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Professional training of physical education and sports specialists: current trends, challenges, and innovations

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ABSTRACT. This study explores the professional training of future physical education and sports specialists, focusing on the development of key competencies within Ukrainian higher education programs. It examines the impact of current educational innovations, including the integration of digital technologies and the shift toward distance learning due to the COVID-19 pandemic and ongoing military conflict. The research evaluates the educational programs in specializations 014.11 'Secondary Education (Physical Education)' and 017 'Physical Education and Sports' at Ternopil Volodymyr Hnatiuk National Pedagogical University. Findings highlight the importance of incorporating innovative pedagogical models, such as blended and dual education, to bridge the gap between theoretical knowledge and practical experience. Despite the inclusion of some digital and inclusive education components, the study reveals significant gaps in psychological training, the use of modern technologies like virtual and augmented reality, and soft skills development. The study concludes with recommendations for enhancing curricula to better align with the evolving demands of the labor market and improve the professional competencies of future physical education teachers, coaches, and instructors.

Keywords: digital technologies; blended learning; dual education; key competencies; inclusive education; soft skills; curriculum development; innovative pedagogy.

Formação profissional de especialistas em educação física e esportes: tendências atuais, desafios e inovações

RESUMO. Este estudo explora a formação profissional de futuros especialistas em educação física e esportes, com foco no desenvolvimento de competências-chave nos programas de ensino superior ucranianos. Ele examina o impacto das inovações educacionais atuais, incluindo a integração de tecnologias digitais e a mudança para o ensino à distância devido à pandemia da COVID-19 e ao conflito militar em curso. A pesquisa avalia os programas educacionais nas especializações 014.11 'Ensino Secundário (Educação Física)' e 017 'Educação Física e Esportes' na Universidade Pedagógica Nacional Volodymyr Hnatiuk de Ternopil. As conclusões destacam a importância de incorporar modelos pedagógicos inovadores, como educação mista e dual, para preencher a lacuna entre o conhecimento teórico e a experiência prática. Apesar da inclusão de alguns componentes de educação digital e inclusiva, o estudo revela lacunas significativas no treinamento psicológico, no uso de tecnologias modernas como realidade virtual e aumentada e no desenvolvimento de habilidades sociais. O estudo conclui com recomendações para aprimorar os currículos, a fim de melhor se alinhar às demandas em evolução do mercado de trabalho e melhorar as competências profissionais dos futuros professores, treinadores e instrutores de educação física.

Palavras chave: tecnologias digitais; aprendizagem combinada; educação dual; competências-chave; educação inclusiva; competências sociais; desenvolvimento curricular; pedagogia inovadora.

Formación profesional de especialistas en educación física y deportes: tendencias actuales, retos e innovaciones

RESUMEN. Este estudio analiza la formación profesional de los futuros especialistas en educación física y deportes, centrándose en el desarrollo de competencias clave dentro de los programas de educación superior ucranianos. Examina el impacto de las innovaciones educativas actuales, incluida la integración de las tecnologías digitales y el cambio hacia la educación a distancia debido a la pandemia de COVID-19 y

al conflicto militar en curso. La investigación evalúa los programas educativos de las especializaciones 014.11 'Educación secundaria (educación física)' y 017 'Educación física y deportes' de la Universidad Pedagógica Nacional Volodymyr Hnatiuk de Ternopil. Los resultados destacan la importancia de incorporar modelos pedagógicos innovadores, como la educación mixta y dual, para salvar la brecha entre los conocimientos teóricos y la experiencia práctica. A pesar de la inclusión de algunos componentes de educación digital e inclusiva, el estudio revela importantes lagunas en la formación psicológica, el uso de tecnologías modernas como la realidad virtual y aumentada, y el desarrollo de habilidades sociales. El estudio concluye con recomendaciones para mejorar los planes de estudio con el fin de adaptarlos mejor a las demandas cambiantes del mercado laboral y mejorar las competencias profesionales de los futuros profesores de educación física, entrenadores e instructores.

