

IMPACT OF INFORMATION TECHNOLOGY ON PHYSICAL EDUCATION IN PRIMARY EDUCATION

Alina Petruța Țurcanu¹

Technological High School “Iorgu Vârnav Liteanu” Liteni¹
pascariualina82@yahoo.com¹

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Abstract

The article explores the impact of the integration of information technology into physical education lessons at primary school level, highlighting modern approaches that are transforming the traditional way of teaching. The study analyses how the use of educational equipment and software can improve pupils' physical performance, motivating and stimulating their interest in physical activities. The results indicate that the application of technology in this context not only enhances the effectiveness of lessons, but also contributes to better retention of information and the development of pupils' motor skills. The findings suggest that the implementation of these modern methods in the physical education curriculum could have significant long-term benefits, suggesting that schools should adopt such technologies to optimise the educational process and support students' holistic development.

Introduction

In an era dominated by technology and digital innovation, the education system faces unique challenges and opportunities. Physical education, a traditional domain of children's physical and cognitive development, is no exception in this context. With the rapid advancement of information technology, new approaches to the teaching and learning of physical education have emerged that promise to revolutionise the way these activities are perceived and implemented in primary education. Integrating technology in education offers innovative tools to improve pupils' performance, stimulate their interest in physical activity and create a more interactive and engaging learning environment. This article aims to explore the essential role of information technology in the educational process, with a focus on physical education at primary level, and to analyse how these modern approaches can transform the educational experience of pupils, bringing significant benefits for their overall development. The use of technology in physical education can increase student motivation, engagement and achievement [1].

Tools such as video analysis software, interactive simulations and virtual reality can transform physical education, making it more engaging and effective [2, 3, 4, 9].

Some authors explore the use of digital media in PE lessons in primary schools, focussing on the pupils' perspective. The study analyses how pupils perceive and react to product-oriented teaching methods in which digital media are integrated into lesson scenarios. The authors discuss the benefits of using these technologies, such as increasing student motivation and engagement, as well as the associated challenges, including adapting the content to the needs of the students [2].

A systematic review of the research on the use of digital technology in physical education over a decade between 2009 and 2020 provides us with the authors, Jastrow, Greve, Thumel, Diekhoff, and Subenbach (2022). They examine a large body of research to identify trends, innovations, and the impact of digital technology on physical education. The article highlights how digital technologies, such as mobile apps, monitoring devices, and online platforms, have been integrated into physical education lessons, emphasising both their benefits and challenges [3]. There are many approaches to the application of information technology in performance sport and fewer in physical education. In this sense, the authors set out to develop a software model that includes both a theoretical and a practical approach to what happens in pre-university education in the field of physical education and sport [12, 13, 14].

Other authors, Phillips, Rodenbeck and Clegg (2014) analyse effective and popular mobile apps in physical education. They evaluate apps that have been validated by teachers and valued by students, highlighting how they enhance PE lessons. The study presents examples of apps that support physical activity monitoring, motor skill development and student engagement [7].

A comprehensive synthesis of the literature by Modra, Domokos and Petracovschi (2021) explores the integration of digital technologies in physical education lessons. They analyse several studies to uncover current trends, advantages and difficulties encountered in the use of these technologies in this domain. The results of the analysis show that digital technologies, such as mobile apps, online platforms and smart devices, can significantly improve the quality of teaching, monitoring and assessment processes in physical education. At the same time, the article also addresses challenges related to the implementation of these technologies, such as accessibility and adequate teacher training [6].

Other authors, Yadav, Sharma and Kumar (2023) explore the role of information technology in physical education and how it can enhance the educational process. The authors discuss the benefits of technologies such as physical activity monitoring apps and interactive educational platforms that can increase engagement and lesson effectiveness. They also outline accessibility challenges and the need for ongoing teacher training. The article recommends integrating technology into the

physical education curriculum to maximise educational benefits [10]. Physical education teachers become catalysts for students' personal progress, motivating them to push their limits, discover their abilities and consciously strengthen their physical health, in accordance with the principles of this innovative method [11].

Material-method

This research aims to investigate and analyse how information technology influences the educational process in physical education classes at primary school level. The aims of this research are to evaluate the impact of information technology on the physical performance and learning of primary school pupils and to analyse how digital technologies influence their motivation and engagement in physical education lessons. The research also aims to identify the most effective ways of integrating technology into the physical education curriculum.

