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Dr. Muhammad Syahrul Rizal, M.Pd
Universitas Pahlawan, Indonesia.

*CORRESPONDENCE

Gita Nurgaya Br Tarigan
gitanurgayabrtarigan@gmail.com

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Gita Nurgaya Br Tarigan
Putri Lagenda Wulandari
Aidilla Pratiwi Siregar
Arsi Zahiri
M. Fadlin Al-Farhan's

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Practice-Based Training and Collaborative Mentoring Enhance Adaptive Physical Education Competencies for Inclusive Teaching: Evidence from Indonesian Physical Education Teachers

Gita Nurgaya Br Tarigan^{*1}, Putri Lagenda Wulandari¹, Aidilla Pratiwi Siregar¹, Arsi Zahiri¹, M. Fadlin Al-Farhan's¹

¹Physical Education, Sekolah Tinggi Olahraga dan Kesehatan Bina Guna, Indonesia.

ABSTRACT

Purpose of the study: This study aimed to evaluate the effectiveness of a practice-based training and collaborative mentoring program in enhancing adaptive physical education competencies among Physical Education, Sports, and Health (PJOK) teachers to support inclusive teaching practice.

Materials and methods: A practice-based professional development program was implemented involving 32 junior and senior high school PJOK teachers participating in the Subject Teacher Forum (MGMP) in Karo Regency, Indonesia. The intervention integrated needs assessment, conceptual workshops, adaptive game modification, lesson-plan development, microteaching, reflective mentoring, and collaborative discussions. Program effectiveness was evaluated using a one-group pretest–posttest approach through knowledge assessments, adaptive teaching-plan evaluations, structured microteaching observations, and participant satisfaction questionnaires. Quantitative data were analyzed descriptively using percentage scores and normalized gain (N-gain), while qualitative reflections were analyzed thematically.

Results: The findings demonstrated substantial improvements in teachers' adaptive physical education competencies following the intervention. Mean knowledge scores increased from 58.28 to 84.84, with an N-gain of 0.64, indicating moderate-to-high learning improvement. The quality of adaptive teaching plans improved from an average score of 60.16 to 86.41, while microteaching performance achieved a mean score of 3.42 (Good category). Furthermore, 90.63% of participants reported that the program was highly relevant to their instructional needs. The most notable improvements were observed in teachers' abilities to modify learning objectives, instructional strategies, equipment, learning environments, assessment methods, and classroom participation to accommodate diverse learner needs.

Conclusions: Practice-based training combined with collaborative mentoring effectively strengthened teachers' readiness and adaptive pedagogical competencies for inclusive physical education. The findings suggest that experiential professional development embedded within teacher learning communities can bridge the gap between inclusive education policies and classroom implementation. Sustaining this approach through continuous MGMP-based professional learning communities may contribute to the long-term implementation of inclusive physical education in mainstream schools.

Keywords

adaptive physical education; inclusive education; teacher professional development; collaborative mentoring; practice-based training; teacher readiness.

INTRODUCTION

Inclusive education aims to ensure that all students possess equitable rights to learning, encompassing those with physical, intellectual, sensory, social-emotional, or other learning challenges (Işıkğöz & İnanç, 2026; Prakosha et al., 2018, p. 67). The principles of inclusion in physical education, sports, and health dictate that students with special needs must have access to mainstream classrooms and opportunities to engage in movement activities tailored to their individual abilities, needs, and potential (Cristea et al., 2020, p. 79; Lubans et al., 2017, p. 30). Consequently, curricula must be designed adaptively, enabling all students to interact meaningfully, understand the importance of physical activity, and enhance their physical fitness. A critical methodology for implementing inclusive PJOK is adaptive physical education, which emphasizes the systematic modification of learning objectives, instructional materials, pedagogical methods, media, game rules, environments, and assessment instruments based on student characteristics (Burhaein & Budi, 2024; Devi & Ganga, 2025; Petrie et al., 2024). Physical education instructors must recognize that challenges often arise from rigid learning designs rather than inherent individual limitations (Lourenço et al., 2025; Pushkarenko et al., 2023, p. 1171293). For instance, traditional competitive small-ball games can be modified—such as utilizing foam balls to reduce impact, adjusting play distances, managing time durations, implementing peer pairing, and shifting success indicators to prioritize participation over standardized performance.

