

Digital Applications in Physical Education: Experience, Benefits, and Implementation Challenges

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Abstract— The article presents the attitudes of physical education teachers toward the use of digital applications, highlighting their advantages and challenges. The aim is to examine teachers' perspectives on the implementation of digital applications in physical education and identify their benefits and difficulties. The study employed literature analysis, surveys, and statistical processing of research results. It was found that 62,9% of teachers incorporate digital applications into their pedagogical practice, while 42,9% started using them during the strict lockdown period. Additionally, 37,1% primarily apply them in distance learning and occasionally in face-to-face lessons. Among various digital tools, teachers prefer interactive learning platforms (67,1%), fitness trackers (34,3%), and applications for monitoring pupils' health (30,0%).

Regarding the impact, 31,4% of teachers recognize the positive influence of digital applications on pupils' motivation, 52,9% believe they facilitate individualized learning, 41,4% consider them effective for health-related tasks, and 48,6% note their role in developing pupils' physical qualities. However, the effectiveness of digital applications in achieving educational (31,5%) and educational-social (25,7%) objectives in physical education remains low.

The study identifies key advantages, such as access to diverse educational materials (47,1%), individualized learning (32,9%), increased pupil motivation (20,0%), improved progress monitoring (17,1%), and enhanced communication with pupils and parents (15,7%). Challenges include difficulties in integrating applications into the learning process (71,4%), lack of time for preparation and implementation (62,9%), insufficient technical support (38,6%), lack of necessary equipment (37,1%), and low digital literacy among teachers (37,1%).

The findings suggest that physical education teachers actively use digital applications, with fitness trackers and health-monitoring tools being the most popular. While teachers find them less effective for achieving educational and social objectives, they recognize their significant role in tracking pupils' physical development and health status.

Keywords— digital applications, physical education, teachers, pupils, lesson.

I. INTRODUCTION

In today's world, the global community has actively embraced the course of economic digitalization and the informatization of all aspects of human life [1, 2].

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Ukrainian society is currently at the stage of active development and implementation of digital technologies across all areas of social relations, including the field of physical culture and sports. The advantages of digital transformation are evident—this enormous leap forward for humanity opens up broad perspectives and opportunities for children, teenagers, youth, and the adult population. The advancement of digitalization in Ukraine in the realm of physical culture and sports plays one of the most significant roles in human and societal life.

According to R. Shchokin and Z. Beleniuk, there is an urgent need to implement a system of digitalization in physical culture and sports. They believe that such a system would help address the following tasks:

- Strengthening transformational leadership, changing mindsets, and enhancing digital potential at the individual level, particularly for participants in the educational process, including teachers, students, and athletes;
- Transforming organizational structure and culture;
- Promoting systemic thinking and the development of integrated approaches to policy-making and the provision of physical fitness and wellness services [3].

To promote the digital space, the Ministry of Youth and Sports of Ukraine is currently paying considerable attention to this issue. A dedicated digitalization sector has been created, leading to the active implementation of sports startups such as: RunAn – a sports tracker designed to reduce injuries and improve running efficiency through running technique control; Gymcerebrum – an artificial intelligence platform with unique computer vision technology, functioning in fitness clubs as a virtual coach; TenniRobo – an innovative table tennis robot that serves as a professional coach, controlled via a mobile application; 12Climb – an interactive climbing wall with thousands of routes controlled via a smartphone, along with an app for tracking training progress; Real Talk Sport – a CRM web system for managing combat sports competitions and the activities of sports federations; Unior F – a sports platform for children, schools, and scouts [4].

Distance learning technologies are a key tool for achieving one of the main goals of educational digitalization—ensuring the continuity of the learning process. These technologies allow for the identification of the specific features of digital application use at the current stage of school physical education development, including personalized learning, remote learning, motivation and engagement of students in physical activities, the creation of educational resources and materials, feedback on the quality of physical education lessons, health and physical condition monitoring, physical development and preparedness assessment, as well as communication and collaboration. This makes our research highly relevant.

The purpose of this study is to examine the attitudes of physical education teachers toward the use of digital

applications in physical education, identifying both the advantages and challenges of their implementation.