Palavras clave: tecnologías digitales; aprendizaje mixto; educación dual; competencias clave; educación inclusiva; habilidades sociales; desarrollo curricular; pedagogía innovadora.

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Introduction

As the education sector provides the labour market with professionals who meet employer objectives, the professionalism of future graduates in pedagogical specialisations is a societal goal. The New Ukrainian School (NUS) standards promote the development of lifelong learning skills, since this capability enables an individual to adapt successfully within society. The labour market is changing, and scholars predict that numerous jobs will either disappear completely or undergo significant alteration in the future decades. Therefore, specialists graduating in 2024 must take these alterations into account.

The COVID-19 pandemic and the 2022 invasion of Ukraine significantly affected the educational process. This has resulted in the proliferation of remote work across numerous professions, hence elevating the significance of practical abilities over theoretical knowledge. The optimal method to integrate academic and practical knowledge is via dual education. As of 2023, the Analytical Report on the outcomes of the fourth year of the pilot project in higher education institutions for the training of specialists in dual education indicates that only four individuals were enrolled in this modality, specifically in the fields of 014.11 'Secondary Education (Physical Education)' and 017 'Physical Education and Sports'. The dual system of education is the most optimal form due to distance learning. This educational paradigm is at the first stages of implementation in Ukrainian education, despite all participants affirming its efficacy.

Kotendzhi et al. (2023) examined the modernisation of the educational process for educating teachers in physical culture and sports. The focus is specifically on professional competence and its development and enhancement, as well as the incorporation of novel forms and methods in the educational process. An analysis of the professional standards of university graduates in the sports field is conducted. Naumchuk et al. (2024) examine the quality and efficacy of professional education for prospective graduates of physical education faculties. It is asserted that educational programs for training physical education specialists must be revised to align with contemporary trends in sports and sports services, particularly those within the fitness business.

In turn, O'Brien et al. (2020) examined the ramifications of remote learning for physical education instructors during the pandemic, focussing on the experiences of five European higher education institutions from various nations, including England, Greece, Ireland, Portugal, and Finland. The researchers concluded that enhancing the quality of education and the effective training of physical education instructors requires the adaptation of educational programs and an increase in the duration allocated for the practical application of theoretical abilities. Lazorenko (2021) examined the use of digital competence skills among graduates of physical education faculties and coaches. The significance of establishing digital culture and information competency skills was validated, their primary components were delineated, and methodological strategies for cultivating digital literacy were revised.

Ukrainian higher education is progressively assimilating into the European education framework, resulting in alterations to educational paradigms. Topuzov et al. (2021) examined the standard of university education in Ukraine relative to that of Latvia. Distance education has profoundly impacted the educational process and resulted in modifications to the educational programs of both nations. Su et al. (2022) examined the elements influencing self-esteem. This study highlighted the significance of self-determination in the professional activities of physical education graduates, as well as its influence on teaching and body image. White et al.

(2021) examined the impact of motivation on students' learning and professional activities. The impetus to learn is contingent upon accurate self-evaluation of one's activities and outcomes. The dimensions of integrating technology and innovative advancements, academic autonomy, and student-centred approaches in the education of the aforementioned professionals are inadequately explored.

The study seeks to identify the characteristics of professional training for physical education teachers, instructors, and coaches. Subsequently, the subsequent tasks were delineated: to evaluate the educational curricula for specialisations 014.11 and 017; to assess the efficacy of professional development for educational candidates; to investigate the implementation of innovative pedagogical methods and models in the realm of sports, as well as the utilisation of interactive technologies and their influence on the quality of professional performance among graduates of physical education faculties.

Materials and methods

This study focused on the analysis of the Educational and Professional Programmes ‘Physical Culture and Sports’ and ‘Secondary Education (Physical Education)’ at Ternopil Volodymyr Hnatiuk National Pedagogical University (2024). The research aimed to evaluate the development of key competencies in future graduates, preparing them for the professional demands of the labor market and societal changes. To collect data, several methods were employed.

