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Original Article

Comparative Study on the Application of Information Technology in Physical Education Lessons for Primary School Students

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Abstract

In today's digital age, information technology has become an integral part of the educational process, influencing various subjects, including physical education. This study explores how information technology can be applied in the physical education classes of primary school students, comparing its effectiveness and impact on student performance and engagement. The study involved two groups of primary school pupils: an experimental group, which used information technology during physical education classes, and a control group, which followed traditional methods. Data were collected through direct observation and physical performance tests. The objectives of the study were to assess how technology influences student engagement and motivation and to analyze the differences in physical performance between the two groups. The research identified both the benefits and challenges of integrating information technology, demonstrating that it has a positive impact on student engagement and performance.

1. Introduction

In the context of rapid technological advancement and the ever-deepening integration of information technology in education, it is essential to understand how these tools influence different areas of education, including physical education.

Recent studies emphasize that information technology can transform and improve educational practices by increasing accessibility, diversifying resources,

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and facilitating faster feedback (Hattie & Timperley, 2007; Cheung & Slavin, 2013).

In physical education, the integration of technologies such as activity-monitoring applications, interactive games and online platforms can significantly influence student engagement and motivation (Tessmer & Richey, 1997).

Literature shows that some authors emphasize the multiple advantages of using modern technologies in physical education lessons and in the instructional-educational process. These sources examine various aspects of technology integration in education, with a special focus on physical education, providing valuable insights from different authors on the benefits of technology in this context (Dragnea & Mate-Teodorescu, 2002; Epuran, 2005; Bota, 2006; Balint, 2009; Papastergiou, 2009; Kirk, 2010; Casey, 2017; Harris & Cale, 2018).

Other authors, such as Marinescu (2009) and Vavpotič, Žvanut & Trobec (2013), emphasize the educational value of instruction through information technologies. They emphasize that the use of these means improves the effectiveness of the educational process in the field of physical education and sport.

According to the authors, Hasanah & Wijayanto (2021) and Papastergion, Natsis, Vernadakis & Panagiotis (2021), the use of digital resources and technological equipment can significantly improve learning and teaching in physical education and sport. E-learning platforms and YouTube are being used to provide interactive resources and videos on sport techniques, health and nutrition, and Hasanah & Wijayanto (2021) have demonstrated their effectiveness in enhancing learning. Apps such as MyFitnessPal and Kids' Fit Club are used to monitor students' physical activity and provide real-time feedback. Studies conducted by Palicka, Jakubec, and Zvonicek (2016) highlighted the positive impact of these apps on student motivation.

Information technology can provide advanced tools, such as physical activity trackers, specialized software applications, and augmented reality technologies, for real-time assessment and monitoring of students' physical performance, allowing for precise personalization of training and providing immediate feedback (Greve et al., 2020; Jastrow, Greve, Thumel, Diekhoff & Subenbach, 2022).

All these ideas, presented above, illustrate the variety of ways in which information technology can be integrated into primary school physical education and sport lessons, positively influencing both the learning process and the physical development of pupils.

This research focuses on evaluating the impact of information technology in physical education lessons for primary school pupils while also comparing its effectiveness and effects on pupils' physical performance and engagement.

The study aims to identify the advantages and challenges of integrating technology into the physical education curriculum, providing an empirical basis for adjusting teaching methodologies. To this end, the research is based on direct observations and physical performance tests to assess how technology can positively influence the educational experience and outcomes in students' sport activities.

2. Material and methods

The use of information technology in physical education classes is anticipated to lead to significant improvement in the physical performance of primary school students compared to traditional teaching methods. Also, the integration of these technologies is expected to increase the level of motivation and involvement of students in physical activities, thus contributing to more active participation and the development of a positive attitude towards physical education.

Methods of scientific research applied in physical education and sport used for the realization of this study were as follows: method of literature review, method of observation, method of pedagogical experiment, method of testing, method of interpretation and information processing.

The sample for the pedagogical experiment consisted of the experimental group, 16 students from 4rd grade A of the "Iorgu Vârnav Liteanu" Technological High School from Liteni, and the control group, 16 students from 4rd grade B of the "Ieremia Irimescu" Secondary School from Brusturi.

The study was carried out over a period of 6 months and included a total of 32 students, 16 from each class, distributed evenly between genders, with 8 boys and 8 girls in each class.

Students in the experimental group had access to information technology during class time, including video support materials, presentations of simple game structures from mini handball and mini football, video recordings of activities with correct executions, and video support provided through the Classroom platform, all of which were used to ensure correct fixation of the concepts taught. For teaching the sports mini-games we used video analytics applications to support instruction and feedback. In contrast, the students in the control group continued to follow the syllabus without the use of information technologies.

The tasks included in the experiment were: standing long jump, trunk lifts - sit-ups and balance.

Standing long jump (cm)

Students present for the check in a standing position, with the tops of their feet level with the line of the jump, with their feet slightly apart, parallel and facing forward, adopting a balanced stance. Performed energetically, the standing long jump describes a phase of flight during which the lower limbs flex forward and prepare for landing and the hands make a vigorous up-and-down descent, amplifying the trajectory of the body. On contact with the ground, the subject will have to land on the feet (soles) only, maintaining balance in this position (crouched, arms oblique forward) so as not to collapse backwards without the support of the hands.