The following methods of scientific research applied in physical education and sport were used to carry out this study: specialised bibliographical study method, document analysis, observation method, pedagogical experiment method, testing method, method of interpretation and information processing. The sample for the pedagogical experiment consisted of two groups: 20 students of the 4th grade A from the Iorgu Vârnăv Liteanu Technological High School in Liteni, who formed the experimental group, and 20 students of the 4th grade from the Roșcani Secondary School in Liteni, who formed the control group. The study was conducted over a 12-month period, involving a total of 40 pupils, distributed evenly between genders, with 10 boys and 10 girls in each group. The students in the experimental group used information technology during class time, including video materials through presentations of simple minihandball and minifootball structures, recordings of correct executions and video support provided through the Classroom platform as well as through the WhatsApp class group. These resources were utilised to ensure correct understanding of the concepts taught. In addition, video analysing applications were also used to teach the sports mini-games to enhance instruction and feedback. The control group continued to follow the traditional programme without the use of information technology.

The following tests were included in the experiment: standing long jump, trunk lifts - sit-ups, throwing the oisín ball, endurance running 400 m.

Results: The modernisation of educational media, driven by scientific and technological progress, has allowed the transition from the use of intuitive static materials to the introduction of modern technology. This development, reflected in various generations of educational media, has significantly contributed to increasing the efficiency of the teaching process [5, 8]. Studying the literature has allowed me to integrate various modern strategies and technologies into PE and sport lessons with the aim of optimising the learning and development process of primary school

students. I have implemented mobile apps and wearable devices to monitor physical activity, used online platforms to share educational resources and facilitate collaboration between students and myself, and virtual games and simulators have been used to improve skills and strategies in different sports disciplines. Virtual simulations were used to recreate sporting experiences and facilitate a better understanding of theoretical concepts, while augmented reality provided real-time feedback, helping to refine techniques and improve sports performance. We integrated gamification elements into physical education lessons to increase student participation and active involvement. We have also organised online competitions and challenges to encourage sport and active lifestyles outside the classroom. We have utilised social platforms and online communities to create a mutually supportive environment between pupils, thus promoting sport and a healthy lifestyle. The implementation of modern technology in practice led to a significant improvement in the motor parameters of the pupils participating in the pedagogical experiment in the experimental group. Table 1 shows the motor performances of students in the two groups, experimental and control, in the four specific tests. The measured parameters include mean values (X), standard deviation ($\pm S$) and coefficient of variation (Cv%).

Table 1. Centralisation of statistical results of the target group

Subjects	Sample												
	Standing long jump			Trunk lifts - sit-ups			Throwing the oisín ball			Endurance running 400 m			
	X	+/-S	Cv%	X	+/-S	Cv%	X	+/-S	Cv%	X	+/-S	Cv%	
20 students, experimental group	T. I.	133	11,1	8,35	18,5	5,41	29,24	14,5	4,93	26,57	3,36	0,61	18,15
	T.F.	142	10,8	7,59	25,2	3,76	14,92	18	3,76	14,89	2,92	0,65	22,26
	D.	9	0,3	0,76	6,7	1,65	14,32	3,5	1,17	11,68	1,07	0,04	4,11
20 pupils, control group	T. I.	132	13,7	10,4	19,2	3,46	17,97	12,6	3,96	31,3	3,29	0,42	12,76
	T.F.	133	13,3	10	20	3,61	18	13,1	3,84	29,2	3,27	0,44	13,45
	D.	1	0,4	0,4	0,8	0,15	0,03	0,5	0,12	2,1	0,02	0,02	0,69

Analyses of these motor indicators, obtained by testing students in the two groups, provided valuable information about the distribution of results and homogeneity of performance.

In the **standing long jump**, the initial and final tests show the following values, fig.1:

