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Original Article

The Impact of the Integration of Information Technology in Physical Education Classes on the Training of Primary School Students

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Abstract

Integrating information technology into physical education has become an increasingly common practice with the potential to transform the way physical skills are taught and learned. This paper analyzes the impact of integrating information technology into physical education classes on the preparation of primary school students. It is hypothesized that the integration of information technology in physical education classes improves the level of physical and motor skills of primary school students by increasing their interest and involvement in physical activities. The objectives are to evaluate the impact of the integration of information technology in physical education classes on pupils' physical preparation, their interest and attitude towards physical activities, as well as to analyze the effectiveness of the technological tools used in the teaching process. The study demonstrated that the integration of information technology in physical education classes can have a significant positive impact on the physical fitness of primary school students.

1. Introduction

In the age of rapid digitalization, information technology has penetrated almost all areas of life, including education. Integrating it into primary physical education classes is not only an opportunity to modernize teaching methods, but also to

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improve pupils' physical and mental preparation (Moață & Stoicescu, 2011; Luciela & Stoicescu, 2011).

By analyzing various studies and practical examples, we will examine to what extent these innovations contribute to a healthier generation that is better prepared for the challenges ahead.

A recent study investigated the use of augmented reality technology to improve students' health and movement skills, highlighting how gamification can increase students' interest and engagement with physical education. The study presents evidence that the use of these modern methods in physical education increases students' motivation, helping them to engage more deeply and improve their physical performance. Gamification, combined with augmented reality elements, makes physical activities more engaging and competitive. The authors present different methods and strategies for implementing these technologies in the physical education curriculum, including practical examples and case studies that have demonstrated the effectiveness of this approach (Solas, Martinez, Rusillo & Ruiz, 2024).

Other research has looked at the impact of using fitness bands in primary schools on pupils' physical activity. According to this research, pupils who used fitness wristbands showed increased motivation to achieve daily exercise goals. This allowed teachers to adjust exercise programs based on the data collected, thus optimizing physical activity to the individual needs of the students (Nuss, Moore, Nelson & Li, 2000).

The authors, Oppici et al. (2022), focus on a systematic review and meta-analysis exploring the impact of exergaming technology on the development of fundamental motor skills in children aged 3-12 years. In this context, they examine how exergaming technologies, which combine video games with physical activity, can influence the development of children's basic skills such as running, jumping, throwing and catching, which are essential for long-term physical activity and overall health. The study identifies and evaluates existing research that has analyzed the effect of exergaming on this age group. The findings of the meta-analysis suggest that exergaming may have a beneficial effect on the development of these fundamental motor skills, although the impact may vary depending on the type and duration of the intervention. The authors emphasize the importance of exergaming as a complement to traditional physical activities, but not as a total substitute.

Another author, Juniu, Shonfeld & Ganot (2013), examines how technology can be used by physical education teachers to optimize teaching and assessment processes for students. Their study discusses the application of technological tools, such as accelerometers, heart rate monitors, and various specialized software, to monitor and analyze students' physical activity. The research conducts a comparative analysis of the integration of technology into physical education teacher training programs in different countries, highlighting both obstacles and successes in the implementation of modern technologies into the educational curriculum.

The literature emphasizes the importance of integrating modern technology into physical education and it offers numerous advantages and is considered essential for improving teaching and learning processes (Luciela, 2011; Modra, Domokos &

Petracovschi, 2021). The use of information technology can transform physical education by motivating students and facilitating the assessment of their performance (Greve et al., 2020). Information technology and digital equipment, such as specialized software and monitoring devices, contribute to personalization and analysis of students' physical activities (Casey & Jones, 2011). It also highlights the benefits of using active games and other modern technologies that stimulate pupils' motivation and engagement in physical activities (Doman, 2024). These technologies also support modern pedagogical methods such as game-based learning and the development of critical thinking (Stoica, 2022). They improve the quality of physical education, both in terms of teaching and assessment, thus contributing to the development of students' fundamental skills (Balint, 2009; Kirk, 2009; Marinescu, 2009; Kennewell, 2004; Volcu & Volcu, 2021; Boon, 2013; Curry & Light, 2021; Țurcanu, 2024).