Recent research underscores that teacher readiness, perceptions toward students with disabilities, pedagogical modification skills, and the availability of institutional and community support are critical determinants of the success of inclusive

physical education. The beliefs and attitudes of physical education teachers are fundamental to the effectiveness of inclusive instructional practices (Hodge et al., 2004; Ojeme & Destiny, 2023; Sari et al., 2023). Conversely, some studies indicate that the implementation of adaptive physical education in inclusive school settings remains constrained by systemic barriers, including inadequate infrastructure and limited teacher knowledge regarding the specific needs of students with disabilities (Hakiki et al., 2023). Addressing these challenges requires multifaceted approaches, including multidisciplinary collaboration, professional development, the integration of assistive technology, and the adaptation of instructional activities to enhance the participation of students with special needs in physical education (Hidayat et al., 2024).

The program was designed in response to the specific needs of Physical Education Teacher Working Group (MGMP PJOK) members in Karo Regency. The region's unique social, geographical, and school network characteristics require teachers to implement creative and flexible physical education instruction despite limited educational resources. Preliminary discussions conducted with MGMP administrators revealed several recurring challenges. First, many teachers lacked practical guidelines for identifying the diverse learning needs of students, particularly those requiring instructional adaptations. Second, they experienced difficulties in formulating learning objectives that could be adjusted to accommodate varying student abilities. Third, instructional practices remained largely oriented toward uniform movement standards, with limited differentiation based on individual learner characteristics. Finally, teachers had not yet maximized the use of simple and accessible teaching resources as adaptive instructional media. Consequently, there is a strong need for practical assessment approaches that evaluate not only technical performance but also students' participation, effort, confidence to engage, collaboration, and individual learning progress, thereby supporting more inclusive and student-centered physical education practices.

The results of Erianti et al. (2025) indicate that improving the self-efficacy and competency of PJOK teachers is essential for designing inclusive learning environments. Teachers require direct experience in modifying games, creating adaptive instructional tools, and developing inclusive instructions for students with diverse needs. Consequently, purely theoretical, lecture-based training is often insufficient; therefore, this community service program utilizes practice-based training, case studies, mentoring, and microteaching.

This community service program aimed to strengthen the capacity of MGMP PJOK teachers in Karo Regency to implement inclusive and adaptive physical education practices. Specifically, the program sought to enhance teachers' understanding of inclusive education principles, improve their competence in adapting learning activities, equipment, instructional rules, learning environments, and assessment strategies, develop practical examples of adaptive teaching resources for classroom implementation, and promote sustained professional collaboration through a teacher learning community committed to the continuous advancement of adaptive physical education.

MATERIALS AND METHODS

This community service program adopted a collaborative mentoring approach combined with participatory training methods. The instructional model enabled participants to integrate theoretical understanding with practical application through problem-solving activities, reflective discussions, and learning simulations. This approach was selected because adaptive physical education requires not only conceptual knowledge but also reflective pedagogical perspectives, observational skills, the ability to modify instructional practices, and the confidence to make appropriate pedagogical decisions in dynamic learning environments.

Partners and Targets Activity

The participants in this community service program were 32 members of the Physical Education Teacher Working Group (MGMP PJOK) in Karo Regency. The cohort comprised 18 junior high school teachers, 10 senior high school teachers, and 4 vocational high school teachers. Their teaching experience varied, with nine participants having less than five years of experience, fourteen having between five and fifteen years, and nine having more than fifteen years of professional teaching experience. Although several participants had previously taught students with learning difficulties, mild physical disabilities, attention-related challenges, or social-emotional support needs, the majority had not received formal training in adaptive physical education. This participant profile reflects the need for systematic professional development to strengthen teachers' competencies in implementing inclusive and adaptive physical education practices.