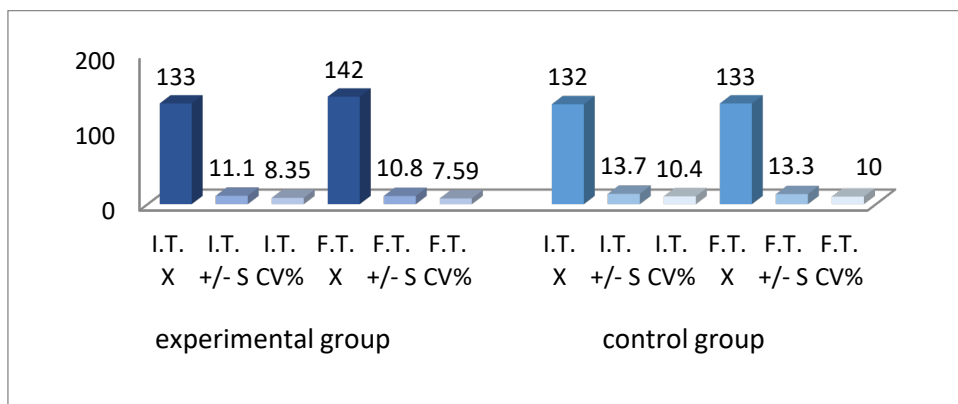


Fig. 1. Standing long jump, initial and final tests

The experimental group showed a significant improvement from baseline to final test, from 133 cm to 142 cm, with a low standard deviation and coefficient of variation, indicating a high homogeneity of performance.

The control group showed non-significant changes, the I. T. and F. T. values are very low, indicating that the absence of multimedia had no effect on the recorded results.

In the **trunk lifts - sit-ups**, the initial and final tests indicate the following values, fig. 2:

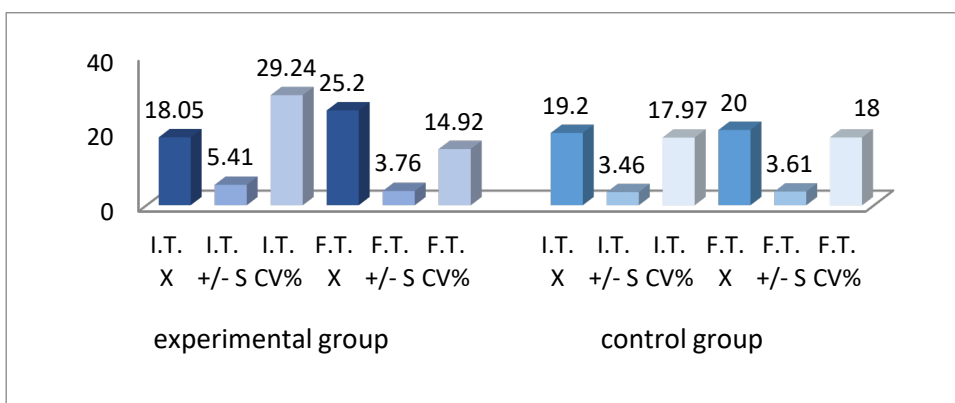


Fig. 2. Trunk lifts - sit-ups, initial and final tests

The experimental group recorded 18 repetitions on the I.T. and 25 on the F.T. with a small standard deviation and a decrease in the coefficient of variation.

The control group showed a slight increase, achieving 19 repetitions on I.T. and 20 repetitions on F.T., with a slight increase in the standard deviation from 3.46 to 3.61 and a stable coefficient of variation around 18%.

The initial and final tests for the **throwing the oisin ball** test show the following values, fig. 3:

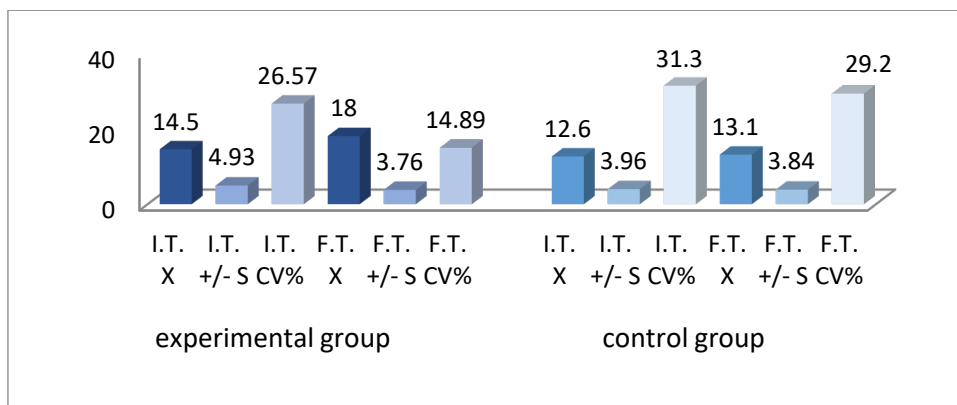


Fig. 3. Throwing the oisin ball, initial and final tests

The experimental group showed an improvement, from 14.5 m to 18 m, with a slight reduction in the standard deviation and coefficient of variation, suggesting an increase in the homogeneity of performance.

