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Understanding Teachers' Knowledge of Meaningful Physical Education in Community of Practice Contexts: A Cross-Sectional Comparative Study

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Abstract

Study purpose. Teachers' understanding of Meaningful Physical Education (Meaningful PE) is a key aspect in promoting meaningful learning experiences for students. While various professional development programs, such as Communities of Practice (CoP), have been implemented, empirical evidence regarding teachers' understanding based on professional characteristics remains limited. This study aims to analyze physical education teachers' level of understanding of Meaningful PE and examine differences based on gender and years of teaching experience.

Materials and methods. The study used a quantitative survey design with a cross-sectional approach towards 66 physical education teachers who regularly participated in CoP. The instrument used was a Likert scale questionnaire (1–5) consisting of 16 statements related to conceptual understanding of Meaningful PE, which had an $r = 0.873$. The data were analyzed using the One-Way ANOVA test and the Tukey test.

Results. The findings indicate that gender is not a significant differentiating factor in teachers' knowledge levels, whilst teaching experience contributes significantly to variations in knowledge. These results confirm that professional experience and involvement in collaborative learning communities play a greater role in shaping teachers' pedagogical literacy than demographic characteristics.

Conclusions. This study reinforces the urgency of community-based continuing professional development to improve teachers' conceptual understanding of meaningful physical education pedagogy.

Keywords: Meaningful Physical Education (MPE), Teacher Knowledge, Community of Practice (CoP), Professional Development, Physical Education.

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Introduction

In recent years, the Meaningful Physical Education (Meaningful PE) approach has gained attention in international physical education studies because it emphasizes meaningful, relevant, and reflective learning experiences for students (Fletcher et al., 2021). In contrast to traditional approaches that focus solely on technical sports skills, Meaningful PE guides the learning process toward students' emotional, social, and cognitive engagement in physical activities (Ní Chróinín et al., 2023). This concept emphasizes the importance of personal experience, social interaction, enjoyment, and the relevance of physical activity as key components in building sustainable physical activity. In a global context, physical education curriculum reform has been moving toward a more holistic and well-being-oriented approach since the 1980s, emphasizing the importance of meaningful learning experiences over mere skill performance (Tinning, 2008). A considerable amount of research has been undertaken to achieve the learning objectives of physical education in alignment with its philosophical foundations (Gustian et al., 2024). In line with this, Meaningful PE contributes to increasing intrinsic motivation, learning engagement, and sustained participation in students' physical activities. This approach is also relevant to contemporary educational paradigms that are oriented towards student-centered learning and authentic learning experiences (Fernandez-Rio et al., 2020). Therefore, teachers' understanding of the Meaningful PE concept is a key factor in the successful implementation of meaningful physical education in schools. Without adequate conceptual understanding, teachers tend to revert to conventional pedagogical practices that focus on drills and technical instruction (Ní Chróinín et al., 2023).

Previous empirical research has explored teachers' understanding and implementation of Meaningful PE, primarily conducted in Western countries, and has highlighted the potential of this approach as well as the challenges teachers face in translating its principles into practice (Fletcher et al., 2021; Ní Chróinín et al., 2023). These studies generally focus on classroom teaching practices, pedagogical strategies, or student experiences, with limited attention paid to how teachers build their knowledge of Meaningful PE through collaborative professional learning environments such as Communities of Practice (CoP) in developing countries.

To address this gap, this study specifically examines teachers' knowledge of Meaningful PE within the context of a Community of Practice (CoP) in a developing country. The novelty of this study lies in two main aspects: (1) an emphasis on the dynamic process of knowledge construction through interactions within CoPs, and (2) the contextualization of Meaningful PE within the setting of developing countries. Through this approach, this study provides new empirical insights into how teachers develop, negotiate, and apply their understanding of Meaningful PE, thereby enriching the literature on Meaningful Physical Education and teacher professional learning.