Stages Implementation

The community service program was implemented through six sequential stages. The first stage involved a baseline needs assessment conducted using a pre-program questionnaire and structured discussions with MGMP PJOK administrators. This assessment was designed to identify teachers' prior experiences, school-based challenges, the availability of instructional resources, and priority topics for professional development. The second stage focused on the development of training materials and instructional modules. The modules covered key topics, including the principles of inclusive and adaptive physical education, strategies for identifying students' individual learning needs, methods for modifying physical activities, adaptive assessment techniques, and the preparation of inclusive teaching resources. The third stage consisted of conceptual training sessions that introduced participants to the fundamental principles of inclusive education. The sessions emphasized students' rights to equitable learning opportunities, the distinction between integration and inclusion, the characteristics of diverse learner needs, and safety considerations in adaptive physical education. The fourth stage involved practical workshops on activity modification. Participants worked collaboratively in small groups to redesign a range of physical education activities, including running, throwing and catching, ball games, and physical fitness exercises. The modifications were guided by the TREE framework, which focuses on adapting Teaching style, Rules, Equipment, and the learning Environment to accommodate diverse student needs. During the fifth stage, participants developed adaptive teaching resources by collaboratively designing learning objectives, instructional procedures, safety guidelines, peer-support strategies, and assessment rubrics tailored to inclusive physical education contexts.

The final stage consisted of microteaching sessions followed by guided reflection. Each group conducted a 15–20 minute

teaching demonstration and received constructive feedback from facilitators and fellow participants. Reflective discussions focused on the inclusiveness of the learning activities, the flexibility of instructional rules, the safety and suitability of equipment, the clarity of instructional guidance, and the extent to which assessment practices captured individual student progress rather than solely technical performance.

Instrument Evaluation

Table 1. Evaluation Instruments and Measurement Indicators

Instrument	Purpose	Indicators/Dimensions	Scale
<i>Knowledge Test</i>	To assess participants' understanding of adaptive physical education before and after the training	Inclusive education principles, adaptive physical education concepts, activity modification, safety procedures, and inclusive assessment (25 multiple-choice items)	Correct answer = 1; Incorrect answer = 0
<i>Microteaching Observation Rubric</i>	To evaluate participants' teaching performance during adaptive physical education simulations	Lesson opening, clarity of instructions, activity and equipment modification, safety management, feedback provision, and participatory assessment	4-point rating scale (1 = Poor to 4 = Excellent)
<i>Adaptive Teaching Resource Assessment Rubric</i>	To assess the quality of adaptive lesson plans developed by participants	Student needs analysis, learning objectives, instructional procedures, activity modification, equipment adaptation, safety strategies, and assessment rubric	Dichotomous scale (0 = Not Achieved; 1 = Achieved)
<i>Participant Satisfaction Questionnaire</i>	To evaluate participants' perceptions of the training program	Relevance of training content, facilitator performance, practical usefulness, time allocation, and feasibility of implementation in schools	4-point Likert scale (1 = Strongly Disagree to 4 = Strongly Agree)

Data Analysis Techniques

Quantitative data were analyzed using descriptive statistics, including means, percentages, and normalized gain (N-gain) scores. The N-gain analysis was employed to determine the extent of participants' knowledge improvement by comparing pre-training and post-training assessment results. The magnitude of learning gains was interpreted using the conventional classification of low, moderate, and high improvement levels.

Qualitative data obtained from reflective notes and group discussions were analyzed using thematic analysis, involving data reduction, theme categorization, and interpretation of findings. The analysis focused on identifying participants' perceptions of the challenges associated with inclusive physical education, the adaptive instructional strategies considered most feasible for classroom implementation, and the need for sustained professional mentoring to support the long-term adoption of adaptive teaching practices.

RESULTS

Implementation of the Community Service Program

The community service program was implemented through a collaborative, simulation-based training model on May 1–2, 2026, at a partner school of the Physical Education Teacher Working Group (MGMP PJOK) in Karo Regency. This instructional approach was designed to bridge the gap between theoretical understanding and practical pedagogical decision-making in authentic and dynamic physical education settings.