II. MATERIALS AND METHODS

The study employed the following scientific methods: analysis and synthesis of literature sources, a questionnaire survey, and mathematical processing of the survey results.

A total of 648 physical education teachers from general secondary education institutions participated in the survey (68.6% men and 31.4% women). The respondents had varying lengths of teaching experience and belonged to different qualification categories. The distribution was as follows:

- 7.14% of physical education teachers held the qualification category “Specialist,” including 8.3% of male and 4.5% of female teachers;
- 18.6% held the second qualification category, comprising 20.8% of men and 13.6% of women;
- 27.1% had obtained the first qualification category based on the results of attestation – 27.1% of male and 27.2% of female teachers respectively;
- 47.1% held the highest qualification category, including 43.8% of men and 54.5% of women.

Regarding teaching experience, the surveyed specialists demonstrated the following distribution:

- 7.14% had 1 to 5 years of experience. Among them, 8.3% were men and 4.5% were women;
- 8.6% of physical education teachers had 6 to 10 years of teaching experience, including 8.3% of male and 9.1% of female respondents;
- 10.0% of respondents had been working in schools for 11 to 20 years, of whom 12.5% were men and 4.5% were women;
- 18.6% had teaching experience ranging from 21 to 25 years. This included 20.8% of men and 13.6% of women;
- 20.0% of teachers reported having 26 to 30 years of experience – 22.9% of men and 13.6% of women;
- 35.7% had been working in schools for more than 30 years, including 27.1% of male and 54.5% of female teachers.

The survey of both physical education teachers and students was conducted using Google Forms, which were distributed through professional communities of physical education teachers and social media platforms such as Facebook, Instagram, and Telegram channels. All participants provided verbal informed consent to take part in the survey, which was indicated at the end of the questionnaire.

III. RESULTS AND DISCUSSION

It was found that the majority of physical education specialists – 62.9% – use various digital devices during physical education lessons. Furthermore, it was revealed that female teachers utilize such devices more frequently than their male counterparts. This is supported by the data:

77.3% of women and 56.2% of men reported using digital tools. An opposite trend is observed among those who do not use digital devices: 13.6% of women and 41.7% of men reported not using any digital applications as auxiliary tools in physical education, representing 32.9% of all respondents.

A small percentage of respondents indicated that they plan to use digital devices in the future. This view is shared by 4.2% of the surveyed teachers, including 2.1% of men and 9.1% of women.

We found that, in general, physical education teachers have been using digital devices in their lessons over the past five years. This was reported by 42.9% of respondents. It was also established that, in terms of gender, female teachers use digital devices during physical education lessons more frequently than male teachers. Specifically, 54.5% of women and 37.5% of men indicated such use.

Since the onset of the COVID-19 pandemic, 7.14% of respondents quickly adapted to the use of digital devices. However, a notable gender difference was observed: 8.3% of male and 4.5% of female teachers reported this adaptation. In addition, 14.3% of physical education specialists began using digital devices only after the introduction of martial law. This was indicated by 10.4% of the surveyed male teachers and 22.7% of female teachers.

A small percentage of respondents indicated that digital applications became an integral part of their teaching experience only in the past academic year. This was reported by 2.1% of male teachers and 4.5% of female teachers.

It is worth noting that, when asked about the reasons for not using digital devices during strict or adaptive quarantine periods, respondents were unable to clearly articulate their answers.

Physical education teachers highlighted varying frequencies in the use of digital devices, applications, and platforms. The majority, 37.1%, reported using them systematically only during online lessons. Female teachers were found to use them more frequently than male teachers: 63.6% of women compared to 25.0% of men. A small proportion, 11.4% of respondents, reported using digital tools very rarely. In this case, a reverse trend was observed – 16.7% of men and 0.0% of women. Occasionally, 10.0% of respondents used digital devices during physical education lessons, with no significant gender differences: 10.4% of men and 9.1% of women. Additionally, 8.6% of respondents reported using digital devices in every lesson. Among them, female teachers again showed higher usage rates than their male counterparts: 12.6% of women versus 6.3% of men. However, 32.95% of respondents did not consider it necessary to use digital devices during lessons, including

41.7% of men and 12.6% of women. These responses raise certain concerns, as they may call into question the effectiveness of conducting physical education lessons during periods of strict quarantine.

