Research in Physical Education, Sport and Health
2025, Vol. 14, No. 2, pp.41-46
ISSN(Print):1857-8152; ISSN(Online):1857-8160

COMPARATIVE ANALYSIS OF THE EDUCATIONAL INFLUENCE ON STUDENTS IN PHYSICAL AND HEALTH EDUCATION AFTER THE FIRST EDUCATIONAL PERIOD: A COMPARISON OF THE TANDEM AND TRADITIONAL TEACHING MODELS

DOI: https://doi.org/10.46733/PESH2514241p
(Original scientific paper)

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Abstract

The aim of this study was to compare educational influence in Physical and Health Education after the first educational period by examining differences between the tandem and traditional teaching models. The study was designed as a comparative, non-experimental (observational) research with two independent groups. The sample consisted of 439 students, of whom 231 attended Physical and Health Education classes delivered through the traditional model (classroom teacher only), while 208 attended classes delivered through the tandem model (a Physical and Health Education teacher in cooperation with the classroom teacher), within a time frame of one school semester. Educational influence was operationalized through four components: (1) attitude toward work in Physical and Health Education, (2) orderliness during lessons and hygiene habits, (3) sense of camaraderie and collective responsibility, and (4) engagement in extracurricular activities, participation in school sport competitions, or membership in a sport organization outside school. The first three components were measured as ordinal variables using a structured observation checklist (scale 1–5), while the fourth component was measured as a nominal variable (YES/NO). Data were collected through systematic structured observation and analyzed using SPSS. Because distributions deviated from normality, non-parametric tests were applied (Mann–Whitney U for ordinal variables and Pearson χ^2 for the nominal variable). Results showed a statistically significant advantage of the tandem model for attitude toward work ($U = 20489.50$; $p = .001$), with a small but educationally meaningful effect (rank-biserial correlation $r_{rb} = 0.15$). For orderliness/hygiene habits ($p = .469$; $r_{rb} = 0.03$) and camaraderie/collective responsibility ($p = .330$; $r_{rb} = 0.05$), no statistically significant differences were found. Contingency analysis indicated a statistically significant association between teaching model and extracurricular engagement ($\chi^2(1) = 5.83$; $p = .017$), with a small effect (Cramer's $V = 0.12$), in favor of the tandem model. In conclusion, the tandem model shows an advantage in promoting a more positive attitude toward Physical and Health Education and higher involvement in extracurricular physical activity, indicating its potential to improve educational outcomes in the early stages of primary education.

Key words: *Physical and Health Education; educational influence; educational teaching; tandem model; traditional model*

Introduction

Educational influence in Physical and Health Education (PE)—including students' attitudes toward work and the transfer of PE-related habits into everyday life—is expressed through pedagogical guidance that involves planned instruction, encouragement, direction, assistance, and systematic monitoring of the learning process. Within a broader didactic framework, teaching is understood as a structured process aimed at enabling students to gradually regulate and take responsibility for their own learning and behavior. Research indicates that, when effectively instructed, Physical and Health Education can support development across multiple domains, including affective, social, and cognitive outcomes, beyond physical competence alone (Bailey et al., 2009).

Educational practice suggests that the elements used to monitor educational influence in PE should be clearly and precisely defined. Student behavior represents a key indicator of educational outcomes,

particularly behaviors that contribute to the development of personal qualities relevant for successful participation in PE. These include discipline, commitment to work, active engagement, cooperation, and responsibility, which represent essential components of the educational dimension of Physical and Health Education. Recent studies also emphasize the importance of diverse pedagogical models in Physical and Health Education, noting that contemporary teaching models can strengthen the pedagogical connection between intentions and learning experiences and contribute to sustained engagement in physical activity (Ferraz et al., 2023).

Accordingly, monitoring educational influence in Physical and Health Education may include several observable indicators: students' attitudes toward work, orderliness during classes and hygiene habits, a sense of camaraderie and collective responsibility, and engagement in extracurricular physical and sport activities. In addition to classroom behavior, students' participation in extracurricular activities, school competitions, membership in sport organizations outside school, and involvement in organized physical activity represent meaningful indicators of educational influence, particularly in early school years when attitudes toward physical activity are being formed.

