

Inclusive Physical Education in Resource-Limited Schools: Factors and Barriers, Effectiveness of Improvised Materials Empowering Diverse Learners

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ABSTRACT

This descriptive quantitative study examined the implementation of inclusive physical education programs in resource-limited schools, focusing on barriers faced by teachers and the effectiveness of improvised materials. Data were collected from 30 PE teachers through a structured survey. Results showed that 76.7% of teachers regularly adapted activities for diverse learners, and 70% strongly agreed that improvised materials enhanced accessibility and engagement. However, the study found that teachers faced major challenges, with 83.4% reporting limited funding and 93.34% having little training in inclusive education. Based on the Universal Design for Learning framework, the study shows that good inclusive PE relies more on teacher creativity and improvised materials than on expensive equipment. The study concludes that improvised materials can help address resource gaps, but schools must invest in teacher training and support to achieve truly inclusive PE programs.

Keywords: Inclusive Physical Education (IPE), Improvised Materials, Resource-Limited Schools, Universal Design for Learning (UDL), and Diverse Learners.

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INTRODUCTION

Liu, X., et al (2025) state that the implementation of inclusive physical education (IPE) represents a global paradigm shift, widely practiced internationally as a strategy to create equitable learning environments. The core tenet of IPE is to ensure that students with disabilities (SWD) and those without disabilities learn together, addressing the specific needs of SWD as a previously marginalized group. This philosophy is not merely aspirational but is structurally embedded within prominent global educational trends that have championed integrated school placements over the past three decades.

Fernández-Río (2022) and colleagues conducted a systematic investigation of teacher perceptions regarding the use of self-made materials in physical education, examining this topic both before and during the COVID-19 pandemic. Their review highlighted that self-made materials address a prevalent problem in PE classes, the scarcity of resources due to limited budgets, noting that 50% of PE teachers worldwide evaluated their materials as limited or insufficient. Gazali N., et al (2025) found that systemic barriers to IPE included a high percentage of teachers (68%) reporting exclusive attitudes from non-disabled students, and 59% of educators lacking formal inclusion training. Teachers also reported encountering significant limits due to disability-unfriendly facilities, which were deemed unsuitable by 68% of respondents, compounded by heavy administrative demands that limited creative lesson design. Kahiga & Kinyua (2022) found that the impact of this pervasive inadequacy is direct and detrimental to student outcomes. When resources are limited, students are denied sufficient practice opportunities, which severely hinders the efficient acquisition of motor skills. The resulting absence or inadequacy of equipment and supplies can lead to teachers skipping relevant concepts, refusing to teach PE, or learners missing concrete educational experiences.

The factors influencing participation of SWD in physical activities within integrated settings are complex and multi-layered, as highlighted by systematic reviews. A dynamic theoretical model encompassing 19 interconnected themes identifies barriers across three critical phases: 1) the perspectives of school

administrators; 2) the two-way dialogue between school management and staff; and 3) the direct interactions among staff, SWD, and peers. Liu, X., et al (2025)

According to Mendez-Gimenez et al. (2023), Empirical research strongly supports the application of Self-Made Materials (SMM) as a high-impact strategy in physical education. Studies have consistently demonstrated that SMM increases student engagement, interest, fun, and enthusiasm among primary and secondary school learners. More significantly for diverse learners, the utilization of SMM is directly linked to student empowerment through the enhancement of basic psychological needs (BPNs).

On the other hand, physical education stands as a fundamental pillar of holistic student development, fostering not only physical fitness but also cognitive growth, social interaction, and emotional well-being. However, the reality of implementing quality physical education programs in resource-limited schools presents significant challenges that threaten to undermine the educational equity that all learners deserve. According to *Hardman* (2008), Research evaluating physical education teachers worldwide revealed that 50% of PE teachers considered their materials 'limited' or 'insufficient', highlighting how the scarcity of resources, due to limited budgets, represents a prevalent problem within PE classes. Kahiga & Kinyua (2022) state that the major concept of improvisation is that the point of concentration requires attention to the problem rather than to the individuals addressing the issue. This, therefore, implies that PE teachers need to use improvised materials when teaching and involve learners in improvisation, as this caters to the limitation of what may not be available for use. This will help in enhancing creativity and problem-solving skills.