In the context of teacher professional development, Communities of Practice (CoP) are seen as an effective strategy for improving teachers' pedagogical capacity and professional reflection (Wang & Fan, 2025). The CoP concept emphasizes that professional learning occurs through social participation, collaboration, and negotiation of meaning within communities of practice (Patton & Parker, 2017). CoP provides teachers with opportunities to share teaching experiences, discuss best practices, and reflect on the challenges of implementing pedagogical innovations such as Meaningful PE. Various studies show that CoP can improve pedagogical knowledge, teaching confidence, and teachers' reflective abilities in adapting new learning approaches (Rhoades & Woods, 2013; Wang & Fan, 2025). In physical education, CoP also functions as a professional dialogue space that allows teachers to link theory with field practice in a contextual manner. Regular involvement in CoP has the potential to strengthen teachers' conceptual understanding of innovative pedagogical approaches through collaborative discussion and reflection on practice (Jones, 2024). In addition, CoP encourages the formation of a culture of continuous learning that is highly relevant in facing the dynamics of the ever-

evolving physical education curriculum (Johnson et al., 2017). Therefore, CoP not only functions as a forum for sharing experiences but also as a mechanism for collectively transforming teachers' pedagogical knowledge. It is therefore important to evaluate the extent to which regular participation in CoP correlates with teachers' level of knowledge of Meaningful PE.

While various studies have highlighted the importance of teacher professional development through learning communities, empirical studies that specifically examine the knowledge of physical education teachers regarding Meaningful PE after participating in CoP are still relatively limited (Beni et al., 2025), particularly in the context of developing countries. In addition, demographic factors such as gender and length of teaching experience are often overlooked in analyses of teachers' pedagogical knowledge development (Makrooni et al., 2025), while both have the potential to influence how teachers understand and internalize innovative learning concepts (Dirckinck-Holmfeld & Coto, 2020). Previous research shows that teaching experience is one of the important predictors in the formation of pedagogical competence and instructional decision-making by teachers (Asún et al., 2020). This shows that access to equal professional development can minimize gender-based gaps in the context of teacher competence. In physical education, the complexity of contextual learning practices also makes teaching experience an important factor in understanding experience-based pedagogical approaches such as Meaningful PE (Fletcher & Ní Chróinín, 2022). Therefore, comparative analysis based on teachers' demographic characteristics is relevant to provide a more comprehensive picture of the distribution of pedagogical knowledge. This approach also strengthens the empirical contribution of research in the literature on physical education teachers' professional development. Previous research has rarely integrated these demographic dimensions with participation in Communities of Practice (CoP), resulting in a fragmented understanding of how individual and social factors jointly shape teachers' pedagogical knowledge. Consequently, there remains a lack of empirical evidence explaining whether and how variables such as gender and teaching experience interact with participation in CoP to influence teachers' understanding of Meaningful PE. Addressing this limitation is crucial for providing a more comprehensive and contextual picture of teachers' professional learning and development.

Based on these gaps, this study aims to analyze the level of physical education teachers' understanding of Meaningful PE after regularly participating in a Community of Practice (CoP), as well as to examine differences in understanding based on demographic characteristics, particularly gender and length of teaching experience. This study is important because it provides empirical contributions to the literature on collaborative learning community-based professional development for physical education teachers (Patton & Parker, 2017). In addition, this study also enriches the academic discourse on the implementation of Meaningful PE in the context of physical education practices in schools, which has so far been dominated by conceptual studies and intervention studies in Western countries. Thus, this study contributes not only to the development of physical education knowledge but also to the practice of sustainable and community-based professional development for teachers.