Among the various types of digital devices, interactive learning platforms such as Google Classroom, Moodle, and Edmodo are the most commonly used. A total of 67.1% of teachers reported using these platforms. A significant gender difference was observed in the responses: 90.9% of female teachers use them, compared to 56.3% of male teachers. We believe that this disparity may be attributed to the fact that female teachers are more focused on conducting lessons during quarantine restrictions, whereas male teachers were likely referring to in-person learning.

Fitness trackers and fitness bracelets are used by 34.3% of respondents as an important tool for monitoring students' health. Among them, 12.6% are women and 6.3% are men. In addition, 30.0% of respondents use various mobile applications for health monitoring, with 59.1% of women and 16.7% of men reporting their use. We believe that this approach promotes a more conscious evaluation by students of the impact of physical exercise on their health, which is particularly important for students with health impairments.

To effectively prepare for physical education lessons, 25.7% of surveyed respondents watch video tutorials on YouTube channels, use the Ukrainian Online School, and participate in Zoom conferences. These resources are used by 20.8% of male teachers and 36.4% of female teachers. This suggests that physical education teachers, regardless of gender, strive to improve both their teaching skills and the quality of physical education lessons. The lowest percentage was observed among those who use workout mobile applications such as Nike Training Club and Adidas Training – only 2.9% of teachers reported using them, including 2.1% of men and 4.5% of women. This indicates that the vast majority of respondents are unfamiliar with the wide range of digital applications that can support students in learning physical exercise techniques while studying specific sports.

The use of digital devices in physical education during the pandemic and martial law has had a certain impact on the quality of lessons, students' motivation to engage in physical exercise, their physical activity levels, the implementation of individualized approaches, as well as on addressing educational, health-related, and developmental objectives, including the development of physical qualities.

According to a survey of physical education teachers, 31.4% reported that the use of digital devices has a very positive effect on students' motivation to perform physical exercises. Among them, 33.3% were men and 27.3% were women. Additionally, 14.3% of respondents believe that the impact is extremely positive. However, 31.4% of

respondents consider that students' motivation to engage in physical activity is not influenced by the use or non-use of digital applications during lessons, perceiving the effect as neutral. This opinion is shared by 25.0% of male teachers and 45.5% of female teachers. Furthermore, 14.3% of teachers are convinced that digitalization has a negative impact on student motivation, as students tend to use mobile phones and applications in a way that distracts them through virtual physical activities. This view was expressed by 16.7% of men and 9.1% of women. An extremely negative impact was noted by 8.6% of respondents, with little difference in opinion between genders: 8.3% of men and 9.1% of women shared this perspective.

We found that 32.9% of the surveyed teachers believe that the use of digital applications during physical education lessons significantly contributes to the implementation of an individualized approach to students. This is confirmed by 31.3% of men and 36.4% of women. A further 52.9% of respondents believe that there is partial support from digital tools in this regard. However, 8.3% of men and 4.5% of women disagreed with this view. Additionally, 7.1% of the surveyed teachers were unable to provide an answer to this question.

A slightly different situation was found regarding the impact of digital applications for monitoring students' physical activity and health. Physical education teachers believe that digital applications, such as fitness trackers and bracelets, can help both teachers and students track physical activity during lessons and monitor students' health. A total of 50.0% of respondents are confident in the effectiveness of digital applications. There is a significant difference between the responses of men and women: 35.4% of men and 81.8% of women believe that these applications are highly effective.

The survey of physical education teachers revealed that the use of digital applications in physical education helps teachers save time on explanations and demonstrating the technique for exercises. This was affirmed by 64.3% of the surveyed teachers. Additionally, the use of digital applications helps implement an individualized approach to students, as stated by 45.7% of respondents. Furthermore, the use of digital applications allows for the integration of other subjects into physical education and the development of students' information and communication competencies, according to 41.2% of teachers.

One in three physical education teachers is convinced that the use of digital applications helps develop students' research skills, with 12.5% of men and 22.7% of women sharing this opinion. For 10.0% of teachers, digital applications allow for a deeper immersion in the study of the material. The opinions of men and women on this issue are nearly identical: 10.4% of men and 9.1% of women agree.