The shift toward SMM aligns strongly with the principles of Universal Design for Learning (UDL). The literature advocates for the adoption of UDL as a vital, transformative step that moves PE programming away from reactive "adaptive" approaches, which often reinforce ableism and segregation, toward a flexible, learner-centered, barrier-free design. Petrie et al. (2024). Crucially, the imperative for improvisation transcends mere material substitution; it is deeply embedded in modern pedagogical goals. Improvisation is recognized as a key element in the acquisition of problem-solving competency within current curricula. Kahiga & Kinyua (2022). This initiative aimed to identify the core problem that lies in the intersection of resource scarcity and the imperative for inclusive education, affecting factors and barriers; the effectiveness of using improvised materials to empower diverse learners.

According to Reyno, L. P., & Caballes, D. G. (2024) In response to the scarcity of commercial gym equipment, this study developed and tested improvised tools such as "Aero Steps" (from wood/scrap) and "Agility Ladders" (from textile/rope). Both students and teachers rated the improvised equipment as highly suitable, acceptable, and durable. Mopera, J. D. (2024) States that while Special Education (SPED) teachers often desire to improvise or modify equipment to suit their learners, they face challenges regarding safety assurances. The study underscores the urgent need for training in the creation of safe, improvised adaptive tools to ensure LSENs can participate meaningfully. While in this study found that teachers rarely had access to standard equipment like jumping pits or hurdles. Instead, they employed alternative practices, such as using rice husks for landing areas or designing softball bats from tree branches. These indigenous coping strategies were essential for continuing physical education classes, demonstrating how local resourcefulness supports curriculum delivery in marginalized communities. Ahmad, M. (2021). The Self-Made Material (SMM) study in Spain of Mendez-Gimenez & Fernandez-Rio (2022) found students and teachers collaboratively build PE equipment from recycled materials (e.g., cardboard, plastic bottles) this approach significantly increased student motivation and participation. By constructing their own materials, students felt a greater connection to the class, and the materials could be easily customized (weight, size, texture) to fit the different skill levels of diverse learners, promoting a naturally inclusive environment.

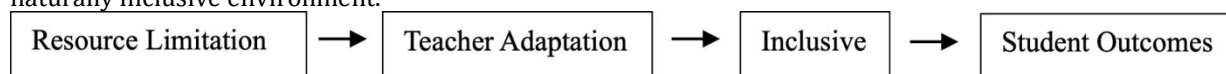


Figure 1: Adopted from the Universal Design for Learning Framework (CAST, 2018; Ramo et. al., 2022)

This study is grounded in the Universal Design for Learning & Adaptation Framework (CAST, 2018; Rao et al., 2022), which prioritizes flexibility and inclusivity in teaching. Physical Education Teachers in resource-constrained schools often encounter obstacles like inadequate facilities, insufficient equipment, and limited institutional support. Nevertheless, they play a crucial role in crafting meaningful and inclusive learning experiences for all students. By applying the UDL principles of engagement, representation, and expression, teachers adapt their approaches by utilizing improvised materials to ensure active participation

of all students in PE activities. This framework underscores how teachers' creativity, adaptability, and dedication bridge the gap between limited resources and successful student outcomes. In this study, the

framework demonstrates that effective use of improvised materials by teachers can boost students' participation, confidence, and sense of belonging, highlighting that inclusive education relies on teachers' innovative strategies rather than just the availability of resources.