First, an in-depth review of the educational programmes for specialisations 014.11 ‘Secondary Education (Physical Education)’ and 017 ‘Physical Education and Sports’ was conducted using publicly available curriculum documents from Ternopil Volodymyr Hnatiuk National Pedagogical University (2024). This review assessed the alignment of the educational programmes with the New Ukrainian School (NUS) standards and examined how well the curricula integrated practical competencies. It focused on evaluating the ratio of theoretical to practical training, including educational practice, training sessions, summer schools, and competitions, and also assessed the extent of dual education implementation within the Faculty of Physical Education.

Additionally, the study utilised statistical data from the Ministry of Education and Science of Ukraine (2023) and the National Health Service of Ukraine (Over the past two, 2024). These data helped to examine the inclusion of students with special educational needs (SEN) in the educational programmes, and whether the educational system accommodates the mental and physical development needs of these students. This information was further compared with official reports on inclusive education, which highlighted the strategies employed to cater to SEN students. Data from the National Health Service (2024) were also used to understand the psychological aspects of training future physical education specialists, particularly focusing on the incorporation of stress management techniques and resilience-building practices within the curriculum.

A further aspect of the study involved an examination of the psychological training embedded in the curricula for physical education professionals. Specifically, the study focused on the integration of resilience, stress management, and mental health issues like PTSD. It also evaluated the alignment of the curricula with the requirements set out in the ‘Strategy for the Development of Higher Education in Ukraine for 2022-2032’ (Order..., 2022), assessing whether the educational programs sufficiently addressed the need for psychological training for future educators. Qualitative data were also collected through interviews and surveys with students, faculty members, and stakeholders in the local educational and sports systems. These qualitative insights were analyzed using NVivo 14 and Atlas.ti 23 software. The analysis of these data helped identify recurring patterns and key issues within the curriculum, such as gaps in digital competencies and the integration of modern technologies like virtual and augmented reality in the teaching process.

The implementation of dual education systems in Ukrainian higher education institutions was another focus of this study. Data from the 2023 Analytical Report on the outcomes of the pilot project in dual education were reviewed to assess the extent to which dual education is being integrated into the curriculum. Additional interviews with academic staff from institutions offering dual education in physical education and sports, such as Zaporizhzhia Polytechnic University and Hlukhiv National Pedagogical University, were conducted. These insights were used to compare the efficacy of dual education versus traditional educational models in preparing students for the professional demands of the labor market. The study also examined the integration of digital competencies within the educational programmes. This included an assessment of the use of technologies such as fitness trackers, virtual health programs, and software used for diagnosing physical conditions. The resources available to students in terms of hardware and software for practical training were also evaluated to determine how well they are equipped for real-world professional scenarios.

Finally, the study included a review of relevant regulatory documents, such as the Law of Ukraine No. 1556-VII on Higher Education' (2014) and the 'Strategy for the Development of Higher Education in Ukraine for 2022-2032' (Order..., 2022), to evaluate how well the educational programmes align with national educational goals. The review was supplemented with a comparison to international best practices in physical education to provide a broader context for evaluating the local educational framework. The data collected through these various methods were systematically analyzed to identify trends, gaps, and areas for improvement in the current educational practices. This approach ensured a comprehensive evaluation of the curricula, pedagogical approaches, and technological integration in the training of future physical education specialists.

Results

The Strategy for the Development of Higher Education in Ukraine for 2022-2032 identifies the primary issue of higher education in Ukraine as its inefficiency (Order..., 2022). The study highlighted that a substantial disparity between the employment market and the training of specialists in higher education institutions results in a pronounced mismatch in supply and demand. The training of physical education experts is characterised by the direct correlation between prospective teachers' activities and the life and health of students. Consequently, the practical aspect of training should be seen as equally significant as the theoretical component. Dual education offers 60-70% practical on-the-job training; however, the Analytical Report (2023) on the outcomes of the fourth year of the pilot project in higher education institutions for training specialists in the dual education format indicates that only 24 higher education institutions offer this opportunity in the specialities 014.11 and 017.