Figure 1. Implementation of the Community Service Program

The first day focused on strengthening participants' conceptual understanding through interactive discussions and case-based learning activities. Drawing on the findings of the preliminary needs assessment conducted with MGMP administrators, facilitators guided participants in examining the diversity of students' learning characteristics within physical education. Discussions highlighted variations in students' physical abilities, including strength, coordination, concentration, confidence, information-processing capacity, and the need for verbal or physical instructional support. Initial responses revealed that several participants associated inclusive education with requiring all students to complete identical learning tasks. However, facilitated discussions and collaborative reflection gradually transformed this perspective, emphasizing that inclusive education is founded on equitable learning opportunities achieved through appropriate instructional adaptation rather than uniform task requirements.

The second day emphasized practical implementation through activity modification workshops and microteaching sessions. Participants worked collaboratively to redesign a variety of physical education activities, including chain-ball games, target-throwing exercises, adaptive relay races, inclusive mini-soccer, and partner-based fitness activities. Guided by the TREE framework (Teaching style, Rules, Equipment, and Environment), participants systematically modified learning tasks by reducing playing areas, establishing safety zones, using foam balls to minimize injury risks, incorporating illustrated instructional cards, replacing elimination-based rules with rotation systems, and providing alternative movement tasks aligned with students' diverse functional abilities. The program concluded with microteaching sessions, during which participants demonstrated adaptive instructional practices and

received structured feedback from facilitators and peers. Reflection sessions focused on the clarity of instructional delivery, the effectiveness of visual demonstrations, strategies for promoting peer support, and the application of flexible assessment criteria that accommodated individual learner differences.

Improvement in Teachers' Knowledge

The comparison of pretest and posttest scores demonstrated a substantial improvement in participants' knowledge following the training program. The mean score increased from 58.28 before the intervention to 84.84 after its completion, yielding a normalized gain (N-gain) score of 0.64, which indicates a moderate-to-high level of learning improvement. The greatest gains were observed in participants' understanding of adaptive game-rule modification and inclusive assessment practices. Prior to the training, many participants viewed instructional adaptation primarily as the modification of equipment. Following the intervention, however, they demonstrated a broader understanding that inclusive physical education can be achieved by adapting multiple instructional components, including learning objectives, teaching strategies, task instructions, student grouping, activity intensity, spatial organization, time allocation, equipment, and assessment criteria to accommodate diverse learner needs.

Table 2. Evaluation results knowledge participant

Indicator Knowledge	Pretest	Posttest	Ascension
<i>Draft education physical adaptive</i>	61.25	86.25	25.00
<i>Principle learning inclusion</i>	59.38	83.75	24.37
<i>Identification need participant educate</i>	55.63	81.88	26.25
<i>Modification activities and tools</i>	60.00	88.13	28.13
<i>Assessment participatory</i>	55.16	84.22	29.06
<i>Average</i>	58.28	84.84	26.56

The observed improvement is consistent with previous research emphasizing the importance of structured professional development in preparing teachers for inclusive physical education. [Neville et al. \(2019, p. 104\)](#) argued that systematic teacher training constitutes a key strategy for strengthening the successful implementation of inclusive physical education. Similarly, [Vasiljanovna \(2025\)](#) reported that enhancing teachers' professional competencies significantly improves their readiness to address the diverse learning needs encountered in inclusive educational settings. The findings of the present program suggest that the increase in participants' knowledge was not solely attributable to the instructional content delivered during the training. Rather, it resulted from participants' active engagement in collaborative learning activities that enabled them to connect pedagogical theory with authentic challenges encountered in their own school contexts. This finding is consistent with previous studies demonstrating that experiential learning, collaborative reflection, and practice-based professional development promote more meaningful and sustainable improvements in teachers' pedagogical competence ([Bufasi et al., 2024, p. 140](#); [Friesen & Brown, 2024, p. 8](#); [Makopoulou et al., 2019, p. 787](#)).

Development of Adaptive Teaching Resources

The training program also strengthened participants' competencies in developing adaptive teaching resources for inclusive physical education. By the end of the program, each participant group had successfully produced instructional materials that incorporated comprehensive student needs profiles, clearly defined learning objectives, structured instructional procedures, differentiated movement activities, equipment adaptations, safety protocols, and inclusive assessment rubrics. The quality of these teaching resources improved substantially, with the average evaluation score increasing from 60.16 during the initial drafting stage to 86.41 after revision and facilitator feedback. The most notable improvements were observed in the development of clearer assessment rubrics and in the alignment between instructional modifications and students' diverse learning characteristics, indicating an enhanced ability to design learning experiences that are both inclusive and pedagogically responsive.