These ideas presented above highlight the variety of ways in which information technology can be effectively integrated into primary physical education classes, having a beneficial impact on the learning and physical development of students.

This research aims to evaluate the impact of technology in physical education, analyzing the effects of its use in physical education classes on the development of motor skills of primary school students.

The study focuses on comparing the effectiveness of technology versus traditional methods, highlighting both the advantages and challenges of integrating technology into the curriculum.

Using empirical methods such as direct observations, questionnaires and performance tests, the research explores how technology can transform the educational experience in physical education, providing a solid basis for adjusting teaching strategies and optimizing motor skill development in students.

2. Material and methods

The purpose of this research is to analyze and evaluate the impact of integrating information technology into physical education classes on the physical readiness and engagement of primary school students. The research aims to determine the extent to which technology, in the form of physical activity monitoring devices, mobile applications and educational software, can improve pupils' physical performance as well as their motivation and active involvement in sports activities.

This research hypothesize that the integration of information technology into physical education classes will have a positive effect on the physical development and engagement of primary school students. Digital technologies are expected to help improve physical performance and increase motivation for sports activities. Technology will enable more effective monitoring of pupils' progress, helping to optimize the teaching process and increase pupils' interest in physical education.

The following scientific research methods were used to carry out this study: specialized bibliographical study method, observation method, pedagogical experiment method, testing method, method of interpretation and information processing.

The sample for the pedagogical experiment consisted of, the experimental group, 20 students from the 3rd grade A of the "Iorgu Vârnav Liteanu" Technological High School from Liteni, respectively, the control group, 20 students from the 3rd grades of the Siliștea Secondary School and the Roșcani Secondary School, both structures of the same high school in Liteni.

The study was conducted during the school year 2023-2024 and included a total of 40 students, 20 students each from 3rd grade A, and 10 students from each structure distributed evenly between genders, with 10 boys and 10 girls.

The students in the experimental group benefited from the use of information technologies during physical education lessons, having access to support materials such as explanatory videos, presentations of simple game structures from minihandball and minifootball, as well as videos of correct execution of physical activities. These resources, available through the Classroom platform and the WhatsApp class group, were used to ensure correct and thorough learning of the concepts taught. Video analysis apps were used in the teaching of sports mini-games, providing students with visual feedback and helping to improve performance. The control group followed the standard syllabus without access to information technology, continuing with traditional teaching methods.

The samples used in the experiment included:

- *Standing long jump*

The test is performed from a seated position behind a line with the soles shoulder width apart. The student executes a lunge by bending and rapidly extending the legs while simultaneously swinging the arms. The impulse must be forceful to accomplish the jump and the landing is made on both feet. The length of the jump is measured from the starting line to the nearest part of the body touching the ground, usually the heel.

- *Oine ball throw*

The test is performed from a standing position with the feet apart at the starting line, in the sagittal plane, with the foot opposite the throwing arm placed in front and the toes of the feet pointing in the direction of the throw. The throwing arm (right or left) is elevated with the elbow pointing forward and the ball positioned above the shoulder while the opposite arm (left or right) is positioned laterally with a slight bend at the elbow joint. The throw of the oyne ball is executed by a swing of the arm, with two throws being made and the better of the two being recorded.

- *Endurance running*

The race is run over a distance of 400 meters, with students positioned behind the starting line. On the start signal the pupils start running at a steady pace that can be maintained throughout the event. The time run by each pupil will be recorded.

3. Results and discussions

The analysis of statistical data obtained from the experiment shows that the integration of information technology significantly contributes to the efficiency and modernization of the educational process.

Comparison of the motor indicators of the subjects in the experimental and

control groups provided essential data on the variation in performance and uniformity of results. This information allowed relevant comparisons to be made between the two groups.