Materials and methods

Research Design

This study used a quantitative approach with a comparative cross-sectional survey design. This design was chosen to identify and compare the level of knowledge of physical education teachers in Indonesia regarding Meaningful Physical Education (MPE) after they participated regularly in Community of Practice (CoP) activities. Activities in the Indonesian Community of Practice have one main objective, which is meaningful physical education, so

that the scope of activities focuses on unraveling the complexity and navigating the innovation of this education in learning practices. The cross-sectional approach allows for the measurement of teachers' knowledge at a certain point in time (post-participation measurement) without manipulating variables (Cohen et al., 2009), so that it is appropriate to evaluate professional knowledge profiles in the context of continuous professional development based on learning communities.

Study participants

The participants in this study were physical education teachers who had regularly participated in Community of Practice (CoP) activities as part of a professional development program. The sampling technique used was purposive sampling with the following inclusion criteria:

(1) active physical education teachers in schools, (2) who have consistently participated in CoP activities on a regular basis for approximately 20 sessions, and (3) who are willing to participate in the study by voluntarily completing a questionnaire. This is important for assessing the effectiveness of a CoP program (Wang & Fan, 2025). The research sample consisted of 66 physical education teachers from all levels: 15 from elementary schools, 28 from junior high schools, and 23 from senior high schools. Of the total sample, 21 were from rural areas, and 45 were from urban areas.

The participants in this study came from various regions in Indonesia, with the majority located on the island of Java. Specifically, the majority of participants came from West Java (i.e., Karawang, Bogor, Subang, Tasikmalaya), Central Java (i.e., Magelang, Tegal, Salatiga, Surakarta, Pati), and East Java (i.e., Kedungadem/Bojonegoro), as well as from the Special Capital Region of Jakarta and the Special Region of Yogyakarta. In addition, participants also represented regions outside Java, including Sumatra (i.e., Peusangan-Aceh, Keluang-South Sumatra, Tarutung-North Sumatra, Belinyu and Simpangkatis-Bangka Belitung Islands), Kalimantan (i.e., Balikpapan-East Kalimantan, Nunukan and Tarakan-North Kalimantan, Tamiang Layang -Central Kalimantan), Sulawesi (i.e., Gowa and Pangkep-South Sulawesi), and Nusa Tenggara (i.e., Lotalain-Rote Ndao, East Nusa Tenggara, and Labuhan-West Nusa Tenggara).

Study organization

The instrument used was a Meaningful Physical Education questionnaire developed based on the pedagogical constructs of Meaningful PE (Fletcher et al., 2021), which emphasizes the meaningfulness of students' learning experiences in physical education. The instrument used was a 5-point Likert scale questionnaire, ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument development process was carried out through several systematic stages. The first stage involved identifying and conceptualizing constructs through a literature review to ensure the clarity of operational definitions for each dimension. The second stage involved developing an instrument matrix that mapped indicators to each dimension, followed by drafting initial items based on those indicators. The third stage was the expert judgment process conducted by a Meaningful PE expert, in which the drafted items were reviewed by a panel of experts to assess their relevance, linguistic clarity, and alignment with the constructs being measured. The Meaningful PE construct is operationalized into five main dimensions: enjoyment, personal relevance, appropriate challenge, social interaction, and engagement. Examples of items representing the Meaningful PE construct include: "I understand that 'fun' in Meaningful PE relates to the emergence of feelings of joy and enthusiasm in students during the learning process" (enjoyment).

The variable score for knowledge was calculated using a composite score, which is the average of all items (Creswell & Creswell, 2018). There were 16 items in total, each

representing a specific dimension. This score reflects teachers' overall level of knowledge regarding the concept of Meaningful PE, with a correlation coefficient of $r = 0.873$.

Statistical analysis

Data collection was conducted after teachers participated in regular Community of Practice (CoP) activities during a specific period. Questionnaires were distributed online to participants who met the inclusion criteria. Before completing the questionnaire, participants were given an explanation of the research objectives, data confidentiality, and voluntary participation rights. All responses collected were checked for completeness before data processing (Cohen et al., 2009). The data were then coded and entered into SPSS 19 statistical software for further analysis. This study used between-group comparison analysis with one-way ANOVA to test differences in knowledge levels based on teachers' demographic characteristics, with Tukey's test to identify differences between groups.

