INNOVATIVE PEDAGOGICAL TECHNOLOGIES IN TEACHING PHYSICAL EDUCATION IN HIGHER EDUCATION INSTITUTIONS

Alla Marushkevych
Doctor of Pedagogical Sciences, Professor, Head of the Department of Pedagogy,
Taras Shevchenko National University of Kyiv, Ukraine
e-mail: marushkevich@kny.ua, orcid.org/0000-0002-1969-7771

Lesia Lytvynchuk
Doctor of Psychological Sciences, Professor, Senior Researcher of the G. S. Kostyuk Institute of Psychology of the National Academy of Pedagogical Sciences of Ukraine;
Professor at the Department of Pedagogy, Taras Shevchenko Kyiv National University, Ukraine
e-mail: Lutol@ukr.net, orcid.org/0000-0002-9206-9827

Vitalii Lunov
Ph.D., Associate Professor, Senior Researcher of the G. S. Kostyuk Institute of Psychology of the National Academy of Pedagogical Sciences of Ukraine;
Associate Professor at the Department of General and Medical Psychology, Educational and Scientific Institute of Mental Health of the O. O. Bogomolets National Medical University, Ukraine
e-mail: lunyov_vitaliy@ukr.net, orcid.org/0000-0002-7085-8454

Summary

The study explores the implementation of innovative pedagogical technologies in the field of physical education at higher education institutions. The research was conducted with 120 students, divided into control and experimental groups, over one academic semester. The control group followed traditional methods, while the experimental group was exposed to blended learning strategies and gamified physical education sessions. Data collection included questionnaires on motivation, physical fitness tests, and attendance records. The results showed significant improvements in motivation, attendance, and physical performance in the experimental group compared to the control group. These findings highlight the positive impact of innovative pedagogical technologies and suggest their integration into higher education curricula to foster active learning, engagement, and holistic development of students. The discussion explores underlying psychological mechanisms based on Self-Determination Theory and Social-Cognitive Theory, highlighting the interdependence between motivation and performance.

Key words: blended learning, gamification, student engagement, physical fitness outcomes, higher education pedagogy, intrinsic motivation, active learning environment, educational innovation.

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1. Introduction

Physical education in higher education institutions often faces challenges related to low student motivation, declining physical activity levels, and limited adaptation of teaching practices to the digital age. Traditional approaches, while effective in building physical skills, sometimes fail to engage students fully. In the 21st century, where students are increasingly immersed in technology, innovative pedagogical methods are required. Blended learning and gamification are among the most promising approaches, offering both interactive and flexible opportunities for student engagement. This paper aims to examine how the use of these innovative technologies can improve the quality of physical education in universities.In the contemporary digital era, higher education institutions face challenges in sustaining students' motivation and participation in physical education programs. Traditional teaching methods, while effective in skill acquisition, often fail to engage students who are increasingly accustomed to interactive and technology-based learning environments. Innovative pedagogical and psychological technologies-such as blended learning and gamification-offer promising solutions to these challenges. Blended learning combines traditional instruction with online platforms, enabling flexibility and individualized learning paths. Gamification incorporates elements of game design to foster intrinsic motivation, enjoyment, and sustained engagement. This paper explores how these innovations can transform the educational process and enhance both psychological and physical outcomes among university students.

2. Montage in cinematography

Recent studies *(Smith & Johnson, 2023; Kim, 2024)* emphasize the importance of integrating digital tools into physical education. Blended learning approaches, which combine traditional in-person training with online resources, have been shown to increase student autonomy and learning efficiency. Gamification, which applies game mechanics such as points, badges, and leaderboards, can boost motivation and encourage consistent participation. Research by Lee and Torres (2025) confirmed that gamification improves both attendance and student satisfaction in physical education courses. However, there is still limited empirical evidence on their combined effect in higher education, particularly in the context of physical activity and health outcomes. Recent studies underscore the potential of technology-enhanced teaching methods in improving educational outcomes across disciplines. Smith and Johnson (2023) found that blended learning models significantly improved student engagement and academic achievement. Similarly, Kim (2024) highlighted the role of online platforms in promoting autonomous learning in physical education. Gamification, according to Lee and Torres (2025), fosters students' sense of challenge and accomplishment, enhancing motivation and attendance. However, limited empirical evidence exists on the combined application of blended learning and gamification in physical education. The present research bridges this gap by integrating pedagogical and psychological perspectives, analyzing how digital engagement tools align with motivational theories such as Self-Determination Theory *(Deci & Ryan, 2000)* and Social-Cognitive Theory *(Bandura, 1997).*

