



The impact of the co-teaching model on students with disabilities in Kazakhstan: a case study

El impacto del modelo de coenseñanza en los estudiantes con discapacidades en Kazajistán: un estudio de caso

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Abstract

Introduction: Inclusive education has become an essential component of modern educational systems, but empirical research in Kazakhstan remains limited. There is a particular lack of studies addressing the practical implementation and effectiveness of co-teaching models in inclusive physical education settings.

Objective: The study aimed to assess the effectiveness of a co-teaching model in improving physical activity, motivation, and social-emotional development among students with disabilities in inclusive physical education class.

Methodology: A quasi-experimental design with a control group was employed. The co-teaching model was implemented during physical education lessons in inclusive classrooms, and data were collected to compare outcomes between the experimental and control groups.

Results: The findings indicated that the co-teaching model significantly enhanced students' physical activity, increased their motivation to participate in physical education, and improved social inclusion. These outcomes demonstrated the positive impact of collaborative teaching on both educational and social dimensions of inclusive learning.

Discussion: The results were consistent with previous international studies highlighting the benefits of co-teaching in promoting inclusion and student engagement. However, this research provided new evidence relevant to the Kazakhstani context, where such models are not widely applied.

Conclusions: Implementing co-teaching in inclusive physical education is an effective approach to fostering participation, motivation, and social-emotional well-being among students with disabilities.

Keywords

Co-teaching; disabilities; inclusive education; Physical Education.

Resumen

Introducción: La educación inclusiva se ha convertido en un componente esencial de los sistemas educativos modernos, pero la investigación empírica en Kazajistán sigue siendo limitada. Existe una falta particular de estudios que aborden la implementación práctica y la efectividad de los modelos de coenseñanza en la educación física inclusiva.

Objetivo: El estudio tuvo como objetivo evaluar la efectividad de un modelo de coenseñanza para mejorar la actividad física, la motivación y el desarrollo socioemocional de los estudiantes con discapacidades en clases inclusivas de educación física.

Metodología: Se empleó un diseño cuasiexperimental con un grupo de control. El modelo de coenseñanza se implementó durante las clases de educación física en aulas inclusivas, y se recopilaban datos para comparar los resultados entre los grupos experimental y de control.

Resultados: Los hallazgos indicaron que el modelo de coenseñanza mejoró significativamente la actividad física de los estudiantes, aumentó su motivación para participar en la educación física y fomentó una mejor inclusión social. Estos resultados demostraron el impacto positivo de la enseñanza colaborativa en las dimensiones educativas y sociales del aprendizaje inclusivo.

Discusión: Los resultados fueron consistentes con estudios internacionales previos que destacan los beneficios de la coenseñanza para promover la inclusión y la participación estudiantil. Sin embargo, esta investigación aportó nuevas evidencias relevantes para el contexto kazajo, donde dichos modelos no se aplican ampliamente.

Conclusiones: La implementación de la coenseñanza en la educación física inclusiva representa una estrategia eficaz para fomentar la participación, la motivación y el bienestar socioemocional de los estudiantes con discapacidades.

Palabras clave

Coenseñanza; discapacidades; educación inclusiva; Educación Física.

Introduction

Inclusive education has become a priority in the education systems of many countries, including Kazakhstan, due to global efforts to ensure equal access to education for all children, regardless of their physical, mental, or sensory disabilities (Shaeffer, 2019). Within this framework, physical education (PE) plays a crucial role in promoting not only physical development but also the social integration of students with disabilities (SWD) (Liu et al., 2025). However, international studies indicate that the active participation of such students in PE classes remains challenging because of insufficient teacher training, the lack of adapted methods, and limited interaction with specialist teachers (Rekaa et al., 2019).

One proposed solution in the literature is the co-teaching model, in which a physical education teacher and a special educator teach together (Vembye et al., 2024). Although the effectiveness of co-teaching has been explored in general education subjects (e.g., mathematics, languages), its application in physical education remains understudied (Sanders-Smith and Dávila, 2024). There is especially limited evidence on how different co-teaching models influence the engagement and physical activity of SWD in inclusive classrooms.