Results

This study presents empirical findings on the level of physical education teachers' knowledge of Meaningful PE based on survey data analysis. The analysis began with descriptive statistics to describe the distribution of knowledge scores, followed by inferential testing using One-Way ANOVA and Tukey's test to identify differences between groups. The presentation of results focused on mean values, standard deviations, and statistical significance as a basis for interpretation in the discussion section.

Table 1. Descriptive Data on Meaningful PE Knowledge on Physical Education Teacher Who Participated in Cop

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Knowledge_gender								
Female	15	73.80	5.467	1.412	70.77	76.83	64	80
Male	51	71.35	11.527	1.614	68.11	74.59	16	80
Total	66	71.91	10.474	1.289	69.33	74.48	16	80
Knowledge_Teaching Experience								
20->30 years	18	71.00	3.162	.816	6.25	9.75	38	11
10-20 years	38	72.22	4.814	.674	16.86	19.57	20	33
1-10 years	10	79.89	6.212	.765	14.37	17.42	2	33
Total	66	75.37	6.78	.654	16.88	23.11	5	33

a. Warning: Between-component variance is negative. It was replaced by 0.0 in computing this random effects measure.

Based on Table 1, Meaningful PE knowledge viewed from gender shows that the female group has a mean of 73.80, while the male group has a mean of 71.50. Meanwhile, in terms of teacher knowledge based on teaching experience, teachers who have taught for 1-10 years, with a mean of 79.89 years, have the highest score, and the lowest score is from teachers who have taught for 20-30 years, with a mean of 71.00.

Table 2. Results of ANOVA Analysis of Physical Education Teacher’s Knowledge after Participating in CoP Based on Gender and Length of Teaching Experience

		Sum of Squares	df	Mean Square	F	Sig.
Knowledge_gender	Between Groups	69.407	1	69.407	.629	.431
	Within Groups	7062.047	64	110.344		
	Total	7131.455	65			
Knowledge_teaching experience	Between Groups	1209.630	1	1209.630	59.614	.000
	Within Groups	1298.627	64	20.291		
	Total	2508.258	65			

Table 2 the results of the analysis show that there is no significant difference in the level of physical education teachers' knowledge about Meaningful PE based on gender and length of teaching experience. The results of the One Way ANOVA test show that the significance value in the Gender group has a significance value ($0.431 > 0.05$), meaning that there is no influence of teachers' knowledge based on gender, because $p > 0.005$. Meanwhile, in the group of teachers based on length of teaching, the value is ($0.000 > 0.05$), meaning that there is an influence of teachers' knowledge based on length of teaching, because $p > 0.005$. The results of this ANOVA test can be concluded that gender is not a distinguishing factor in teachers' understanding of Meaningful PE after participating in the Community of Practice (CoP) activity, while length of teaching is a distinguishing factor in teachers' understanding of Meaningful PE after participating in the Community of Practice (CoP) activity. The lack of a significant effect of gender can be explained by the fact that teachers’ professional knowledge particularly regarding pedagogical approaches such as MPE is shaped more by access to education, training, and professional experience than by demographic factors such as gender. A number of previous studies have shown that there are no consistent differences between male and female teachers in terms of pedagogical knowledge or teaching practices, as both have relatively equal opportunities in formal education and professional development (Fletcher et al., 2021b). Thus, in this context, gender is not a primary determinant in shaping teachers’ understanding of the MPE concept.

To see the differences in teachers' knowledge based on length of teaching, a further test was conducted, namely the Tuckey post hoc test, which is presented in Table 3.