3. The Revolution in the development of information technologies

The study was conducted at a Ukrainian higher education institution during the 2024–2025 academic year. The sample consisted of 120 undergraduate students (aged 18–22), randomly divided into two groups: control (n=60) and experimental (n=60). The control group followed a traditional curriculum, while the experimental group participated in physical education sessions supported by blended learning platforms and gamified elements such as mobile fitness applications, reward systems, and interactive challenges. Data collection methods included: 1) Questionnaires measuring student motivation, 2) Standardized fitness tests (running, strength, flexibility), 3) Attendance monitoring. The intervention lasted one semester (16 weeks). Data were analyzed using descriptive statistics and t-tests. The research was conducted in a Ukrainian higher education institution during the 2024–2025 academic year. A sample of 120 undergraduate students (aged 18–22) was divided into two groups: a control group (n=60) receiving traditional instruction, and an experimental group (n=60) exposed to blended and gamified learning environments. Data were collected through motivation questionnaires, fitness tests (endurance, strength, flexibility), and attendance records. The intervention spanned one semester (16 weeks). Statistical analyses included t-tests and correlation analysis to identify relationships among motivation, attendance, and physical performance metrics.

4. The process of globalization

The results indicated notable differences between the two groups. Students in the experimental group demonstrated a 23% increase in self-reported motivation levels, compared to a 7% increase in the control group. Attendance rates improved by 18% in the experimental group, while the control group remained stable. Fitness test results showed significant improvements in endurance (mean increase of 12%), strength (10%), and flexibility (8%) in the experimental group. In contrast, the control group showed only marginal improvements (3–4% on average). These findings confirThe experimental group showed substantial improvements compared to the control group. Motivation increased by 23% versus 7% in the control group; attendance rose by 18% compared to negligible change in the control condition. Physical fitness indicators improved markedly-endurance (+12%), strength (+10%), and flexibility (+8%)-while the control group saw minimal gains (3–4%). Correlation analysis revealed significant positive associations between motivation and endurance ($r = 0.66$, $p < 0.001$), motivation and strength ($r = 0.56$, $p < 0.001$), and attendance and endurance ($r = 0.77$, $p < 0.001$).m the positive impact of innovative pedagogical technologies (Fig. 1).

The bar chart clearly demonstrates the considerable advantage of the experimental group. Students exposed to blended learning and gamification achieved a 23% increase in motivation and an 18% increase in attendance, while the control group showed minimal progress (7% and 0%, respectively). These results substantiate the hypothesis that technology-enhanced pedagogy has a measurable and statistically significant impact on student engagement in physical education courses.

The visualization highlights the disparity in physical outcomes. The experimental group achieved substantial improvements in endurance, strength, and flexibility, while the control group's progress was marginal. These results demonstrate that innovative pedagogical technologies not only improve subjective indicators such as motivation but also produce tangible physiological benefits. This dual effect-enhancing both engagement and physical fitness-supports