The test results were expressed as arithmetic mean (X), standard deviation (±S) and coefficient of variation (Cv%), providing a detailed picture of pupils' progress and confirming the positive impact of technology on the teaching of physical education to primary school students.

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

Subjects		Sample								
		Standing long jump, cm			Oine ball throw, m			Endurance running – 400 m		
		X	+/-S	Cv%	X	+/-S	Cv%	X	+/-S	Cv%
20 students, experimental group	**I. T.**	120,25	12,34	10,26	12,85	4,08	31,75	3,69	0,62	16,80
	F. T.	131,25	12,32	9,38	15,5	4,14	26,7	3,29	0,57	17,32
	D.	*11*	*0,02*	*0,88*	*2,65*	*0,06*	*5,05*	*0,4*	*0,05*	*0,52*
20 students, control group	**I. T.**	123,3	10,41	8,44	13,10	4,11	31,37	*3,50*	*0,48*	13,71
	F. T.	123,8	10,03	8,10	13,25	4,21	31,77	*3,49*	*0,48*	13,75
	D.	*0,5*	*0,38*	*0,34*	*0,15*	*0,1*	*0,4*	*0,01*	*0*	*0,04*

Interpretation of the results presented in Table 1 reveals significant differences between the experimental and control groups following the experiment, as follows:

- *In the standing long jump (cm):*

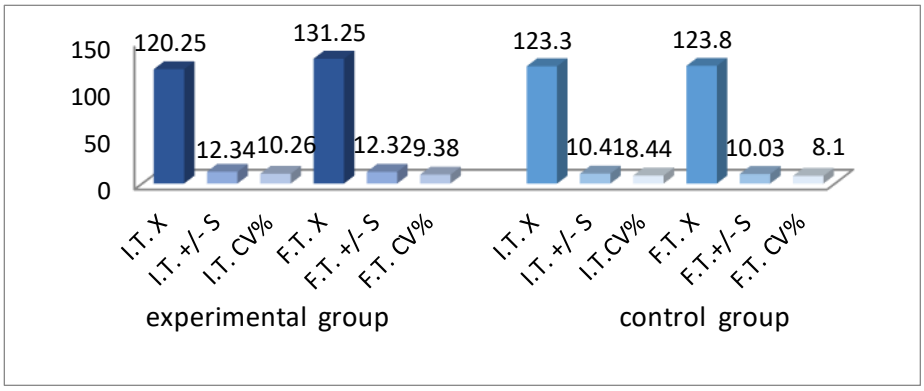

Figure 1. *Standing long jump, initial and final tests*

The experimental group showed an improvement of 11 cm between baseline and final testing, with an almost constant standard variation and a slightly lower coefficient of variation in the final test, suggesting a smoothing of the results.

The control group had an insignificant improvement of only 0.5 cm, with similar variation and uniformity at baseline and final testing.

- *On the oine ball throw (m):*

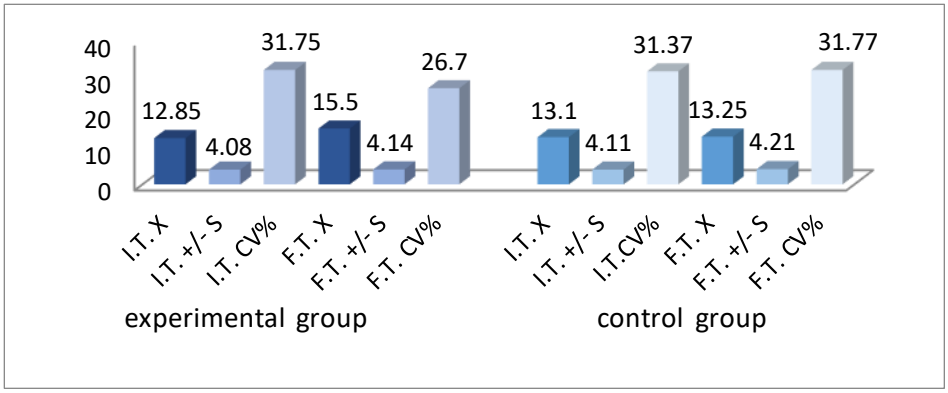

Figure 2. *Oine ball throw, initial and final tests*

The experimental group showed an increase of 2.65 m, with a decrease in the coefficient of variation from 31.75% to 26.7%, indicating a significant increase and a reduction in the variation between students.