Table 3. Assessment product adaptive teaching tools

Aspect Evaluation	Initial Draft	Draft Revision
Compliance objective with need student	62.50	85.94
Clarity step learning	64.06	86.72
Modification rules , tools , and environment	58.59	88.28
Safety strategy	61.72	86.25
Assessment participatory and individual	53.91	84.84
<i>Average</i>	60.16	86.41

The adaptive teaching resources developed by participants demonstrated a clear shift in instructional orientation from performance-based learning toward approaches that prioritize participation and individual student development. For instance, in throw-and-catch activities, participants designed assessment criteria that extended beyond the number of successful catches to include students' willingness to participate, ability to follow instructions, collaboration with peers, and improvements in coordination compared with previous learning sessions. This transition represents an important advancement in inclusive assessment practices, as students with diverse educational needs exhibit varying rates and patterns of development. Consequently, assessment should emphasize individual learning processes and progress rather than focusing exclusively on technical performance.

These findings are consistent with the study by [Sari et al., \(2022\)](#), which reported that although physical education teachers generally recognize the educational value of inclusive physical education for students with disabilities, many remain concerned about environmental constraints and limited institutional support. The present training program addressed these concerns by providing participants with practical examples of instructional adaptations that can be readily implemented in school settings. Likewise, [Qonita et al., \(2024\)](#) emphasized that appropriate modifications of learning media and instructional resources enable students with special educational needs to participate more effectively in physical education activities according to their individual abilities and limitations.

Microteaching Performance

Participants' adaptive teaching competencies were further evaluated through microteaching sessions conducted in small groups. Overall, participants demonstrated satisfactory performance in delivering adaptive instruction, particularly in providing clear verbal explanations, using visual demonstrations, implementing appropriate safety procedures, and facilitating differentiated physical

activities. The average microteaching score was **3.42** on a four-point scale, indicating a **good** level of teaching performance. The highest scores were achieved in **safety management** (3.59) and **modification of rules and equipment** (3.53), reflecting participants' strong ability to create safe and accessible learning environments. In contrast, the provision of individualized feedback (3.19) received the lowest average score, suggesting that personalized instructional support remains an area requiring further professional development.

Table 4. Results of Microteaching Performance Assessment

Performance Aspect	Mean Score	Category
Inclusive lesson opening and apperception	3.38	Good
Clarity of verbal and visual instructions	3.31	Good
Modification of rules and equipment	3.53	Very Good
Safety management	3.59	Very Good
Individualized feedback	3.19	Good
Process- and participation-based assessment	3.31	Good
Overall Mean	3.42	Good

The microteaching results indicate that adaptive physical education is more effectively understood when professional development emphasizes experiential and practice-oriented learning. Participants reported that the training demonstrated how instructional adaptations could be implemented without substantial financial investment. Instead, teachers successfully utilized inexpensive and readily available materials, including plastic balls, improvised cones, raffia ropes, color-coded cards, sand-filled bottles, and simple field markers. These resources were selected based on their safety, visibility, accessibility, and suitability for achieving specific movement learning objectives.

The findings also reinforce previous evidence regarding the implementation of inclusive physical education. [Gazali et al., \(2025\)](#) identified inadequate facilities, teachers' professional competencies, institutional attitudes, and limited environmental support as major barriers to inclusive practice. The present program demonstrates that many of these challenges can be addressed through well-designed instructional modifications and practical teacher training. Nevertheless, the long-term sustainability of adaptive physical education requires broader institutional support, including school policies that promote inclusion, adequate learning facilities, and interdisciplinary collaboration among physical education teachers, homeroom teachers, special education specialists, school counselors, parents, and healthcare professionals. Continuous professional development remains essential to ensure that teachers maintain and further develop the competencies required for inclusive physical education.