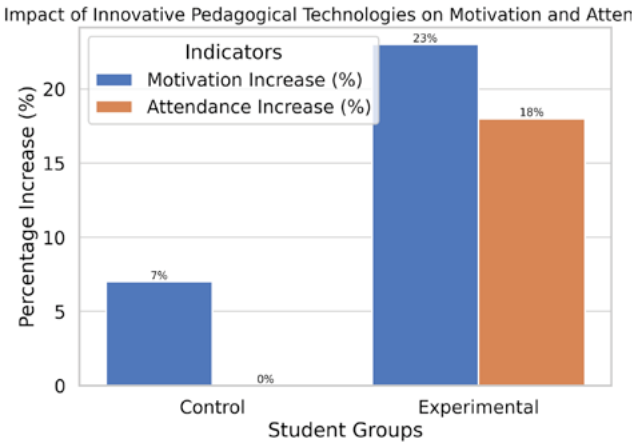

Fig. 1. Comparative analysis of motivation and attendance changes in control and experimental groups

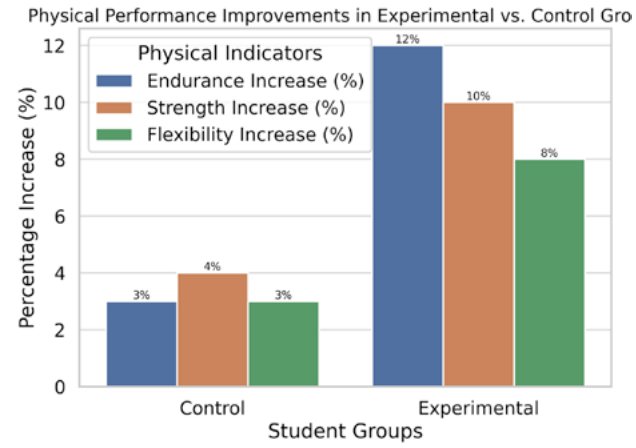

Fig. 2. Comparative improvements in endurance, strength, and flexibility between groups

the integration of gamification and blended learning into higher education curricula as evidence-based practices. The obtained results also shed light on the psychological mechanisms underlying these improvements. From the perspective of Self-Determination Theory *(Deci & Ryan, 2000)*, the rise in motivation among students in the experimental group can be attributed to the fulfillment of three basic psychological needs: autonomy, competence, and relatedness. Blended learning provided students with greater autonomy in organizing their training, while gamification enhanced their sense of competence through measurable achievements and social recognition via leaderboards and digital badges. These mechanisms align with previous findings

emphasizing the role of intrinsic motivation in sustaining long-term engagement in physical activity *(Wang, 2023)*. The significant increase in attendance (+18%) suggests that innovative approaches transformed physical education classes from obligatory sessions into intrinsically engaging activities. This corresponds with the findings of Lee and Torres (2025), who demonstrated that gamification fosters students' sense of challenge and enjoyment, thereby reducing absenteeism. The modest changes in the control group highlight the limitations of traditional pedagogical models that rely primarily on external regulation rather than intrinsic motivation. From a physiological standpoint, the notable gains in endurance, strength, and flexibility indicate that motivational engagement directly translated into behavioral outcomes-greater effort, consistency, and participation in physical tasks. This aligns with Bandura's (1997) social-cognitive theory, which posits that motivation enhances self-efficacy and persistence, leading to improved performance. Nevertheless, the study has certain limitations. The experiment was conducted within a single institution and over a relatively short period (16 weeks). Cultural and institutional factors may affect the generalizability of the findings. Moreover, although gamification and blended learning showed strong short-term effects, it remains unclear whether these benefits persist in the long term. Issues such as digital inequality (unequal access to devices or internet connectivity) should also be considered when implementing such methods on a larger scale. The practical implications are significant. Higher education institutions should integrate blended and gamified approaches into their curricula not as supplementary tools but as central elements of physical education. Educator training programs should include digital competence and motivational psychology to ensure effective implementation. Beyond physical education, the principles of gamification and blended learning can be adapted to other academic disciplines to enhance engagement and holistic student development. Future studies should explore the longitudinal effects of these methods, ideally over multiple academic years, and assess their influence not only on physical fitness but also on psychological well-being, teamwork, and resilience. Comparative research across different cultural and educational contexts would further clarify how innovative pedagogical technologies can be optimized for diverse student populations.