Evidence-based co-teaching is still emerging in Kazakhstan. Key challenges include the complexities involved in the design and implementation of co-teaching, limited teacher training, and the absence of a unified theory or consistent practice across schools (Karibaev et al., 2024). There is also a need to address inconsistencies in the definitions and practical applications of co-teaching. Research shows that co-teaching is one of the most important predictors of successful inclusion (Botagariyev et al., 2024). However, there remains a deficit of empirical data on co-teaching in the Kazakh academic context. Most studies (Ospankulov et al., 2023; Yerezhepov et al., 2025; Kuralbayeva et al., 2025) focus on the regulatory framework, infrastructural constraints, or the overall level of inclusiveness of educational institutions, while co-teaching in inclusive classrooms often remains overlooked.

This research addresses a significant gap in the literature by providing an empirically based method for improving the physical activity, motivation, and social-emotional development of SWD through teacher partnerships that transcend traditional professional boundaries by adopting the concept of collaborative learning. Accordingly, the study aims to evaluate the effectiveness of a co-teaching model in improving physical activity, motivation, and social-emotional development among SWD in inclusive classrooms. Therefore, the following research question guides our study:

Q1: What is the impact of the co-teaching model on SWD in inclusive classrooms with respect to physical activity, motivation, and social-emotional development compared to traditional physical education classes?

Theoretical Framework

The current stage of development is characterized by the education system's focus on educational policy, shaped by leading public institutions (UN, UNESCO, World Bank) and implemented on a global scale. The main trends driving the development of education are openness, uniformity, and continuity. The primary requirements are that education be universal and accessible. In other words, education seeks to create the necessary conditions for all children, without exception, to meet their needs for knowledge, skills, and competencies, thereby ensuring equality in this process.

In line with these trends, the strategic goal of schools is to support every student, including SWD, in achieving success and being effectively included in society (Allan and Omarova, 2022; Duggan, 2023; Wright, 2023). Working with SWD requires specific approaches. Many of the difficulties they face due to health-related conditions can be effectively addressed through structured educational, developmental, and correctional support within the school environment.

According to researchers (Al-Hassan et al., 2024; Adarkwah and Amponsah, 2024), inclusive education (IE) is the most effective way to foster optimal interaction between SWD and society, as joint learning enhances communication between SWD, their peers, and teachers. However, the quality of IE in Kazakhstan remains a concern among researchers. The current state of social integration for students



with special educational needs is still underdeveloped, which weakens their social position and reinforces existing inequalities.

Development of Adaptive Physical Education (APE) in IE

APE is a relatively new direction within the Kazakhstani rehabilitation system, aimed at fostering self-confidence, building readiness to cope with physical stress, and developing a sustainable need for physical activity. Currently, APE and adaptive sports are actively evolving; however, the participation of individuals with disabilities largely depends on the nature and severity of their impairments (Block et al., 2021).

Table 1 presents a categorization of the main forms of adaptive physical culture. Each area serves specific purposes and can be implemented either independently or in combination, ensuring an individualized approach to students.

Table 1. Categorizing the Main Forms of APE

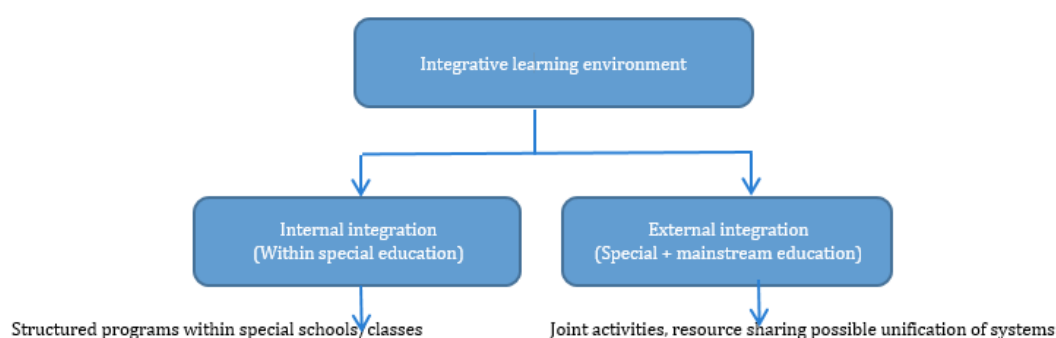
Form of adaptive physical culture	Description
Adaptive physical education	Structured physical education programs tailored to individuals with special needs
Adaptive sports	Competitive and recreational sports modified to accommodate SWD
Adaptive motor recreation	Leisure-time physical activities designed for relaxation and enjoyment, adapted as necessary
Adaptive physical rehabilitation	Physical activity-based rehabilitation programs aimed at recovery and functional restoration
Creative body-oriented practices	Innovative and expressive movement-based activities fostering creativity and body awareness
Extreme forms of motor activity	Challenging or adventurous physical activities adapted for SWD