The control group showed only a minor improvement from 12.6 m to 13.1 m, with constant values of standard deviation and coefficient of variation.

In the endurance running, 400 m, the initial and final tests show the following values, fig. 4:

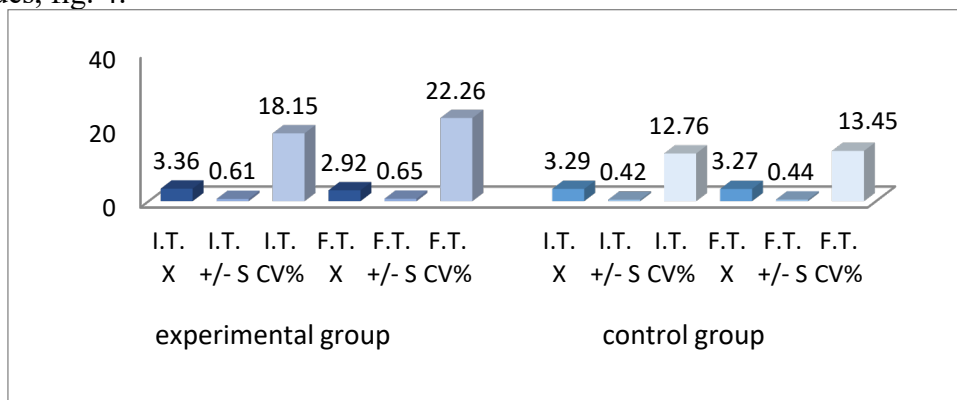


Fig. 4. Endurance running, 400 m, initial and final tests

The experimental group showed an improvement from 3.36 minutes to 2.92 minutes, with a reduction in standard deviation and coefficient of variation.

The control group showed a slight increase, obtaining values of 3.29 minutes in I.T. and 3.27 minutes in F.T., indicating that the absence of multimedia materials did not influence performance.

The experimental group showed significant improvements in all tests, with a reduction in standard deviations and coefficients of variation compared to the control group, which obtained only modest increases, with minor variations in the homogeneity of the results.

Discussions: The results obtained in our study indicate a significant positive influence of the integration of information technology in the process of physical education on the preparation of primary school students. Specifically, the use of interactive applications, handheld devices and digital instructional materials led to an increase in student engagement, student motivation and a significant improvement in measured physical performance. These findings are in line with studies by Chen, Hsu, Lin, Wang, 2021 who observed that the use of information technology can enhance students' interaction and interest in physical activities. Also, Greve, Thumel, Jastrow, Krieger, Schwelder, Subenbach, 2020 emphasized that digital monitoring of individual performance improves students' self-perception and their determination to progress. However, unlike the findings of Jastrow, Greve, Thumel, Diekhoff, and Subenbach 2022, who did not identify significant changes in students' attitudes towards physical education but emphasized the benefits and challenges of digital technology on physical education, our study emphasizes the importance of designing specific activities tailored to the level and interests of the students. The importance of the results lies in the fact that they demonstrate the effectiveness of modern teaching methods in physical education, especially at primary level. The integration of technology contributes not only to the development of physical skills, but also to the development of digital competences, so necessary in today's society. These findings may have direct implications for educational policies, suggesting the need to invest in equipment and teacher training in the use of technology.

Conclusions

The research highlighted the positive impact of the integration of modern technology in physical education on the development of motor parameters of primary school students.

The experimental group, which benefited from the implementation of information technology, showed significant improvements in motor performance, reflected by increased mean values and greater homogeneity of results.

These results suggest that the use of modern technologies, such as virtual simulations, mobile applications and real-time feedback, can streamline the learning process and stimulate students' physical development.

The control group, which did not benefit from the same technological tools, showed only modest improvements, emphasizing the importance of integrating technology into physical education to achieve superior results.

In conclusion, modern information technology plays an essential role in optimizing and diversifying physical education activities, contributing significantly to the physical and motor development of primary school students.

As a result of the research, the proposed objectives have been achieved, highlighting the significant impact of information technology on the physical performance and learning process of primary school pupils.

The results indicate that digital technologies play an important role in increasing students' motivation and engagement in physical education lessons. Also, effective ways of integrating these technologies into the physical education curriculum have been identified, which can thus contribute to the optimization of the educational process in this area.

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