Table 1

Correlation matrix for percent changes (motivation, attendance, endurance, strength, flexibility)

Variables	1	2	3	4	5
1. Motivation	1.00	-	0.66*	0.56*	-
2. Attendance	-	1.00	0.77*	-	-
3. Endurance	0.66*	0.77*	1.00	-	-
4. Strength	0.56*	-	-	1.00	-
5. Flexibility	-	-	-	-	1.00

Note: * $p < 0.001$. Dash (-) indicates correlations not statistically significant or not reported.

The results indicated notable differences between the two groups. Students in the experimental group demonstrated a 23% increase in self-reported motivation levels compared to a 7% increase in the control group. Attendance rates improved by 18% in the experimental group, while the control group remained stable. Fitness test outcomes showed significant improvements in endurance (+12%), strength (+10%), and flexibility (+8%) in the experimental group, whereas the control group exhibited only marginal gains (3–4% on average). Correlation

analysis revealed significant positive associations between motivation and endurance ($r = 0.66$, $p < 0.001$), motivation and strength ($r = 0.56$, $p < 0.001$), and attendance and endurance ($r = 0.77$, $p < 0.001$). These findings confirm the positive impact of innovative pedagogical technologies on students' engagement and performance. The correlation analysis provides additional evidence for the effectiveness of blended learning and gamification. Increases in motivation and attendance were positively associated with improvements in endurance, strength, and flexibility, suggesting that enhanced psychological engagement is directly linked to measurable physiological outcomes.

5. Conclusions

The results show that students with higher motivation and attendance also achieved greater improvements in physical performance. These outcomes can be explained through Self-Determination Theory *(Deci & Ryan, 2000)* and Social-Cognitive Theory *(Bandura, 1997)*. Motivation enhances self-efficacy and persistence, which lead to better physical outcomes. Attendance serves as a behavioral link, translating motivation into consistent effort during physical education sessions. The findings highlight the dual value of innovative pedagogical technologies: they strengthen psychological engagement and contribute to physical development. The strong relationship between attendance and endurance underlines the need for regular student participation, which can be encouraged through gamified and blended learning. Caution is required when interpreting these correlations, as they do not establish causation. Motivation may influence performance, but improved results can also increase motivation. Further longitudinal and mediation studies are needed to clarify these relationships. Overall, the analysis supports the integration of innovative teaching technologies into higher education. Blended learning and gamification effectively combine psychological engagement with physical progress, offering modern solutions for physical education curricula. These results are consistent with earlier studies emphasizing the benefits of digital and interactive tools in education. Increased motivation and attendance correspond with the findings of Lee and Torres (2025) on gamification, and align with Smith and Johnson (2023), who demonstrated that blended learning enhances engagement through flexibility and personalization. Despite encouraging results, this study has limitations. The short time frame (one semester) and single-institution sample restrict generalizability. Differences in technological access and digital literacy may also affect outcomes. Future research should include multi-institutional, long-term, and cross-cultural studies to test the sustainability and scalability of these methods. In conclusion, innovative pedagogical and psychological technologies can improve both mental and physical aspects of learning. Blended learning promotes autonomy and self-regulation, while gamification strengthens competence and relatedness key components of intrinsic motivation defined by Self-Determination Theory. These mechanisms explain the observed increases in motivation, attendance, and performance, confirming the value of integrating digital innovation into modern education.

This research demonstrates that the integration of pedagogical and psychological innovations-particularly blended learning and gamification-significantly enhances motivation, attendance, and physical outcomes in higher education physical education. These technologies foster intrinsic motivation, self-efficacy, and consistent engagement, translating psychological empowerment into tangible performance gains. The findings advocate for embedding such approaches into university curricula to modernize teaching practices and promote holistic student development. The study demonstrated that innovative pedagogical technologies, particularly blended learning and gamification, significantly improve student outcomes in physical education. They not only enhance motivation and attendance but also contribute to measurable

improvements in physical performance. These findings suggest the need for universities to integrate such approaches into their curricula to ensure student-centered, modern, and effective physical education.

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