APE in educational institutions is regarded as the most widespread form of including SWD in physical activity (Morrison and Gleddie, 2019). In Kazakhstan, two main models of pedagogical integration are being developed:

1. Internal integration, implemented within the special education system;
2. External integration, involving interaction between special and mainstream education, aimed at creating conditions for joint activities and, where appropriate resources are available, the potential unification of these systems within a single educational institution.

Various forms of integrative learning environments are illustrated in Figure 1.

Figure 1. Multiple Forms of the Integrative Learning Environment



In this context, identifying effective strategies for organizing PE within IE settings becomes particularly important. Researchers highlight that environmental barriers to implementing IPE remain significant, making recreational motor activities the most accessible option for SWD (Bertills and Björk, 2024). These barriers are often more pronounced in PE than in other subjects, as this area requires not only physical accessibility but also the adaptation of teaching methods, equipment, and physical spaces. Consequently, there is a growing need to revise educational content to accommodate the diverse needs and abilities of all students. In this regard, APE plays an increasingly vital role, serving as a key

mechanism for enabling SWD to participate actively in both educational and social contexts (Pocock and Miyahara, 2018).

Theoretical Foundations of Co-teaching

Co-teaching as an educational practice is becoming increasingly common worldwide (Salifu, 2021). However, in many contexts, particularly in Kazakhstan, it remains relatively understudied. The involvement of additional specialists and greater interaction between adults and students create expanded opportunities for organizing the educational process and can serve as a major catalyst for developing IPE. The preparedness of all participants, including teacher assistants, is a key factor in ensuring the success of co-teaching (Cook and McDuffie-Landrum, 2020). Because co-teaching facilitates the implementation of differentiation and individualization in learning, assistants must become proficient in these areas to effectively fulfill their roles (Scruggs and Mastropieri, 2017). This, in turn, is crucial for guaranteeing that children with special educational needs receive high-quality education in a supportive environment.

Co-teaching occurs when two or more experts work together in the teaching and learning process (Rytivaara and Kershner, 2012). It is conducted in a shared physical space, such as a classroom, where students collaborate and work as a team to complete educational activities (Barron and Friend, 2025). Instead of simply supporting the work of others, each specialist acts as an equal partner with comparable professional training (Hedin et al., 2020). All teachers actively participate in lesson planning and implementation, which is the defining feature of co-teaching (Jones and Winters, 2024). This approach ensures the participation of all students, including those with special educational needs (Iacono et al., 2023). Such collaborative teacher interaction enables differentiated support, which is difficult to achieve in a traditional environment where one teacher instructs the entire class.

Models and Forms of Co-education

To systematize current approaches to joint learning, it is necessary to identify the main co-education models and forms (Carty and Marie Farrell, 2018; Kim and Moodie, 2023; Gurgur and Uzuner, 2011; Pancsofar and Petroff, 2016). Table 2 presents a classification of each model along with its key features and guiding principles.