However, 7.1% of respondents believe that digital applications distract students from completing educational tasks. Moreover, 4.3% of respondents think that the digitalization of physical education interferes with the teacher's educational activities. This was noted by 4.2% of men and 4.5% of women.

It is worth noting that physical education teachers highlighted both the advantages and disadvantages of using digital devices during PE lessons. The main advantage mentioned by the specialists was access to a wide range of educational materials, as noted by 47.1% of the teachers.

During the interviews, teachers pointed out that modern printed materials do not devote enough attention to the subject of physical education, resulting in a lack of methodological support for conducting PE lessons. Therefore, when preparing for PE classes, teachers often have to search for the necessary materials online on their own. Female teachers tend to use online resources more frequently than their male counterparts (81.8% compared to 31.3%, respectively).

Among the advantages, teachers noted that the use of digital applications enhances the individual approach to students, as agreed by 32.9% of respondents. It is also worth mentioning that 20.0% of physical education teachers believe that the digitalization of physical education increases students' motivation during lessons.

In addition, 17.1% of teachers – including 14.6% of men and 22.7% of women – believe that digital applications help track students' learning progress, particularly in terms of the development of physical abilities.

We found that 15.7% of teachers used digital devices to improve communication with students and their parents, especially during periods of remote or blended learning. Teachers typically do this through Viber groups. Male teachers communicate with students or parents less frequently than female teachers, as indicated by 6.3% of men and 36.4% of women (fig. 1).

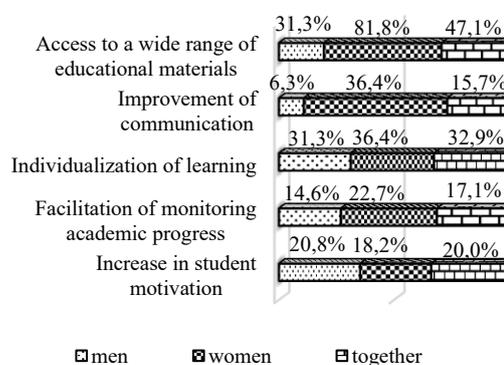


Fig. 1. Advantages of using digital applications in physical education, %.

During the survey, physical education teachers emphasized certain challenges they faced while using digital applications in their teaching. The main ones are as follows:

➤ Lack of time for preparation and integration of digital tools into PE lessons – reported by 62.9% of surveyed teachers. Broken down by gender: 41.2% of male teachers and 95.5% of female teachers;

➤ Difficulties integrating applications into the educational process – 71.4% of physical education teachers. This was highlighted by 58.3% of men and 95.5% of women;

➤ Insufficient technical support for PE lessons – 38.6% of all respondents, including 37.5% of male and 40.9% of female teachers;

➤ Lack of necessary equipment – reported by 37.1% of schools. This was noted by 20.8% of male teachers and 72.7% of female teachers;

➤ Low level of personal digital literacy – 37.1% of surveyed teachers, including 33.3% of men and 45.5% of women;

➤ Low level of students' digital literacy – 14.3%. According to 16.7% of male and 9.1% of female physical education teachers.

In light of these challenges, physical education teachers emphasized the need for additional training in digital literacy and the development of methodological guidelines for using digital applications in physical education (PE). This view is shared by 44.3% of respondents. The opinions of male and female teachers on this issue are nearly identical: 41.7% of men and 50.0% of women. Additionally, 31.4% of respondents believe that such training is needed, but not urgently. Meanwhile, 17.1% think that there is no need for specific measures to improve digital literacy, and 7.1% completely reject the necessity of such measures.

Despite the generally positive impact of digital applications, every third respondent noted that their use reduces the quality of physical education lessons. However, 12.9% of teachers believe otherwise and emphasize a significant improvement in lesson quality. This view is shared by 12.5% of male and 13.6% of female teachers. Additionally, 10.0% of teachers reported a moderate improvement in PE lessons thanks to digital applications. Meanwhile, 17.1% of teachers expressed a neutral opinion regarding the use of digital applications – including 20.8% of men and 9.1% of women.