The primary objective of this research is to explore and evaluate the effectiveness of improvised materials in promoting inclusive physical education for diverse learners in resource-limited school settings. Specifically, the study aims to: identify the challenges and barriers faced by physical education teachers in implementing inclusive PE programs in resource-limited schools; assess the effectiveness of improvised materials in facilitating participation and engagement (including students with disabilities, different skill levels, and varied backgrounds) in PE activities; and determine the impact of improvised materials on students' physical skill development, confidence, and sense of inclusion during PE classes.

Through this investigation, the research seeks to shift the paradigm from viewing resource limitation as an insurmountable barrier to recognizing it as an opportunity for creative pedagogy and inclusive innovation. By demonstrating that meaningful, equitable physical education can be delivered without expensive equipment or elaborate facilities, this study aims to empower educators, validate community resources, and ultimately ensure that all students regardless of their school's economic circumstances or their individual learning needs have access to quality physical education experiences. The findings will contribute to both the theoretical understanding of inclusive education in constrained contexts and the practical knowledge base of educators working to create equitable learning environments for every student.

Statement of the Problem

The study seeks to identify and measure the effectiveness of the pedagogical intervention in inclusive PE programs using improvised materials in resource-constrained settings.

Specifically, this study aims to answer the following questions:

What are the factors and barriers affecting physical education teachers in the implementation of inclusive PE programs in resource-limited schools?

Facilities and Equipment

Instructional Materials

Institutional Support

How effective are improvised materials in facilitating the participation and engagement of diverse learners in PE activities?

Wood/Scrap as aero steps, Rope as agility ladders

Rice husks for landing area and softball bats from tree branches

Visual aids such as flags and cards for hearing-impaired students

What is the impact of improvised materials on students' physical skill development, confidence, and sense of inclusion during PE classes in resource-limited schools?

METHODOLOGY

Research Design

This study utilized a descriptive quantitative research design to explore and document the strategies, innovations, and challenges faced by PE teachers in implementing inclusive physical education in resource-limited schools. The design is appropriate for identifying patterns and summarizing practices without manipulating variables, offering a snapshot of current realities in both public and private school settings.

Participants

The study involved 30 Physical Education (PE) teachers from various public and private schools. Participants were selected through purposive sampling, ensuring that each respondent had experience teaching PE in environments with limited resources and diverse learner needs.

Research Instrument

A **structured survey questionnaire** was developed and administered via **Google Forms** to facilitate easy distribution and data collection. The instrument was divided into five key sections:

Demographic Profile

Age, gender, years of teaching experience

School type (public/private)

Training in inclusive education

Inclusive Teaching Practices

Likert-scale items (1–5) assessing frequency and effectiveness of inclusive strategies (e.g., peer-assisted learning, modified activities).

Use of Improvised Materials

Types of materials used (e.g., recycled items, locally available tools)

Frequency of use

Perceived effectiveness in engaging diverse learners

Facilities and Equipment

Likert scale item (1-6) assessing the facilities and equipment in school

Challenges Encountered

Multiple-choice and scaled items identifying barriers (e.g., lack of funding, limited space, insufficient training)

The questionnaire was reviewed by experts in physical education and inclusive pedagogy to ensure content validity. A pilot test was conducted with five PE teachers to refine clarity and reliability.

Data Collection Procedure

The finalized questionnaire was distributed electronically via Google Forms.

Participants received an invitation link through email and professional networks.

Informed consent was embedded in the first section of the form, ensuring voluntary participation and confidentiality.

Data collection was conducted over a two-week period.

Data Analysis

Collected data were analysed using descriptive statistics: Analysis was performed using spreadsheet tools and statistical software such as Google Sheets.

or SPSS.