Table 2. Models and Forms of Co-Education: Key Features and Principles

Model/Form	Description	Principles
Integrated	Boys and girls learn together in the same classroom	Equal access, inclusion, reduction of stereotypes
Separate classes	Boys and girls study separately in certain subjects	Gender-sensitive instruction tailored to students' needs
Separate schools	Single-sex schools with specialized curricula	Focused learning, gender identity development, confidence building
Partial co-education	Combination of co-educational and gender-segregated classes	Flexibility, balance between academic and social development
Mixed-age co-education	Students of different ages and genders learn together	Peer learning, collaboration, scaffolding
Online co-education	Co-educational school offering separate online classes	Adapted instruction, minimized distractions

The Study's Co-Teaching Model

The selection of the co-teaching model for this study was informed by a review of literature on IPE (Petrie et al., 2018; Wang, 2019; Ruscitti et al., 2017). Considering the organizational conditions of comprehensive schools in Kazakhstan, limited opportunities for staff retraining, and teachers' readiness for interdisciplinary collaboration, a combined co-teaching model emphasizing the "One Teach – One Assist" format was chosen. In this model, the lead physical education teacher maintains the usual lesson structure, while the specialist teacher provides targeted support to SWD—assisting with exercises, adapting instructions, ensuring psychological comfort, and monitoring student engagement.

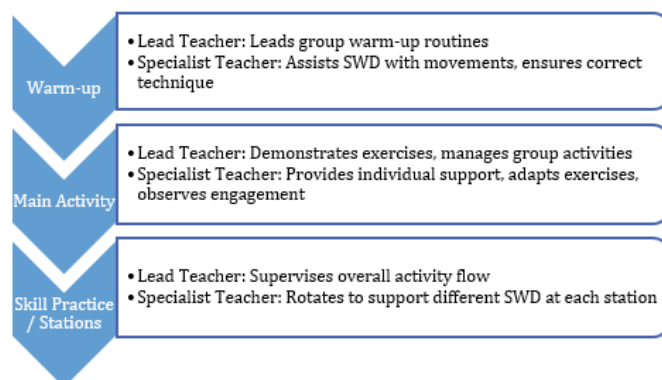
This approach integrates evidence-based principles, proven effectiveness, and the flexibility required to adapt to the realities of Kazakhstani schools, making it optimal for achieving the study's objectives. The combined co-teaching model can be applied at various stages of a physical education lesson. Its structural adaptability allows for flexible role distribution between teachers, which is particularly important when resources and personnel are limited.



Given the requirements of inclusive education and the unique context of comprehensive schools in Kazakhstan, this model represents a theoretically sound and potentially effective approach for implementing collaborative pedagogical activities in PE lessons.

Figure 2 illustrates the co-teaching model in adaptive PE, including lesson phases and teacher roles.

Figure 2. Model of Co-Teaching in APE (One Teach – One Assist)



Method

This study employed a quasi-experimental design (Maciejewski, 2020) with a control group to evaluate the effectiveness of the co-teaching model implemented in physical education lessons within inclusive classrooms. A quasi-experimental approach was chosen due to the impracticality of fully randomizing participants, given organizational constraints and the specific characteristics of the educational setting. The primary aim of this design is to compare the educational outcomes and physical activity levels of SWD and their peers across two groups: the experimental group, which participated in co-taught physical education lessons led by a physical education teacher and a specialist teacher, and the control group, which followed traditional physical education lessons without specialist support. This approach enables the assessment of the impact of the co-teaching model on student engagement, physical activity levels, and socio-psychological indicators. The design incorporates pre-test and post-test measurements of key variables in both groups, allowing for the analysis of changes over time and the evaluation of the intervention's effectiveness.

Participants

Fifteen fourth-grade students with officially confirmed disabilities from Special Boarding School No. 2 in Almaty, Kazakhstan, aged 9–10 years, participated in the study. Participants were assigned to either the experimental group (EG, $n = 8$) or the control group (CG, $n = 7$). All students attended inclusive classrooms and were medically cleared to participate in physical education, with appropriate modifications provided as needed.

To ensure valid data collection, each participant received individual or small-group support during questionnaire completion, including reading items aloud, paraphrasing in simpler language, and clarifying unfamiliar terms. Comprehension checks were conducted before inclusion in the final analysis; students who continued to demonstrate significant difficulties understanding the questionnaires despite assistance were excluded.