Given the multidimensional nature of educational influence in Physical and Health Education, the organization of teaching becomes a critical pedagogical issue. Different teaching models may vary in their potential to foster positive educational outcomes among students. Therefore, this study aimed to compare educational influence after the first educational period by examining differences between a tandem teaching model and a traditional teaching model.

Methods

Research subject and aim

The subject of the research was didactic-methodological teaching models in Physical and Health Education related to developmental aspects of educational teaching (educational influence) among students in the first educational period. The research focused on analyzing educational influences that arise from differences in the organization and implementation of Physical and Health Education teaching.

The aim of the research was to determine the didactic-methodological value of Physical and Health Education teaching models in relation to developmental aspects of educational influence among students in the first educational period.

Research task and hypothesis

Based on the defined subject and aim, the following research task was set: to determine whether differences exist in didactic-educational aspects of educational teaching (influence) between the two applied Physical and Health Education teaching models.

The hypothesis stated that statistically significant differences would exist between the two applied models in the didactic aspects of educational teaching (influence), in favor of the tandem model.

Type and design of the research

The research was conducted as a comparative, non-experimental (observational) study with two independent groups of students. The study compared educational influence outcomes between students attending Physical and Health Education classes delivered via the traditional model and those attending classes delivered via the tandem model.

Participants

The study included a total sample of 439 students from the first educational period, involved in regular primary school Physical and Health Education classes. Participants were divided into two independent groups: 231 students attending classes taught through the model with a classroom teacher only (traditional model) and 208 students attending classes taught through the model with a Physical and Health Education teacher in cooperation with the classroom teacher (tandem model). All students attended classes within the regular curriculum.

Time frame of the research

The research was conducted over one school semester, and educational aspects of Physical and Health Education were monitored continuously during regular classes.

Variables and indicators of educational teaching (influence)

Educational teaching (influence) in Physical and Health Education was operationalized through four components: students' attitude toward work during Physical and Health Education; orderliness during classes and hygiene habits; sense of camaraderie and collective responsibility; participation in extracurricular activities, participation in school sport competitions, or membership in sport organizations outside school.

The first three components were measured at an ordinal level (scale), while the fourth component was measured as a nominal variable (YES/NO).

Method and instruments for data collection

Data were collected using systematic structured observation. Observation focused on recording students' behavior during Physical and Health Education lessons as an indicator of educational influence. For this purpose, a pre-prepared instrument was used—a structured checklist with a scale format (1–5). Each of the first three components was assessed through five clearly defined achievement criteria. The level of educational influence for each student was determined based on the aggregated assessment of criteria. Observation was conducted by classroom teachers who were members of the research team, coordinated by the principal researcher, to ensure consistency and control in data collection.

Statistical data processing

Statistical processing was performed using SPSS. A prior logical control of observation sheets was conducted, including identification and elimination of extreme values (outliers) and assessment of data distributions. Because the results deviated from a normal distribution, non-parametric tests were applied to test differences between the two independent groups: Mann–Whitney U for the ordinal variables and Pearson Chi-Square for the nominal variable (extracurricular engagement). Statistical significance was set at $p < .05$.

Ethical aspects

The research was conducted within the regular teaching process without disruption of instructional dynamics. Data were processed anonymously and used exclusively for research purposes, with approval from the participating schools.

Results

During data collection and processing, all basic methodological and statistical principles for conducting empirical research were respected. After data entry into SPSS, an initial analysis was performed including logical control of observation sheets, identification of illogical and evidently incorrect entries, and identification and elimination of extreme values (outliers). This was followed by distribution analysis and determination of deviations from the Gaussian normal distribution.

Because part of the variables did not meet assumptions of normality, non-parametric statistical tests were applied to test differences between students from the two teaching models in Physical and Health Education. Mann–Whitney U was used for ordinal variables as a non-parametric alternative to the independent-samples t-test, while Pearson Chi-Square was used for the nominal variable. Despite deviations from normality, results indicated that the necessary methodological and statistical criteria were met for further analysis and interpretation. Findings are presented in Table 1 and Table 2.