We asked physical education teachers about the impact of digital applications on achieving the goals of PE lessons – educational, health-related, and developmental. A total of 31.4% of teachers believe that digital applications negatively affect the achievement of educational goals.

The opinions differ significantly between male and female teachers: 41.7% of men and only 9.1% of women. Additionally, 30.0% of respondents noted a somewhat negative effect. On the other hand, 7.1% of respondents believe that digital applications help achieve educational goals. Another 30.0% think that digital tools help more than hinder in reaching educational objectives, with a notable difference between genders: 68.2% of women compared to 12.5% of men.

Regarding the impact of digital applications on achieving health-related goals, teachers' responses were significantly more positive compared to educational goals. A total of 41.4% of teachers believe that digital applications improve the achievement of health-related goals during lessons, with a higher percentage among women (50%) compared to men (37.5%).

31.4% of respondents think that digital applications somewhat help in achieving health-related goals. Teachers believe that the use of fitness trackers for health will encourage students to be more mindful of their health. There is a notable difference between male and female teachers on this: 45.5% of women and 24.0% of men agree with this.

15.7% of respondents are convinced that digital applications do not help achieve educational goals during physical education lessons. Men have a more negative attitude towards this, with 20.8% of men compared to 4.5% of women holding this view. 8.3% of men express a strongly negative opinion about using digital applications to achieve health-related goals. Additionally, 8.3% of men had difficulty providing a clear answer to this question.

45.7% of teachers consider the use of digital applications ineffective for achieving developmental goals during PE lessons, as they do not contribute to the development of moral-volitional qualities or the formation of teamwork skills. Women are more strongly convinced of this: 54.5% of women compared to 41.7% of men. However, 37.5% of men strongly reject the use of digital applications to achieve developmental goals. We also found that nearly one in five respondents (22.9%) has a more positive attitude towards using digital applications for developmental goals than negative, with a significant difference between men and women: 16.7% of men and 36.4% of women. Only 5.7% of teachers are firmly convinced of the need to use digital applications to achieve developmental goals.

When asked the question, "Do digital applications improve tracking the development of students' physical abilities?" 48.6% of respondents answered positively. There is a slight difference in responses between men and women: more women (68.2%) are convinced of this than men (39.6%). However, 15.7% of teachers disagree with this, with responses from both genders being almost identical: 16.7% of men and 13.6% of women. Additionally, 8.6% of teachers have a negative attitude

towards using digital applications for monitoring the development of students' physical abilities.

Thus, our study confirms the conclusions of other Ukrainian scholars [5, 6, 7, 8] regarding the relevance of using digital devices in physical education, as well as the research of foreign scientists on the advantages and challenges of integrating digital technologies into the educational process [9, 10] and the impact of digitalization on physical activity [11, 12]. It is worth noting that our research complements the conclusions of Australian scholars [13] on the importance of using digital applications to enhance motivation for physical education, as well as our previous studies on monitoring physical condition through digital technologies [14]. Moreover, our study [15] emphasizes the importance of using digital devices as an alternative means of supporting physical activity during the Covid-19 pandemic and complements the findings of foreign researchers [16, 17, 18, 19, 20].

It has also been established that the results of our survey of physical education teachers in Ukraine align with the findings of foreign researchers, who emphasize the readiness of physical education teachers to apply digital technologies in physical education, provided that the teachers' perception of the lesson as a practical discipline is not compromised [21]; the importance of using digital devices to enhance student motivation and physical activity [22]; as well as the advantages and challenges of using digital technologies in physical education practice [23, 24].

IV. CONCLUSION

Thus, the survey of physical education teachers of different genders, qualification categories, and teaching experience allows us to conclude that, in today's conditions, the overwhelming majority of physical education teachers use digital devices and applications during physical education lessons. Most teachers do this in the context of distance learning.

Among the full range of digital applications, the most popular among physical education teachers are fitness trackers and applications that allow monitoring health levels.

It was established that physical education teachers consider digital applications ineffective for achieving developmental goals, less effective for educational goals, and the most effective tools for tracking the development of physical qualities and students' health.

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