Inclusion criteria were: (1) enrollment in the fourth grade at the specified school, (2) informed consent from both parents and students, and (3) officially confirmed disability status based on medical or psychological reports. Exclusion criteria were: (1) medical contraindications to physical education, and (2) irregular attendance (missing more than 25% of lessons). Participants were randomly selected from the school population meeting the inclusion criteria and who agreed to participate (see Table 3).

Table 3. Demographic Characteristics of Participants

Characteristic	EG	CG	Total
Age (years), mean (SD)	9.5 (0.3)	9.6 (0.4)	9.55 (0.35)
Gender			
Male	5 (62.5%)	4 (57.1%)	9 (60.0%)
Female	3 (37.5%)	3 (42.9%)	6 (40.0%)
Type of disability*			
Physical	3 (37.5%)	2 (28.6%)	5 (33.3%)
Mild intellectual	2 (25.0%)	2 (28.6%)	4 (26.7%)
Speech/communication	3 (37.5%)	3 (42.9%)	6 (40.0%)
Regular attendees (>75% attendance)	8 (100%)	7 (100%)	15 (100%)

Procedure

The program was implemented over 12 weeks, with two 45-minute lessons per week. Although the primary target of the intervention was students with special educational needs, the program was delivered to the entire inclusive classroom. This approach enabled all students to participate in physical education activities and fostered greater social integration and inclusive interaction. The main stages of each lesson and the specific roles of the teachers are outlined in Table 4.

Table 4. Lesson Stages and Adaptation in Inclusive PE

Lesson stage	Duration	Description
Warm-up	15 min	PE teacher leads a general warm-up for the whole class, including stretching and light aerobic activity.
Main activity	25 min	PE teacher organizes physical exercises and games, managing group activities and lesson flow.
Conclusion & relaxation	5 min	Joint reflection on the lesson and guided relaxation activities led by both PE teacher and special educator.

Within the co-teaching model, the PE teacher planned and conducted lessons according to the curriculum, managing the class as a whole and supporting the active participation of all students. The special educator provided individualized assistance to SWD, adapted exercises to match their abilities, monitored task performance, and facilitated their social integration within the group. A detailed weekly overview of the intervention program's structure and objectives is presented in Table 5.

Table 5. Weekly Structure of Program

Weeks	Lesson focus	Activities and methods
1-2	Introduction and Baseline Assessment	Introduction to class routines; baseline assessment of physical skills (running, jumping, flexibility) and social interaction.
3-4	Basic Motor Skills and Warm-Up Routines	Teach fundamental motor skills (running, jumping, throwing); introduce warm-up exercises tailored to individual needs.
5-6	Team Games and Cooperation	Introduce simple team games that promote cooperation and communication.
7-8	Skill Development and Adapted Exercises	Practice more complex movements and skills; provide modified versions to ensure participation for all students.
9-10	Social Skills and Inclusion Focus	Engage in activities designed to enhance social interaction, peer support, and inclusive participation.
11-12	Reflection and Consolidation	Review individual and group progress; guided relaxation; group feedback sessions.

Instrument and Data Collection Methods

For a visual overview of the tools and methods used for data collection, as well as the procedures for conducting surveys among SWD. SWD participants received individualized support during questionnaire completion, including simplified phrasing, read-aloud assistance, and clarification of unfamiliar terms. Visual Likert scales (e.g., smiley faces) were employed to facilitate comprehension. Surveys were conducted in quiet, familiar resource rooms, with breaks provided as needed. All SWD participants were medically cleared for physical education and had their status confirmed by PMPK documentation. Table 6 summarizes the key aspects of this data collection process.

Table 6. Instruments and Adaptations for SWD

Instrument / Procedure	Description	SWD-specific Adaptations
Physical Activity Tests	Standardized tests: 6-Minute Walk, Standing Long Jump, Sit and Reach, administered in school gym.	Conducted individually or in small groups; demonstrations before each test; extra time and rest breaks; visual distance markers; verbal encouragement throughout.