Included are the National University 'Zaporizhzhia Polytechnic' and the Hlukhiv National Pedagogical University of Oleksandr Dovzhenko. As of 2023, merely four individuals were enrolled in the dual education system at the aforementioned universities. The dual education model offers an ideal integration of theoretical knowledge and practical experience, enabling students to develop skills in a workplace setting, while employers benefit from reduced recruitment costs and get a specialist already acquainted with the unique requirements and working conditions. The examination of the curriculum for the 014.11 and 017 specialisations has revealed that they do not offer the same allocation of theoretical and practical training as seen in the dual format; when such training is available, it is typically at the student's request, and in certain instances, at the employers' request.

The research indicates that a survey of students and employers regarding the efficacy of dual education identified a primary cause of its inefficiency as the incongruence between educational programs and the requirements and circumstances of production. The knowledge imparted to pupils is disconnected from reality and does not align with the working conditions of their future employment. Consequently, it can be asserted that the majority of employers want to ensure that educational programs are optimally tailored to the working conditions of employees at the production site, taking into account all technologies and methods employed by the firm. Regarding specialisations 014.11 and 017, which prepare teachers, coaches, and instructors, a dual style of education would be most beneficial; nevertheless, the educational programs do not prioritise practical knowledge over theoretical knowledge.

The research revealed that the population of children with special educational needs (SEN) has nearly doubled in the last four years; however, educational programs allocate only a minimal number of credits for the courses 'Adaptive Sports' and 'Inclusive Education and Physical Education in Special Medical Groups' (Ministry of Education and Science of Ukraine, 2023; Over..., 2024).

The evaluation of educational programs has concluded that the integration of modern technology into the educational process is inadequate. Innovative technologies encompass augmented reality (AR), virtual reality (VR), soft skills enhancement, and digital health (Vinnichuk, 2025). The disparity between curricula and contemporary working situations diminishes the efficiency and quality of expert training.

The training of physical education and sports professionals is distinctive, as it incorporates not only classroom instruction but also the active utilisation of sports facilities and complexes (Ahmeti & Stankovska, 2023; Kalenlchuk et al., 2023). As per the Report on Physical Culture and Sports of Ukraine for 2023, as of 1 January 2024, the nation possesses various categories of sports facilities (encompassing state and municipal property), including complex facilities such as stadiums, arenas, tennis courts, football fields, gyms, swimming pools, shooting ranges, stands, cycling tracks, artificial ice venues, archery and biathlon ranges, ski resorts, equestrian facilities, and rowing canals, among others.

The example utilised is Ternopil Volodymyr Hnatiuk National Pedagogical University. The execution of the educational curriculum at this institution for specialities 014.11 and 017 encompasses training in specialised sports facilities, which comprise game halls, gymnasiums, music rhythm and wrestling classrooms, an athletics arena with tracks, and a stadium featuring a football pitch, running tracks, throwing and jumping sectors, as well as physical therapy and massage rooms. Moreover, students of the university consistently engage in contests at regional, national, and European levels, as well as in cross-country athletics, sports days, relay races, and various sports events, thereby enhancing their skill levels. The curriculum encompasses summer and winter camps as well as pedagogical techniques. This enables students to enhance their knowledge and skills through practical application. The educational institution collaborates with children's and youth sports schools and programs, enabling pupils to engage in practice.

The study's findings indicated that the educational curriculum at Ternopil Volodymyr Hnatiuk National Pedagogical University for the specialism 014.11 includes the educational component 'Inclusive Education and Physical Education in Special Medical Groups', which is worth 6 credits. The educational program in speciality 017 encompasses the study of the component 'Theory and Methods of Adaptive Sports' for 3 credits, while the same speciality (017) at Sumy State Pedagogical University named after A.S. Makarenko contains 'Adaptive Sports' for 4 credits. The enrolment of students in inclusive classes within regular secondary education has nearly doubled in recent years (Ministry of Education and Science of Ukraine, 2023), increasing from 18,643 in the 2019-2020 academic year to 40,354 in 2023-2024.