Differences in educational influence components

Using the Mann–Whitney U test, differences were analyzed between students from the two teaching models across three ordinal educational variables: attitude toward work in Physical and Health Education, orderliness and hygiene habits, and sense of camaraderie and collective responsibility.

Results presented in Table 1 show a statistically significant difference between groups for attitude toward work. Students taught through the tandem model achieved significantly better results in engagement, active learning, participation, regular attendance, and regular exercise ($U = 20489.50$; $p = 0.001 < 0.05$). For orderliness and hygiene habits ($U = 23254.50$; $p = 0.469 > 0.05$) and camaraderie and collective responsibility ($U = 22911.00$; $p = 0.330 > 0.05$), no statistically significant differences were found.

In addition to statistical significance, the magnitude of differences was estimated through effect size indicators. Rank-biserial correlation indicated a small but educationally meaningful effect favoring the

tandem model for attitude toward work ($r_{rβ}$ = 0.15), while effects for orderliness/hygiene habits ($r_{rβ}$ = 0.03) and camaraderie/collective responsibility ($r_{rβ}$ = 0.05) were negligible.

Table 1. Differences in educational influence components between the two teaching models

Variable	Model	N	M	SD	Mann–Whitney U	p	Effect size ($r_{rβ}$)
Attitude toward work	Traditional	231	4.39	0.90	20489.50	.001*	0.15
	Tandem	208	4.63	0.73			
Orderliness & hygiene habits	Traditional	231	4.55	0.76	23254.50	.469	0.03
	Tandem	208	4.57	0.80			
Camaraderie & collective responsibility	Traditional	231	4.39	0.87	22911.00	.330	0.05
	Tandem	208	4.49	0.78			

Note. M = mean; SD = standard deviation; $r_{rβ}$ = rank-biserial correlation ($1 - 2U / n_1 n_2$). $p < .05$

Students' engagement in extracurricular activities

To determine differences in students' engagement in extracurricular activities, participation in school sport competitions, and membership in sport organizations outside school, a contingency analysis was performed using Pearson Chi-Square. Contingency tables were constructed by crossing the teaching model (traditional vs. tandem) with the nominal engagement variable (YES/NO), reported as frequencies and percentages.

Analysis of Table 2 and the Pearson Chi-Square test ($\chi^2 = 5.828$; $p = 0.017 < 0.05$) indicate a statistically significant difference in extracurricular engagement between the two teaching models. Percentages show that in the traditional model group (N = 231), 47.6% were engaged and 52.4% were not engaged. In the tandem model group (N = 208), 59.1% were engaged and 40.9% were not engaged.

The strength of association between teaching model and extracurricular engagement, expressed by Cramer's V, indicates a small effect (V = 0.12), suggesting a modest but practically meaningful association.

Table 2. Engagement in extracurricular physical and sport activities by teaching model

Teaching model	N	Engaged n (%)	Not engaged n (%)
Traditional model	231	110 (47.6%)	121 (52.4%)
Tandem model	208	123 (59.1%)	85 (40.9%)

$\chi^2(1) = 5.83$, $p = .017$, Cramer's V = 0.12

Note. Engagement includes extracurricular activities, school sport competitions, and/or membership in a sport organization outside school.

These results indicate that the tandem model has a more pronounced positive influence on encouraging students to participate actively in extracurricular physical and sport activities.

Discussion

Physical and Health Education as a school subject plays an important role in students' overall psychophysical development, particularly during the first educational period. Monitoring educational influence—namely attitudes toward work and the application of Physical and Health Education in everyday life—is expressed through educational teaching that involves planned guidance, encouragement, direction, assistance, and monitoring of the learning process, enabling students to gradually develop self-regulation in learning. In line with the methodology, educational influence was examined through four components: attitude toward work, orderliness/hygiene habits, camaraderie/collective responsibility, and extracurricular engagement. The analysis enables a deeper understanding of the educational effects of the applied teaching models.