Questionnaires	Standardized tools assessing enjoyment, self-perception, engagement (PACES, ES, PSPP-C).	Items read aloud, simplified language; visual supports (pictograms); oral or assisted responses; explanation of unfamiliar terms.
Teacher Rating Scales	Observation tools (Engagement Scale, Adaptation Scale) with 5-point rating system.	Observers trained in SWD indicators; structured observation protocols; repeated observations across lessons to capture variability.
Pilot Testing & Validation	Instruments tested with 30 students (grades 4–6) and reviewed by expert panel.	SWD included in pilot testing to check clarity and feasibility; instruments adjusted based on feedback from SWD and educators.
Teacher Training	Two-day workshop on co-teaching, inclusive lesson planning, and support techniques.	Hands-on practice with adapted PE activities; role-play scenarios with SWD participation; guidance on using adaptations during all lesson stages.

Data analysis

Data were analyzed using SPSS (version 27). Descriptive statistics and inferential tests (paired and independent t-tests, repeated-measures ANOVA) were applied to examine within-group changes and between-group differences before and after the intervention (see Table 7).

Table 7. Data Analysis Methods

Method	Purpose / Notes
Descriptive statistics	Means, standard deviations, frequencies, percentages
Paired & independent t-tests	To compare pre/post changes within and between groups
Repeated measures ANOVA	To evaluate interaction effects (group × time); Greenhouse–Geisser correction applied when needed
Effect size	Cohen's <i>d</i> and partial η^2 ; standard interpretation used
Reliability analysis	Cronbach's $\alpha \geq 0.70$ considered acceptable

Results and Discussion

Table 8 presents the descriptive statistics and reliability indices of the Likert scales.

Table 8. Descriptive Statistics and Scale Reliability

Scale	Group	Mean (Pre)	SD (Pre)	Mean (Post)	SD (Post)	Cronbach's α (Pre)	Cronbach's α (Post)
PACES	EG	3.45	0.78	4.10	0.65	0.85	0.87
	CG	3.48	0.80	3.50	0.75	0.84	0.83
ES	EG	3.10	0.70	3.90	0.60	0.81	0.85
	CG	3.12	0.72	3.15	0.70	0.79	0.80
PSPP-C	EG	2.85	0.65	3.50	0.68	0.82	0.84
	CG	2.80	0.66	2.82	0.70	0.80	0.81

Referring to Table 8, the results indicate that the adapted intervention had a significant impact on key aspects of physical activity and emotional perception among children in the EG. The observed increase in enjoyment and engagement suggests enhanced motivation, which is essential for sustaining regular activity and promoting effective learning. Furthermore, the improvement in physical self-perception reflects greater confidence in their abilities, supporting social adaptation and further development. In contrast, the CG did not show significant changes, underscoring the effectiveness of targeted adaptations and specialist support. The high reliability of the scales used confirms both the validity of the data and the consistency of the measurements. Overall, the findings support the conclusion that an integrated approach that accounts for individual needs positively influences children's psychological and physical well-being, which is critical for the development of inclusive physical education programs (Nariz II, 2025).

Table 9 shows the results of paired t-tests conducted to compare pre- and post-intervention scores within each group.

Table 9. Results of Paired Samples t-test for Comparison of Pre- and Posttest (within groups)

Scale/Test	Group	Mean difference (Post–Pre)	95% CI for difference	t	df	p-value	Cohen's <i>d</i>	Assumption checks
6-Minute Walk Test (m)	EG	+45.2	[32.5, 57.9]	7.32	7	<0.001	0.95	Normality (Shapiro–Wilk $p=0.12$)
	CG	+8.4	[–5.1, 21.9]	1.25	6	0.215	0.16	Normality ($p=0.08$)
Standing Long Jump (cm)	EG	+21.6	[14.8, 28.4]	6.10	7	<0.001	0.85	Normality ($p=0.15$)