Consequently, a discrepancy exists between the curricula of higher education institutions and the requirements of professionals in secondary education institutions. Children with Special Educational Needs want heightened attention, particularly for their physical well-being (Järvis et al., 2022). The New Ukrainian School (NUS) program mandates the complete integration of children with special educational needs (SEN) into the educational framework, emphasising full inclusion and adaptation within general education and preschool institutions, rather than individual education, inclusive resource centres, or separate educational facilities. Consequently, one could contend that there is a necessity for physical education professionals to assist these pupils, who are currently under-represented in educational institutions. The majority of educators are required to instruct in inclusive classrooms. Consequently, physical education instructors must personalise curriculum and develop a distinct educational pathway that enhances the socialisation of these youngsters.

The Strategy for the Development of Higher Education in Ukraine for 2022-2032 highlights the same issue, asserting that the student-centered approach is flawed and inconsistent in implementation (Order..., 2022). This addresses the deficiency of possibilities for students to select and construct their educational pathways, including the choice of certain subjects or educational components. The educational programs in specialisations 014.11 and 017 at Ternopil Volodymyr Hnatiuk National Pedagogical University incorporate elective components constituting 1:4 of the total program volume, in accordance with the regulations outlined in the Law of Ukraine No. 1556-VII 'On Higher Education' (2014). The education industry is among the first to react to societal and technological transformations. Global digitisation encompasses all aspects of society. In education, they are becoming increasingly significant, as they are intended to integrate modern technology for the effective adaption of prospective graduates across various institutional levels.

This study's results indicate that the modernisation of educational material in Ukrainian higher education institutions is progressing at a sluggish pace. The implementation of digital tools in the professional practices of prospective graduates from physical education faculties was exclusively initiated at Sumy State Pedagogical University named after A. S. Makarenko and Ivan Franko National University of Lviv through the author's model (Semenikhina et al., 2022). In light of societal demands, essential competencies for coaches and physical education instructors include the proficiency in utilising hardware and software to evaluate an individual's physical state, hence enabling the formulation of recommendations or the development of a personalised sports activity trajectory. These gadgets encompass fitness bracelets, diverse trackers, controllers, heart rate monitors, and numerous programs such as Runkeeper, Freeletics, FitOn, and Glo. The extensive proliferation of fitness programs, including mobile applications, pilates, and yoga, has not yet been incorporated into the curricula of higher education institutions that prepare physical education teachers and coaches. Health-saving technologies are being integrated into the NUS; however, emphasis must be placed on the higher education system, where future specialists should obtain the requisite knowledge and abilities for subsequent application in preschool, secondary, or vocational educational institutions.

Digital health, or 'digital health', had significant development in the last century; nonetheless, as of 2024, this notion is not encompassed under the laws of Ukrainian legislation (Ronquillo et al., 2023). Higher Education Institutions (HEIs) employ digital and interactive technologies, notably incorporating 'Digital Technologies and Metrological Control in Professional Activity' as a requisite element in all first-level higher education curricula. Additionally, 'Digital Technologies in Education and Science: Training Course' and 'Workshop on Digital Technologies' are featured in the second (Master's) level educational programs at Ternopil Volodymyr Hnatiuk National Pedagogical University.

The education sector, particularly higher education institutions, need to lead social transformation; nevertheless, the use of innovative technology is not as prevalent as in other nations. Augmented reality (AR) and virtual reality (VR) can substantially enhance the training of physical education and sports educators. Digital technologies are profoundly transforming the educational model and broadening the avenues for creativity (Dahan & Keller, 2025). The application of augmented reality in lectures and practical sessions can establish a fundamentally novel method of interaction between students and information. This enables pupils to engage in a gaming environment or participate in a simulation.