Trunk lifts - sit-ups (number of correct lifts performed in 30 seconds)

The subject lies on a gym mat in the starting position: supine, knees bent at 90o, feet flat on the floor, hands behind the back of the head. At the examiner's signal the subject will perform as many sit-ups and returns to the starting position as possible within 30 seconds;

Balance (held for 30 seconds)

Standing, on the floor, hands on hips. Students are asked to stand on their toes, simultaneously on both feet, with their hands on their hips and to hold this position, without moving, for as long as possible (max. 30s.). The time during which each subject maintained the correct position is timed.

3. Results and discussions

The analysis of statistically processed data from the experiment indicates that the use of information technology contributes significantly to the efficiency and modernization of the teaching process.

We will perform the statistical analysis of the results presented in Table 1 by comparing the performance of the two groups, the experimental group and the control group, in the three tests.

Table 1. *Centralization of statistical results of the target group*

Subjects		**Sample**								
		Standing long jump			**Trunk lifts - sit-ups**			**Balance**		
		X	+/-S	Cv%	X	+/-S	Cv%	X	+/-S	Cv%
16 students, experimental group	**I. T.**	131,68	8,30	6,30	18,06	5,25	29,06	23,32	7,10	30,44
	F. T.	140,56	8,80	6,26	24,87	3,99	16,04	29,19	1,45	4,96
	D.	*8,88*	*0,50*	*0,04*	*6,81*	*1,26*	*13,02*	*5,87*	*5,65*	*25,48*
16 students, control group	**I. T.**	132,87	16,00	12,04	17,56	4,44	25,28	22,29	5,65	25,34
	F. T.	133,62	15,34	11,48	18,43	4,50	24,41	22,93	5,22	22,76
	D.	*0,75*	*0,66*	*0,56*	*0,87*	*0,06*	*0,87*	*0,64*	*0,43*	*2,58*

The analysis of the motor indicators after testing subjects in the two groups involved in the pedagogical experiment provided important information about the distribution of performance and the uniformity of results.

This facilitated meaningful comparisons between the experimental and control groups on the basis of the tests performed. Each trial has initial (I.T.) and final (F.T.) measurements and differences (D.) are calculated to observe progress.
The values are expressed as arithmetic average (X), standard deviation (±S) and coefficient of variation (Cv%).

- *Standing long jump*

The students in the experimental group showed a significant improvement from baseline to final test, from 131.68 to 140.56, with a low standard deviation and coefficient of variation, indicating a higher homogeneity of performance.

The students in the control group showed no change, the I.T. and F.T. values are almost identical, indicating that the absence of information technology had no

effect on performance.

- *Trunk lifts - sit-ups*

It was observed a substantial increase of 6.81, in students in the experimental group, with a significant improvement in the consistency of performance, with a difference in the coefficient of variability of 13.02, placing the subjects in a relatively homogeneous group.

The improvement was insignificant, 0.87, with no noticeable change in the consistency of performance, the absence of information technology did not improve the performance of this control group.

- *Balance*

The students in this experimental group showed a notable improvement of 5.87, and the consistency of performance improved significantly, the coefficient of variability decreased from 30.44 to 4.96, the subjects falling into a relatively heterogeneous group.

The improvement of this control group was insignificant, the difference of the tests being 0.64, with a slight improvement in the consistency of performance, the coefficient of variability decreased from 25.34 to 22.76.

The statistically processed data from the experiment indicate that the use of information technology contributes significantly to the efficiency and modernization of the teaching process.

Thus, the experimental group showed significant improvements in all three tests, both in terms of performance and consistency of performance, indicating the effectiveness of the applied interventions.

The control group showed minor improvements, with little change in the consistency of performance, suggesting that the specific interventions applied to the experimental group were effective in improving the physical performance of the experimental students.

Discussions

The results show that the experimental group showed significant improvements in all three experimental samples. This suggests that the interventions applied, the introduction of modern technologies and innovative methods, were effective. In contrast, the control group showed minor improvements, indicating that traditional teaching and training methods were not as effective.

The results are in line with previous studies emphasizing the benefits of using modern technologies in physical education (Dragnea et al., 2002; Epuran, 2005; Bota, 2006; Balint, 2009; Papastergiou, 2009; Kirk, 2010; Casey, 2017; Harris et al., 2018).

This study demonstrated that technology integration can improve students' motivation, interest and performance in physical activities.

4. Conclusions

In conclusion, it can be said that information technology has the potential to transform physical education lessons, making them more attractive and effective

for primary school pupils. However, the success of this integration depends on the available resources and adequate teacher training.

This study emphasizes the importance of applying information technology in physical education and provides a basis for implementing modern and effective educational strategies.

At the same time, this study has demonstrated that the use of modern technologies and innovative methods in physical education can have a significant impact on student performance.

While the short-term results of this research are promising, further long-term research is needed to confirm and extend these findings.

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