Sit and Reach Test (cm)	CG	+5.2	[-2.1, 12.5]	1.50	6	0.140	0.20	Normality (p=0.10)
	EG	+4.5	[2.9, 6.1]	5.80	7	<0.001	0.80	Normality (p=0.22)
PACES	CG	+1.1	[-1.4, 3.6]	0.95	6	0.340	0.12	Normality (p=0.09)
	EG	+0.65	[0.46, 0.84]	8.10	7	<0.001	1.05	Normality (p=0.10)
ES	CG	+0.02	[-0.08, 0.12]	0.40	6	0.680	0.05	Normality (p=0.11)
	EG	+0.80	[0.57, 1.03]	7.50	7	<0.001	0.98	Normality (p=0.09)
PSPP-C	CG	+0.03	[-0.05, 0.11]	0.85	6	0.390	0.11	Normality (p=0.13)
	EG	+0.65	[0.45, 0.85]	6.80	7	<0.001	0.88	Normality (p=0.10)
	CG	+0.02	[-0.10, 0.14]	0.35	6	0.730	0.04	Normality (p=0.12)

Referring to Table 9, the EG demonstrated significant improvement across all variables. Participants reported greater enjoyment and motivation toward PE, alongside increased engagement and confidence in their physical abilities. In contrast, the CG showed only minimal, non-significant changes, underscoring the effectiveness and targeted nature of the developed program. Verification of statistical assumptions confirmed the suitability of the analytical methods applied, while the high reliability coefficients indicated the stability and consistency of the scales used. These findings suggest that the intervention had a positive impact on children's motivation, involvement, and physical fitness, supporting the feasibility of implementing an integrated approach that includes both a PE teacher and a specialist teacher (Smedegaard et al., 2016).

Figure 3 illustrates the effect sizes (Cohen's d) for various physical performance and psychological outcome measures of the EG at post-test following the intervention. All measures demonstrated moderate to large effects, with Cohen's d values ranging from 0.8 to 1.2. The horizontal bars represent 95% confidence intervals, none of which cross zero, thereby reinforcing the statistical significance of these differences.

Figure 3. Forest plot of effect sizes in the EG.

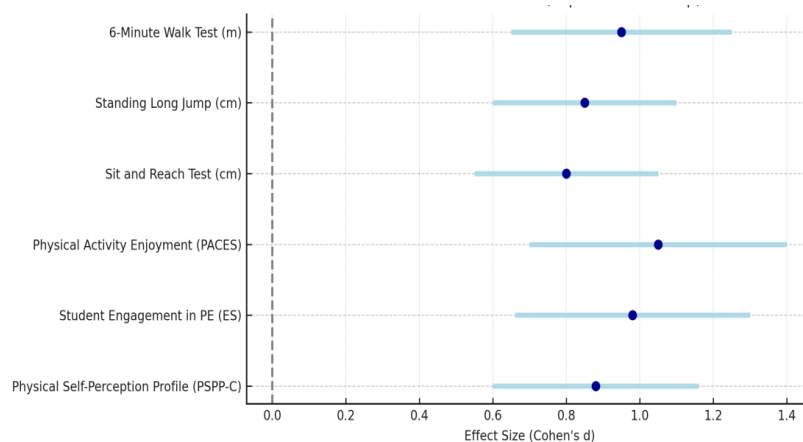


Table 10 presents the results of independent t-tests comparing the performance of the EG and CG at the post-test stage.

Table 10. Results of the Independent Samples t-test for Comparison of EG and CG (Post-test)

Scale/Test	t	df	p-value	Cohen's d	Homogeneity of Variance (Levene's Test)
6-Minute Walk Test (meters)	5.90	13	<0.001	1.08	p = 0.40 (equal variances assumed)
Standing Long Jump (cm)	5.20	13	<0.001	0.95	p = 0.33
Sit and Reach Test (cm)	4.85	13	<0.001	0.85	p = 0.47
PACES	7.40	13	<0.001	1.20	p = 0.50
ES	7.00	13	<0.001	1.15	p = 0.42
PSPP-C	6.45	13	<0.001	1.05	p = 0.36