RESULTS

A total of 30 public and private teachers completed the survey (response rate: 100%). Table 1 presents the demographic characteristics of respondents,

Table 1: Demographic Profile (N=30)

Characteristics	Category	n	%
Gender	Male	19	63.3%
	Female	11	36.7%
	Non-binary/Other	0	0%
Age Group	18–23 Years Old	2	6.7%
	24–30 Years Old	19	63.3%
	31+ Years Old	9	30%
Years of Teaching Experience	0–3 Years	12	40%
	4–6 Years	3	10%
	7+ Years	15	50%
School Type	Public School	7	23.3%
	Private School	23	76.7%
Training in Inclusive Education	0–3 Trainings	28	93.34%
	4–6 Trainings	1	3.33%
	7+ Trainings	1	3.33%

This table summarizes the demographic characteristics of a sample of 30 participants. It includes their gender, age group, years of teaching experience, school type, and the extent of their training in inclusive education. Most participants are male (63.3%), aged between 24-30 years (63.3%), and have seven or more years of teaching experience (50%). A majority work in private schools (76.7%). Nearly all have received zero to three training in inclusive education (93.34%), indicating limited training exposure in this area.

Table 2: Mean and Standard Deviation

Key Section	Mean (M)	Interpretation	Ranking
Inclusive Teaching Practices	4.73	Strongly Agree	1
Use of Improvised Materials	4.28	Strongly Agree	2
Challenges Encountered	4.15	Agree	3
Facilities and Equipment	4.01	Agree	4

Table 2.1 Inclusive Teaching Practices

Question	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Total Respondents
I regularly adapt physical activities to meet the diverse needs of my students.	0% (0)	0% (0)	23.3% (7)	76.7% (23)	30
I use peer-assisted learning strategies to promote inclusion in my PE class.	0% (0)	3.3% (1)	33.3% (10)	63.3% (19)	30
I modify rules and game structures so that all students can participate meaningfully.	0% (0)	6.7% (2)	30% (9)	63.3% (19)	30
I provide individualized support or alternative tasks for learners with special needs.	0% (0)	3.3% (1)	20% (6)	76.7% (23)	30
My inclusive teaching strategies effectively enhance students' engagement and participation.	0% (0)	3.3% (1)	20% (6)	76.7% (23)	30

Adaptation of Activities – Most respondents reported adapting activities for diverse learners, with 76.7% (n=23) “Strongly Agreed.” Meanwhile, 23.3% (n=7) “Agreed,” showing strong overall practice.

Peer-Assisted Learning – A combined 63.3% (n=19) “Strongly Agreed” they use peer-assisted strategies, while 33.3% (n=10) were “Agreed.” Only 3.3% (n=1) remained “Neutral,” indicating moderate implementation.

Modification of Rules – Majority 76.7% (n=23) “Strongly Agreed” to modifying rules for inclusion, with 20.0% (n=6) “Agree.” Only 3.3% (n=1) “Neutral,” reflecting strong inclusive efforts.

Individualized Support – 63.3% (n=19) “Strongly Agreed” they provide individualized support, 30.0% (n=9) “Agreed”, and 6.7% (n=2) remained “Neutral” suggesting room for improvement.

Enhancing Engagement – Most respondents (76.7%, n=23) “Strongly Agreed” their strategies enhance engagement, 20.0% (n=6) were “Agreed,” and 3.3% (n=1) “Neutral,” showing overall effective practice.

Table 2.2 Use of Improvised Materials

Question	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Total Respondents
I frequently use improvised or locally available materials in my PE lessons.	3.3% (1)	13.3% (4)	43.4% (13)	40% (12)	30
The use of recycled or low-cost materials helps me conduct more inclusive activities.	3.3% (1)	16.7% (5)	50% (15)	30% (9)	30
I am confident in creating and adapting improvised materials for different physical activities.	0% (0)	20% (6)	33.3% (10)	46.7% (14)	30
Improvised equipment effectively supports skill development among students.	3.3% (1)	10% (3)	30% (9)	56.7% (17)	30
Using locally available materials makes PE more accessible and enjoyable for learners.	0% (0)	10% (3)	20% (6)	70% (21)	30

Use of Improvised Materials – Most respondents reported using improvised materials, with 40% (n=12) “Strongly Agreed” and 43.4% (n=13) “Agreed”. Only 13.3% (n=4) were “Neutral” and 3.3% (n=1) “Disagreed”.