The control group showed an insignificant increase of only 0.15 m and the variation in performance remained constant.

- *Endurance running (400 m):*

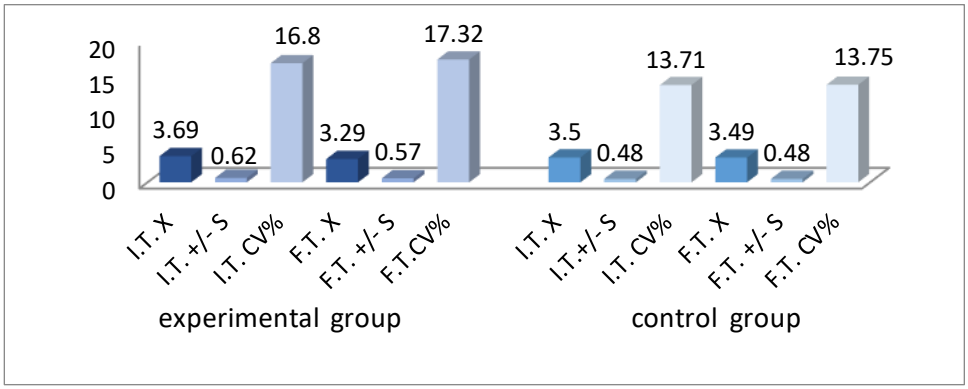

Figure 3. *Endurance running, initial and final tests*

The experimental group showed an improvement in time of 0.4 seconds and the coefficient of variation remained almost constant, suggesting a relative uniformity in performance.

The control group showed no significant improvement, with only 0.01 seconds difference, and the variation between performances remained almost unchanged.

The data suggest that the integration of information technology into the teaching process contributed to improved physical performance and a leveling of results in the experimental group, while the control group showed only minor improvements.

Discussions

In the research conducted in the present study, the integration of technology, such as educational videos, digital platforms and video analytics applications, led to a significant improvement in the physical performance of the students in the experimental group. For example, the improvements of 11 cm in the long jump and 2.65 m in the oine ball throw demonstrate the effectiveness of technology-assisted teaching methods in the development of physical skills. These results align with those obtained in other studies examining the impact of technology use in physical education.

The results obtained confirm the findings presented by the cited authors in the literature (Balint, 2009; Kirk, 2009; Marinescu, 2009; Kennewell, 2004; Greve et al., 2020; Volcu, & Volcu, 2021; Boon, 2013; Curry & Light, 2021; Modra, Domokos & Petracovschi, 2021; Doman, 2024).

The integration of technology has not only improved teaching and assessment methods, but has also contributed to personalizing the educational experience, boosting students' motivation and facilitating a more detailed analysis of their performance.

4. Conclusions

The findings of this research confirm the significant impact of the integration of information technology in physical education on the preparation of primary school students.

The use of digital equipment and specialized software has not only helped to increase students' motivation and involvement in physical activities, but also to personalize and optimize the process of performance assessment.

Through these technologies, we were able to tailor the activities to the individual needs of each student, providing personalized feedback and guidance.

It was also able to demonstrate that technology supports modern pedagogical methods such as game-based learning and the development of critical thinking. Students were not only more physically active, but also developed essential cognitive skills, thus improving the overall quality of physical education.

We believe that the integration of information technology into physical education lessons is an essential resource for developing the physical and cognitive skills of primary school pupils. It should not completely replace traditional methods, but function as a complementary tool, helping to optimize the teaching process and increase pupils' interest in physical education lessons.

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