The results of the comparative analysis using the independent t-test revealed that students in the EG significantly outperformed those in the CG across all measured indicators of both physical fitness and psycho-emotional state. These differences were evident in the final (post-test) scores, showing high

statistical significance and large effect sizes, which underscores the strong practical relevance of the intervention. Specifically, the EG exhibited improvements in endurance, strength, and flexibility, as well as greater engagement in physical education lessons and enhanced positive physical self-esteem. These findings highlight the effectiveness of a comprehensive inclusive program that fosters collaboration between the PE teacher and the specialist. Moreover, tests of the assumptions required for parametric analysis (Shapiro–Wilk test and Levene’s test) confirmed data normality and equality of variances between groups, thereby strengthening the reliability of the results.

Table 11 presents the results of a one-way repeated-measures ANOVA examining the effect of time in the EG.

Table 11. One-way repeated measures ANOVA

Scale/Test	F (1, 14)	p-value	Partial η^2	Assumption Check (Mauchly’s Test)
6-Minute Walk Test (meters)	20.5	<0.001	0.15	p = 0.45 (sphericity assumed)
Standing Long Jump (cm)	18.2	<0.001	0.13	p = 0.50 (sphericity assumed)
Sit and Reach Test (cm)	16.7	<0.001	0.12	p = 0.48 (sphericity assumed)
PACES	25.4	<0.001	0.18	p = 0.55 (sphericity assumed)
ES	23.7	<0.001	0.17	p = 0.60 (sphericity assumed)
PSPP-C	22.1	<0.001	0.16	p = 0.52 (sphericity assumed)

The analysis revealed that all examined parameters in the EG changed significantly over time ($p < 0.001$). Mauchly’s test confirmed that the assumption of sphericity was met for all variables ($p > 0.05$), allowing the use of the conventional F-test without correction. Partial η^2 values ranged from 0.12 to 0.18, indicating medium effect sizes according to Cohen’s conventions, which further support the practical significance of the findings. These results align with previous research demonstrating that co-teaching approaches enhance learning outcomes in inclusive environments (Gokbulut et al., 2020; Galindo Perdomo et al., 2023).

This study evaluates the effectiveness of a co-teaching model in enhancing physical activity, motivation, and social-emotional development among SWD in inclusive classrooms. It is the first study to examine how a co-teaching model facilitates these outcomes through teacher partnerships that extend beyond traditional professional boundaries via collaborative learning. These findings are consistent with prior research. A review of the literature indicates that co-teaching positively influences students’ physical activity, motivation, and social-emotional development (Steinert and Jurkowski, 2024; Rodríguez Herrero et al., 2023; Qualls et al., 2025; King-Sears et al., 2021). Alsudairy (2024) investigated how a training program affects the ability of in-service general education and special education teachers to collaborate and co-teach. The results demonstrated that the training program was effective, as participants achieved higher post-test scores on both co-teaching and collaboration measures. Notably, special education teachers outperformed their general education counterparts in co-teaching skills. By highlighting the potential of the co-teaching model to promote educational equity and enhance children’s health in inclusive school settings, this study makes a meaningful contribution to the evidence base supporting the integration of specialists in physical education lessons.

Conclusions

In conclusion, this study evaluated the effectiveness of a co-teaching model in enhancing physical activity, motivation, and social-emotional development among SWD in inclusive classrooms. The results demonstrated that co-teaching significantly benefited these outcomes compared to traditional physical education classes. This study expands the existing literature by providing the first evaluation of a co-teaching model involving a physical education teacher and a specialist teacher in the Kazakhstani context, using modern statistical methods. The findings underscore the importance of direct experience and institutional support in implementing evidence-based co-teaching.

This work makes a meaningful contribution to the development of inclusive education and highlights the potential of co-teaching to improve the quality of physical education lessons. The study confirms the value of an integrated teaching approach and curriculum adaptation in inclusive classes, opening new



opportunities for enhancing educational and health practices in schools in Kazakhstan and beyond. At a time when inclusion in physical education was just beginning in Kazakhstani schools, this study provides an important practical guideline. Its findings can serve as a foundation for developing recommendations on educational policy and professional training in the field of inclusive education.

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