Recycled/Low-Cost Materials – A majority supported the role of recycled or low-cost materials in inclusivity, with 30% (n=9) “Strongly Agreed” and 50% (n=15) “Agreed”. Meanwhile, 16.7% (n=5) were “Neutral” and 3.3% (n=1) “Disagreed.”

Confidence in Creating Materials – Respondents reported high confidence, with 46.7% (n=14) “Strongly Agreed” and 33.3% (n=10) “Agreed”. Only 20% (n=6) were “Neutral”, and 0% (n=0) “Disagreed.”

Improvised Equipment for Skill Development – The effectiveness of improvised equipment was affirmed by 56.7% (n=17) “Strongly Agreed” and 30% (n=9) “Agreed.” Additionally, 10% (n=3) were “Neutral” and 3.3% (n=1) “Disagree.”

Locally Available Materials for Accessibility – Most respondents endorsed locally available materials, with 70% (n=21) “Strongly Agreed” and 20% (n=6) “Agreed”. Only 10% (n=3) were “Neutral”, and 0% (n=0) “Disagreed”.

Table 2.3 Facilities and Equipment

Question	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Total Respondents
The available PE facilities in my school are adequate for conducting inclusive physical activities.	3.3% (1)	6.7% (2)	16.7% (5)	23.3% (7)	50% (15)	30
The condition and safety of existing sports equipment meet students’ needs.	3.3% (1)	3.3% (1)	16.7% (5)	26.7% (8)	50% (15)	30
My school provides sufficient space for conducting a variety of PE activities.	3.3% (1)	10% (3)	10% (3)	23.3% (7)	53.3% (16)	30

Adequacy of Facilities - A significant majority of respondents viewed their facilities positively. Half of the teachers (50.0%, n=15) "Strongly Agreed," and 23.3% (n=7) "Agreed" that the available PE facilities in their school are adequate for conducting inclusive physical activities.

Condition of Equipment - Similarly, perceptions of equipment condition and safety were favorable. 50.0% (n=15) "Strongly Agreed," and 26.7% (n=8) "Agreed" that the existing sports equipment meets students' needs.

Sufficient Space - The availability of space was also seen as an asset by most participants. A combined 76.6% of teachers either "Strongly Agreed" (53.3%, n=16) or "Agreed" (23.3%, n=7) that their school provides sufficient space for conducting a variety of PE activities.

Table 2.4 Challenges Encountered

Question	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Total Respondents
Limited funding and resources make it difficult to implement inclusive PE programs.	3.3% (1)	3.3% (1)	10% (3)	26.7% (8)	56.7% (17)	30
Lack of training in inclusive education limits my ability to address diverse learner needs.	3.3% (1)	6.7% (2)	20% (6)	23.3% (7)	46.7% (14)	30

Limited Funding and Resources - The most prominent challenge identified was financial. A vast majority of respondents (83.4%) either "Strongly Agreed" (56.7%, n=17) or "Agreed" (26.7%, n=8) that limited funding and resources make it difficult to implement inclusive PE programs.

Lack of Training - A lack of specialized training was also identified as a significant barrier. 46.7% (n=14) "Strongly Agreed," and 23.3% (n=7) "Agreed," indicating that a combined 70.0% of teachers feel their lack of training in inclusive education limits their ability to address diverse learner needs. A notable 20.0% (n=6) of respondents remained "Neutral" on this statement.

DISCUSSION

The results of this study highlight how PE teachers in resource-limited schools actively negotiate the demands of inclusive education despite constraints in funding, facilities, and professional preparation. Overall, the teachers who participated in this research demonstrated a strong willingness to modify instruction and create a supportive learning environment for diverse learners. This commitment is evident in their consistent use of adapted activities, flexible rules, and differentiated support-practices that are at the core of inclusiveness in PE.