Participants' Satisfaction with the Training Program

The post-program satisfaction survey demonstrated a highly positive response from participants regarding the overall quality and relevance of the training. A total of 29 participants (90.63%) reported that the program was **highly relevant** to their professional teaching needs, while the remaining three participants (9.37%) considered it **relevant**. Notably, none of the participants indicated that the training was irrelevant to their instructional practice.

Participants also expressed strong appreciation for the practical value of the program. Twenty-eight participants (87.50%) rated the overall usefulness of the training as **very good**, highlighting its direct applicability to classroom practice. Among the various training components, the adaptive lesson plans, instructional resources, and inclusive assessment rubrics were consistently identified as the most valuable outputs. Participants noted that these materials could be readily adapted to accommodate the specific contexts, available resources, and diverse learning needs within their respective schools, thereby enhancing the feasibility of implementing inclusive and adaptive physical education practices.

Table 5. Response participant to activity

Aspect Response	Very good	Good	Enough	Not enough
Relevance material	90.63%	9.37%	0%	0%
Clarity delivery	84.38%	15.62%	0%	0%
Benefit practice field	87.50%	12.50%	0%	0%
Compliance example teaching tools	81.25%	18.75%	0%	0%
Opportunity implementation in schools	78.13%	21.87%	0%	0%

Participants' Reflections

Analysis of participants' reflective feedback revealed three dominant themes. First, teachers emphasized the need for practical and accessible guidelines to help identify students' learning support needs without relying on formal medical diagnoses. Participants recognized that the primary responsibility of physical education teachers is not to classify students according to disability categories, but rather to identify the instructional accommodations required to support meaningful participation. These accommodations may include providing additional verbal guidance, using safer equipment, shortening activity duration, implementing peer-assisted learning, or organizing learning spaces more effectively.

Second, participants highlighted the need for a repository of adaptive physical education activities that could be applied across a wide range of PJOK learning materials. Such a resource was considered essential for assisting teachers in selecting and modifying instructional activities appropriate to students' diverse abilities and learning characteristics.

Third, participants expressed the importance of strengthening professional collaboration through the MGMP PJOK network by establishing a structured forum for sharing best practices. They believed that continuous peer exchange, collaborative reflection, and the dissemination of successful instructional strategies would reduce professional isolation and support the sustainable implementation of inclusive and adaptive physical education across schools.

DISCUSSION

The findings of this community service program demonstrate that physical education teachers are better able to

understand and implement adaptive physical education when professional development is contextualized, practice-oriented, and collaborative. Rather than positioning participants as passive recipients of theoretical information, the training actively engaged teachers in solving authentic pedagogical challenges encountered in their own school settings. This experiential approach effectively narrowed the gap between the theoretical principles of inclusive education and their practical application within physical education classrooms in Karo Regency.

The substantial improvement in participants' knowledge highlights the importance of equipping teachers with a strong conceptual foundation in inclusive education and instructional adaptation. Without adequate preparation, teachers may unintentionally adopt a one-size-fits-all approach in the name of equality, thereby overlooking the diverse learning needs of individual students. Previous studies have similarly argued that equitable learning is achieved not through identical instructional experiences, but through differentiated support that enables every learner to attain meaningful educational outcomes (Dignath et al., 2022, p. 2642; Folgueras et al., 2023, p. 881; Sari et al., 2022; Vergara et al., 2025). This principle is particularly relevant in physical education, where learning activities involve safety considerations and are strongly influenced by students' physical abilities, coordination, communication skills, confidence, and psychosocial readiness (Lubans et al., 2017, p. 30; Prasetyo et al., 2022, p. 289).

Another important outcome of the program was the improvement in teachers' ability to develop adaptive teaching resources. Instructional materials serve as a critical link between the objectives of inclusive education and classroom implementation by enabling teachers to provide safe, flexible, and meaningful learning experiences. The adaptive lesson plans and assessment instruments produced during the training reflected a shift from performance-oriented instruction toward approaches that value participation, individual progress, and equitable learning opportunities. These findings are consistent with Rakaa et al. (2025) who emphasized that adaptive pedagogical strategies, including peer tutoring and collaborative learning, play a crucial role in increasing both participation and social interaction among students with diverse educational needs. The collaborative design activities incorporated into this program further reinforced these inclusive teaching principles.