In contrast to augmented reality, virtual reality enables immersion in a digitally constructed environment, allowing interaction with various gyms or venues within a secure and easily regulated setting (Cattolico et al., 2025; Georgiev et al., 2025). The most renowned and efficient platforms for developing AR applications include Vuforia, ARToolKit, Kudan, Catchoom, Augment, HP Reveal, WikiTude, LayAR, Blippar, AEON Reality, InfinityAR, and others. They possess an extensive array of tools for generating AR objects in both 2-D and 3-D formats, enabling the integration of audio, video files, and text elements, while effectively storing the outcome in the cloud. Furthermore, one can utilise software libraries, employ a mobile camera, generate animations of items and 3-D models, and monitor the location and movement of things, among other capabilities. Consequently, the learning process is no longer confined to the classroom and can occur both directly on the sports pitch and in any suitable location.

This study indicates that in Ukrainian higher education institutions, notably regarding specialities 014.11 and 017, such methods are employed only sporadically. This is attributable to various objective factors: an obsolete material and technical infrastructure, insufficient technological devices for both students and educators, issues with content accessibility, and a failure to adapt curricula to developments, among others. The advantages of utilising these realities are substantial: broadening the scope of scientific inquiry, developing and evaluating experimental models and programs, integrating components of education, instruction, and play, enhancing interactivity, ensuring accessibility (usable with merely a smartphone equipped with an application), and advancing technological proficiency.

This study indicates that the challenge in employing virtual and augmented reality in the training of physical education and sports specialists is the absence of a cohesive technological framework, as these innovations are advancing so swiftly that the pedagogical community struggles to understand and incorporate them into the educational system. An examination of the curriculum for specialisations 014.11 and 017 revealed that 6 credits are allocated for the study of foundational psychology ('Psychology' and 'Psychology of Sport', respectively). Scientists emphasise the necessity of adapting curriculum, educational programs, and instructional methodologies to the conditions under martial law. This pertains to stress resilience, addressing the manifestations of post-traumatic stress disorder (PTSD) that may affect all those involved in the educational process, as well as anxiety and mental health illnesses. The incidence of patients diagnosed with PTSD nearly doubled between 2021 and 2023, and as of March 6, 2024, the patient count approached the total for the entirety of 2021 (Figure 1).

Owing to the COVID-19 pandemic and martial law, the majority of educational institutions have transitioned to distance learning, with some adopting blended learning methodologies. Consequently, the educational process has transitioned to a more digital format, accompanied by heightened psychological stress attributable to frequent air raids, power and internet disruptions, and the forced movement of students to different cities or countries. Consequently, these factors must be incorporated into the instructional program. The field of 'Sport Psychology' examines the conditions necessary for the secure physical development of students during training and competitions, considering the mental strain experienced by coaches and physical education instructors due to factors such as noise, the simultaneous presence of multiple age groups in training sessions, and the responsibility for the safety and well-being of students.