Inclusive Teaching Practices Amid Limited Resources

The results indicate that teachers frequently implement inclusive strategies in their classes. High agreement rates (over 70% in most items) show that teachers regularly adapt activities, modify game rules, and provide individualized support to ensure that students with varied needs can participate meaningfully. This finding aligns with the Universal Design for Learning (UDL), which emphasizes flexible

approaches to engagement, representation, and expression. Teachers' consistent use of these strategies demonstrates that inclusivity is largely dependent on pedagogical intentionality rather than the availability of advanced resources.

However, while the majority of teachers report implementing inclusive practices, the presence of neutral responses—particularly regarding individualized support—suggests that some educators still struggle to fully accommodate learners with disabilities or special needs. This gap may be linked to the limited training in inclusive education noted by 93% of respondents, indicating that teachers rely heavily on experience and improvisation rather than formal preparation.

Role of Improvised Materials in Promoting Engagement

One of the strongest themes that emerged from the data is the value teachers place on improvised materials. Studies show that improvised tools—such as wood-based Aero Steps, textile agility ladders, landing areas made from rice husks, or softball bats crafted from tree branches—are viewed as suitable, durable, and practical alternatives when commercial equipment is unavailable. Most respondents shared that using recycled or easily available materials significantly helped them engage students and adjust activities based on ability levels. This finding reinforces the idea that effective PE instruction is not solely dependent on standard equipment. Instead, the ability to improvise appears to encourage teachers to think more creatively about lesson design, which can lead to more student-centered and flexible learning environments. The positive perceptions toward improvised materials also reflect a practical mindset—teachers are not simply “making do”, but rather using these materials intentionally to support participation.

Adequacy of Facilities and Ongoing Systemic Constraints

Interestingly, most teachers expressed satisfaction with their school's facilities, equipment, and available space. Over 70% strongly agreed that they had sufficient physical space for PE activities. This contrasts with earlier international research (Hardman, 2008), which showed widespread inadequacies in facilities and equipment. One possible explanation is that teachers have adapted to their realities and have recalibrated their expectations accordingly. Despite these positive perceptions, financial limitations remain a common challenge.

Most respondents acknowledged that funding constraints restrict their ability to acquire specialized materials or develop more comprehensive inclusive programs. This points to a disconnect between teachers' resourcefulness and the broader systemic issues that continue to impact PE instruction.

Training Needs and Institutional Support Gaps

A major challenge revealed in the data is the lack of training in inclusive education. Nearly all respondents had only 0-3 training on inclusive practices. This lack of professional development contributes to uncertainty among some teachers about how to fully support diverse learners, especially those with special needs. This finding is consistent with the global studies emphasizing that teacher preparedness is one of the strongest predictors of successful inclusiveness in PE.

The data also highlighted the need for stronger institutional support. While teachers are creative and resourceful, innovation alone can not replace systemic investment. Schools must address funding constraints, provide regular training, and create formal policies that sustain inclusive PE initiatives. Without institutional backing, inclusive efforts rely too heavily on individual teacher initiative.

Implications for Inclusive Physical Education

Taken together, the findings suggest several important implications:

Improvised materials are effective tools for inclusion, enabling teachers to accommodate diverse skill levels and learning needs even in low-resource environments.

Teachers possess strong commitment and creativity, but need structured training to strengthen their capacity to support students with special needs.

Resource scarcity does not necessarily hinder PE quality, especially when educators apply UDL-informed strategies and improvisation.

Systemic challenges remain, particularly in terms of funding, specialized materials, and institutional backing for inclusive PE programs.

Overall, this study demonstrates that improvised materials, when paired with inclusive teaching strategies, can significantly enhance participation, engagement, and accessibility in PE classes within resource-limited schools. While teachers show strong adaptability and commitment, sustained improvements in inclusive PE require increased institutional support, targeted training, and long-term investment. By reframing resource constraints as opportunities for innovation rather than barriers, schools can move toward more equitable and empowering physical education experiences for all learners.

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