learning plans to adjust learning strategies to various student learning styles in the classroom, highlighting the gap between theoretical knowledge and practical implementation.

G. In-service PPG

In-service PPG excels in practical application and real-world experience. The program a demonstrates deep understanding of student characteristics with excellent ability to identify student characteristics including talents, interests, weaknesses, and strengths based on practical experience. Participants bring valuable practical experience in designing and implementing learning based on real teaching experience with good administrative learning preparation. They also possess diverse development strategies, being capable of developing student potential through various methods including intelligence tests, interest and talent tests, extracurricular activities, and student participation in competitions according to their potential.

Nevertheless, in-service PPG has limitations regarding short duration and uneven competence, especially in technology. The fact that the study period is comparatively shorter than pre-service PPG may restrict in-depth coverage of curriculum, which has an impact on the overall quality of professional development. The program faces challenges with

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uneven competency, especially in technology, due to heterogeneous student composition including senior teachers unfamiliar with learning technology. Furthermore, limited interaction due to distance learning implementation reduces opportunities for direct interaction between students and lecturers, potentially reducing the quality of deep pedagogical discussions and guidance that are essential for professional growth.

V. Conclusion

This study concludes that there are statistically significant differences in the pedagogical competencies between Pre-service and In-service participants in the Teacher Professional Education (PPG) Program for prospective Elementary School Physical Education (PE) teachers. These differences are evident across five essential dimensions: understanding learners, planning instruction, implementing instruction, evaluating learning outcomes, and conducting follow-up actions.

Pre-service PPG participants demonstrated greater competence in instructional planning and classroom implementation, which can be attributed to the longer and more comprehensive duration of their training program. However, they exhibited limitations in understanding learner characteristics and adapting to classroom dynamics, primarily due to their limited teaching experience. Conversely, In-service PPG participants showed stronger abilities in recognizing student needs and facilitating learner development, a strength that stems from their ongoing professional practice. Nevertheless, the relatively short duration of the In-service program restricts opportunities for in-depth engagement with pedagogical theories and instructional design.

Based on the author's reflection, these findings emphasize the critical importance of integrating both theoretical knowledge and practical experience in the development of pedagogical competence. While each PPG pathway possesses unique advantages, neither can be deemed wholly superior. Instead, a more holistic and balanced teacher education framework is needed—one that combines the academic rigor of the Pre-service program with the experiential strengths of the In-service program.

Based on the results of this study, the following recommendations are proposed:

1. For policymakers and educational institutions: It is recommended to consider developing hybrid models that blend the strengths of both PPG pathways. These may include extended practicum components for Pre-service participants and enhanced pedagogical theory modules for In-service participants.
2. For program developers: Collaborative learning environments should be designed to facilitate mutual learning, peer reflection, and mentoring between Pre-service and In-service PPG participants.
3. For future researchers: Further longitudinal studies are needed to investigate the sustained impact of PPG pathways on teacher performance, instructional quality, and student learning outcomes across diverse educational contexts.

In conclusion, the development of pedagogical competence in teacher education should not be approached as a one-size-fits-all process. Rather, it requires a dynamic, evidence-informed, and context-sensitive model that accommodates the varying needs of prospective educators. Such an approach will not only enhance the effectiveness of teacher preparation programs but also contribute to the overall quality of education in schools.

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