The findings also suggest that short-term professional development should be complemented by sustained mentoring and continuous professional support. Although participants demonstrated satisfactory competence during the microteaching sessions, individualized feedback and differentiated instructional planning remained areas requiring further improvement. Ongoing mentoring can help teachers refine their ability to provide personalized feedback, respond to differences in students' learning pace and attention, and design learning tasks with graduated levels of difficulty that accommodate diverse learner abilities (Phumsaidorn & Julsuwan, 2024, p. 35; Polyiem et al., 2026). Likewise, previous research has highlighted the value of differentiated instructional frameworks, such as the STEPS model—which adapts Space, Task, Equipment, People, and Speed—in promoting inclusive participation while maintaining the quality of learning experiences (Pushkarenko et al., 2023, p. 1171293; Rock et al., 2008, p. 37). To prevent inclusive PJOK from becoming too simplistic for some students or overly demanding for others, the implementation of structured differentiation strategies is imperative. Research suggests that models like STEPS (modifying Space, Task, Equipment, People, and Speed) can significantly enhance inclusive participation without sacrificing learning quality (Munster et al., 2019; Petrie et al., 2018). Incorporating these structured adaptation frameworks into future professional development initiatives may further strengthen teachers' instructional competence.

Despite the encouraging outcomes of this program, successful implementation of adaptive physical education cannot rely solely on teachers' creativity and commitment. Institutional support remains fundamental to sustaining inclusive practice. Schools should establish policies that prioritize student safety, provide accessible adaptive equipment, and ensure that physical learning environments are suitable for students with diverse abilities. Previous studies have consistently identified inadequate infrastructure and limited institutional support as significant barriers to the implementation of inclusive physical education (Gazali et al., 2025; Hakiki et al., 2023). Therefore, school leaders and educational policymakers play an essential role in sustaining the impact of teacher professional development through appropriate resource allocation, supportive school policies, and long-term commitment to inclusive education (Husain & Ishar, 2025).

Finally, the active involvement of the Physical Education Teacher Working Group (MGMP PJOK) represents a strategic mechanism for sustaining professional learning beyond the training program itself. As a professional learning community, the MGMP can facilitate the continuous exchange of best practices, peer mentoring, and the collaborative development of adaptive teaching resources. Furthermore, integrating traditional games and the cultural values of mutual cooperation that characterize the Karo community into adaptive physical education offers opportunities to enhance both instructional accessibility and cultural relevance. Such an approach not only supports inclusive learning but also strengthens local identity while preserving regional cultural heritage within the educational process.

CONCLUSION

This community service program demonstrated that the adaptive physical education training provided to MGMP PJOK teachers in Karo Regency effectively enhanced participants' professional competencies, including their conceptual understanding of inclusive physical education, their ability to develop adaptive teaching resources, and their instructional performance, all of which achieved satisfactory outcomes. The findings indicate that a contextual, practice-oriented, and collaborative training model—integrating simulations, case-based discussions, and microteaching—provides an effective approach for translating the principles of inclusive education into practical classroom implementation.

Beyond improving teachers' knowledge and instructional skills, the program promoted a meaningful shift in pedagogical perspectives by encouraging participants to become reflective practitioners capable of designing differentiated learning experiences that accommodate diverse student needs. The active involvement of the MGMP PJOK also demonstrated the value of professional learning communities in supporting the sustainable implementation of inclusive physical education through peer collaboration and continuous knowledge sharing.

To maximize the long-term impact of this initiative, follow-up efforts should focus on establishing structured best-practice forums within the MGMP, developing a repository of adaptive physical education activities that incorporates local cultural contexts, and strengthening collaboration among teachers, school leaders, parents, special education professionals, and educational policymakers. In addition, sustained professional mentoring, supportive institutional policies, and adequate adaptive learning resources are essential to ensure that inclusive physical education moves beyond a uniform *one-size-fits-all* approach toward instructional practices that are equitable, safe, participatory, and responsive to the diverse abilities of all learners.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this article. The community service program was conducted independently without any financial, commercial, or personal relationships that could have influenced the design, implementation, analysis, interpretation of the findings, or preparation of the manuscript.

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