Table 3. Results of the Tuckey Post Hoc Test on Meaningful PE knowledge

Knowledge_Teaching Experience	N	Subset for alpha = 0.05
20->30 Years	10	68.20
10-20 Years	17	72.97
1-10 Years	39	73.50

The results of the Tukey post hoc test showed that there was no significant difference in the level of knowledge of Meaningful Physical Education (MPE) based on the length of teaching experience ($p > 0.05$). Although teachers with 1–10 years of experience had a higher average knowledge score than the other groups, all groups were in one homogeneous subset, indicating that the difference in means was not statistically significant.

Discussion

The findings of this study indicate that teaching experience plays a significant role in shaping teachers' knowledge of Meaningful Physical Education. These findings can be understood not only through the accumulation of individual experience but also through teachers' engagement in social and professional processes, such as participation in Communities of Practice. From this perspective, pedagogical knowledge is not formed solely through individual efforts but rather through interaction, collaboration, and the sharing of practices with fellow teachers. As their experience grows, teachers tend to become more actively involved in professional discussions, shared reflection, and the exchange of learning strategies, which allows them to deepen their contextual understanding of the concept of Meaningful PE. This aligns with the view that professional learning is situational and develops through participation in meaningful social practices (Fletcher & Ní Chróinín, 2022).

Two important findings in understanding physical education teachers' knowledge of Meaningful PE after participating in a Community of Practice (CoP) are that there are no significant differences based on gender and that there are differences based on length of teaching experience. These findings illustrate that demographic factors do not always play a universal role in shaping teachers' pedagogical knowledge, especially in the context of community-based professional development (Patton & Parker, 2017). Within the framework of contemporary physical education that emphasizes meaningful learning experiences, teachers' understanding of pedagogical concepts is determined not only by personal characteristics, but also by collaborative and reflective professional learning processes (Beni et al., 2025). Therefore, the interpretation of these research results needs to be placed in the context of continuous professional learning experienced by teachers through CoP. Regular involvement in CoP has the potential to create a learning ecosystem that enables a more equitable distribution of pedagogical knowledge among community members (Johnson et al., 2017). Thus, the results of this study not only describe the profile of teachers' knowledge but also reflect the dynamics of professional learning in the community of practice.

The insignificant difference in knowledge based on gender indicates that male and female teachers have relatively equal levels of understanding of the MPE concept. This suggests that access to regularly attended CoP activities may have provided inclusive and equal professional learning opportunities for all teachers (Wang & Fan, 2025). In the context of CoP, the process of sharing experiences, reflective discussions, and the exchange of learning practices enables the collective construction of knowledge regardless of gender differences (Acheampong, 2025). In other words, pedagogical knowledge about Meaningful PE is shaped more by active participation in professional learning communities than by individual demographic attributes. This condition reinforces the assumption that collaborative learning environments can reduce knowledge gaps that may arise due to social or cultural factors (Jones, 2024). In addition, equal participation in professional forums also enables teachers to gain a similar conceptual understanding of the implementation of meaningful learning in physical education (Beni et al., 2024).

From the perspective of teacher professional development, these findings are consistent with the view that teacher learning is social, dialogical, and reflective practice based. The concept of professional knowledge CoP develops through participation in shared practice, negotiation of meaning, and ongoing interaction among community members (Wang & Fan, 2025). In the context of Meaningful PE, collective discussions about teaching experiences, implementation challenges, and reflections on learning practices enable teachers to develop a deeper understanding of these pedagogical concepts (Fletcher et al., 2021). Therefore, the equality of knowledge between male and female teachers in this study can be understood as the result of a participatory and collaborative professional learning process (Kirk, 2019). CoP serves as a learning space that not only transfers knowledge but also shapes pedagogical

understanding through shared experiences and critical reflection on physical education learning practices.