Results show that students attending classes taught through the tandem model achieved statistically significantly better outcomes in attitude toward work—engagement, active learning, participation, attendance, and regular exercise. Although the effect size is small ($r_{rβ}$ = 0.15), it is educationally meaningful in school-based research because changes in attitudes and behavior are often gradual and shaped by multiple

contextual influences. Small but consistent effects favoring the tandem model suggest cumulative improvement in educational outcomes rather than isolated short-term differences.

To ensure that Physical and Health Education positively affects children's overall development, students must develop positive attitudes toward the subject. Teachers play a crucial role by motivating students and teaching them about the importance of physical exercise for development and health (Dragutinović & Mitrović, 2019b). These insights align with the present findings, indicating stronger educational influence of the tandem model compared with the traditional model. A positive attitude toward Physical and Health Education may be developed through interesting, diverse, and dynamic lesson content, where teacher creativity is important. Within the tandem model, teachers may apply a wider range of competitive games, acrobatics, and structured motor activities adapted to developmental needs, positively affecting students' emotional needs as well (Bjelica & Krivokapić, 2010b; Bjelica & Krivokapić, 2011a). If lessons are monotonous and insufficiently stimulating, students are less likely to develop affinity for the subject, making early systematic development of positive attitudes essential.

The results regarding extracurricular engagement also indicate statistically significant differences favoring students taught through the tandem model. Although Cramer's V indicates a small effect (V = 0.12), this finding is practically important because it reflects the gradual and cumulative nature of teaching organization in shaping stable habits of physical activity and sport participation. Physical activity and sport have a stimulating effect on children, represent a means of socialization, and create positive attitudes toward Physical and Health Education (Švraka, 2012). Children who engage in sport are often better socially integrated and develop teamwork, supporting harmonious social development (Švraka, 2012).

For orderliness/hygiene habits and camaraderie/collective responsibility, no statistically significant differences were found. However, high ratings in both groups indicate that these educational aspects are developed at a high level regardless of the teaching model, likely due to broader and longer-term educational influences shaped through school culture, family environment, and overall educational processes.

Physical and Health Education contributes to whole-person development and is not limited to physical abilities and health improvement but includes structured use of physical exercises, games, and sport that influence overall psychophysical development (Šimleša & Potkonjak, 1989). As a systemic process, it supports healthy development, strengthening health, formation of hygiene habits, and active rest (Bakovljev, 1997; Bjelica & Krivokapić, 2011b; Bjelica & Krivokapić, 2019). High-quality teaching requires adequate material conditions and competent teachers who foster positive attitudes (Zrnzević & Zrnzević, 2015; Dragutinović & Mitrović, 2019a). In this context, the results suggest the tandem model as an effective didactic-methodological approach for improving educational aspects of Physical and Health Education in the first educational period.

Conclusion

This research aimed to determine differences in educational influence among students in the first educational period depending on the applied teaching model in Physical and Health Education. The analysis provided a clear overview of educational effects of the traditional and tandem teaching models.

Results demonstrated a statistically significant advantage of the tandem model in fostering a positive attitude toward Physical and Health Education. Students taught through the tandem model showed higher levels of engagement, activity, involvement, and regularity in the teaching process, indicating stronger educational influence compared to the traditional model.

For orderliness/hygiene habits and camaraderie/collective responsibility, no statistically significant differences were found. Nevertheless, high levels of these educational components in both groups suggest they are shaped by broader educational influences and general school environment.

A particularly important finding concerns extracurricular engagement. The statistically significantly higher engagement among tandem model students suggests that this approach has broader educational effects extending beyond regular Physical and Health Education classes.

Overall, the tandem model appears to be an effective approach for improving selected educational aspects in early primary education by integrating specialized expertise of the Physical and Health Education teacher with the continuous educational presence of the classroom teacher. However, the study was conducted over one semester and relied on observation, which represents a limitation. Future studies should include longer timeframes, more indicators, and mixed methods to examine long-term effects more comprehensively.

In conclusion, the results contribute to understanding the educational dimension of Physical and Health Education and support the application of the tandem model as a contemporary and pedagogically justified approach in early formal education.

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