Unlike gender, teaching experience was found to have an effect on teachers' knowledge of Meaningful PE. These findings indicate that professional experience is an important factor in shaping teachers' conceptual and pedagogical understanding of physical education learning innovations (Fletcher et al., 2025). Teachers with longer service tend to have more diverse pedagogical experience, including in dealing with changes in curriculum, learning approaches, and student characteristics. This experience contributes to the formation of a more mature pedagogical scheme in understanding the concept of meaningful learning (Fletcher & Ovens, 2015). In addition, long-term exposure to teaching practices allows teachers to develop stronger reflective skills, making it easier to internalize Meaningful PE principles in the context of real learning in schools (Beni et al., 2024).

Furthermore, more experienced teachers generally have a better capacity to relate theoretical concepts to learning practices in the field. In the context of CoP, long teaching experience also enriches the quality of professional discussions because senior teachers tend to bring more contextual and reflective perspectives on practice (Milton et al., 2025). This enables the process of recontextualizing knowledge, whereby the concept of Meaningful PE is not only understood conceptually, but also integrated into the actual practice of physical education learning (Beni et al., 2025). Thus, participation in CoP not only serves as a means of knowledge transfer but also as a space for integration between professional experience and conceptual understanding (Asún et al., 2020). The accumulation of teaching experience also enables teachers to be more critical in reflecting on learning practices and adjusting the Meaningful PE approach to students' needs.

Overall, these findings indicate that the Community of Practice serves as an inclusive professional learning space that minimizes gender-based differences, but is still influenced by variations in teachers' teaching experiences (Zhao et al., 2019). This implies that CoP-based professional development needs to be designed differently, taking into account teaching experience backgrounds (Patton & Parker, 2017) for example, through a mentoring strategy between experienced teachers (Geletu, 2026) and novice teachers, practice-based discussions, and collaborative pedagogical reflection (Duncombe & Armour, 2010). Thus, improving teachers' knowledge of Meaningful PE depends not only on participation in learning communities but also on how professional experiences are utilized as sources of reflection and construction of more comprehensive pedagogical knowledge in physical education practices at school.

This study has several limitations that need to be considered when interpreting the findings. First, the cross-sectional research design only captures teachers' knowledge at a single point in time after participating in an online Community of Practice (CoP), so it cannot explain longitudinal changes in knowledge or direct causal relationships (Fletcher & Bullock, 2015). Second, the use of self-report instruments has the potential to cause perception bias and social desirability bias, whereby respondents may give answers that are considered professionally ideal. Third, the variables analyzed are still limited to certain demographic factors such as gender and length of teaching experience, thus not covering other factors that may potentially influence teachers' knowledge, such as intensity of participation in CoP, educational background, or previous professional training experience. In addition, the context of the sample, which came from a group of teachers who had regularly participated in CoP, also limited the generalization of the findings to the population of physical education teachers who were not yet involved in professional learning communities. Therefore, further research is recommended using a longitudinal or quasi-experimental design to examine the impact of CoP on teacher knowledge development more comprehensively, expanding the research variables by including aspects of pedagogical content knowledge and learning practices, and combining quantitative

data with qualitative approaches such as interviews or teacher reflections in order to gain a deeper understanding of the process of constructing Meaningful PE knowledge in the context of continuous professional development.

Conclusion

In general, this study emphasizes the importance of strengthening teachers' knowledge through a structured and collaborative approach to continuous professional development, particularly through the practice of Community of Practice (CoP). Regular participation in CoP is seen as a relevant strategy to support pedagogical reflection, exchange of experiences, and continuous improvement of teachers' professional capacity. In the context of physical education and knowledge-based learning, collective professional learning processes not only contribute to the enrichment of conceptual insights but also encourage the formation of a culture of lifelong learning among teachers. Therefore, the integration of CoP into teacher professional development programs needs to be considered as part of education quality improvement policies. In addition, this study provides theoretical implications that teacher knowledge development cannot be separated from the context of their professional experiences and the dynamics of the learning communities they participate in. In the future, further studies are recommended to examine other more comprehensive variables, such as the quality of participation in CoPs, institutional factors, and educational policy support, in order to gain a more holistic understanding of teacher knowledge improvement in educational practice.

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Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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