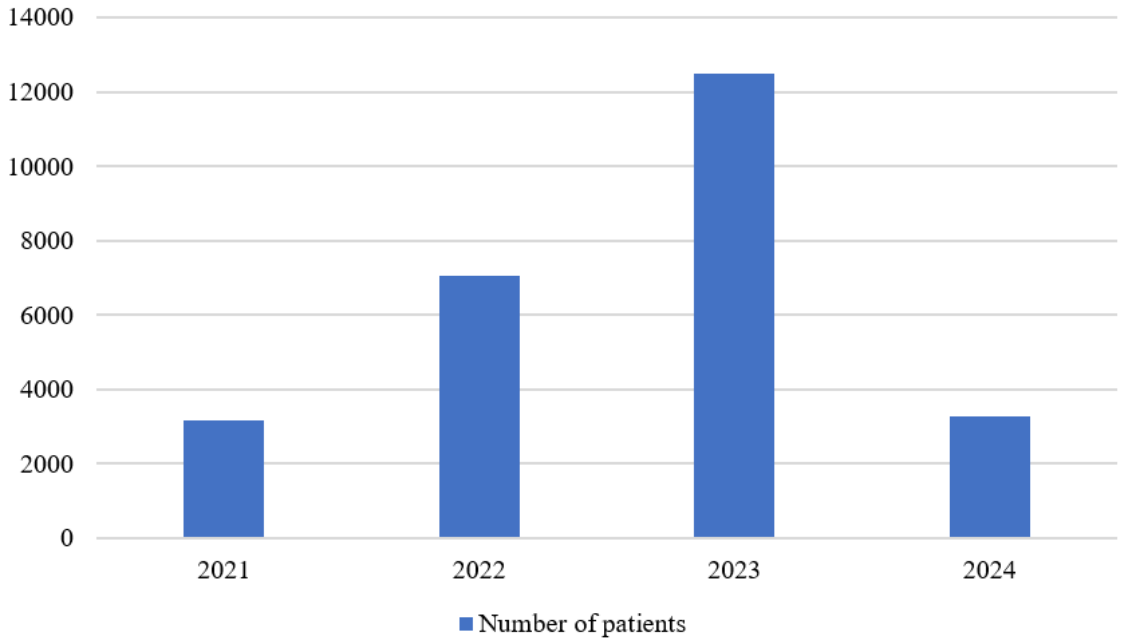

Figure 1. Growth dynamics of patients with PTSD in 2021-2023.
Source: National Health Service of Ukraine (Over..., 2024).

Additionally, the impacts of war operations and their aftermath in Ukraine contribute to these factors. Consequently, educators and trainers must possess the resources to mitigate the aforementioned stressors to function efficiently. To effectively cultivate the psychological support and mental health competencies of future physical education specialists, it is essential to establish suitable psychological and pedagogical conditions that encompass both theoretical and practical knowledge and skills, active engagement in diverse sports and recreational activities, and consideration of the individual psychological traits of students, among other factors.

This study indicates that the education of prospective physical education and sports professionals lacks the development of resilience, defined as the capacity to sustain a healthy mental and physical state following adverse events such as war, disasters, pandemics, and natural calamities. Given that educators and trainers operate in a 'person-to-person' context, it is prudent to cultivate and enhance resilience, which comprises the essential elements of optimism, adaptability, perseverance, and hope. This will assist professionals in alleviating stress and its repercussions, managing their own life and the safety of students, fostering a secure educational environment, and enabling both themselves and students to navigate unpleasant emotions.

The study investigated the presence of mentoring as a professional competency in educational programs related to specialisations 014.11 and 017, which focus on the training of teachers, instructors, and trainers. The Draft 'Concept of Education Development for 2015-2025' (CONCEPT, 2022) indicates that the primary method adopted by contemporary education is competence-based. The evolution of educational material and the transformation of societal values, particularly in the context of Industry 4.0, demand specialists possessing advanced social and psychological capabilities. These encompass the capacity to traverse the information landscape, engage in lifelong learning, pursue self-enhancement, grasp cutting-edge technology, and exhibit attributes like as agility, initiative, creativity, and dynamism. A mentor employs several tactics, including counselling, training, and coaching.

These aspects are essential because a physical education teacher must possess not only general competencies in delivering lessons, training, or competitions but also the ability to design individualised or group lessons tailored to age, psychological, and physical characteristics, as well as proficiency in utilising digital technologies in professional practice to restore, maintain, or modify an individual's physical condition. The examination of the educational programs for specialities 014.11 and 017 revealed that the training of specialists in these fields partially incorporates information technology, specifically specialised software and digital mobile technologies (such as tracker applications, pedometers, and virtual reality). This impacts the educational outcomes of training experts, resulting in a disparity between societal demand for teachers and teacher trainers possessing specific traits and skills and the capacity of higher education institutions to produce such specialists. The findings of this study indicate that educational and professional programs inadequately fulfil the requirements of employers.

The National Institute for Strategic Studies reported that the unemployment rate among youngsters in 2023 was the lowest compared to 2021 (Figure 2). Nevertheless, among 112.3 thousand individuals, the proportion of unemployed young (under 35 years of age) was considerable, at 22% of the total. Among them, 1,800 individuals are university graduates who remain unemployed. This indicates that the employment and education sectors must be aligned.

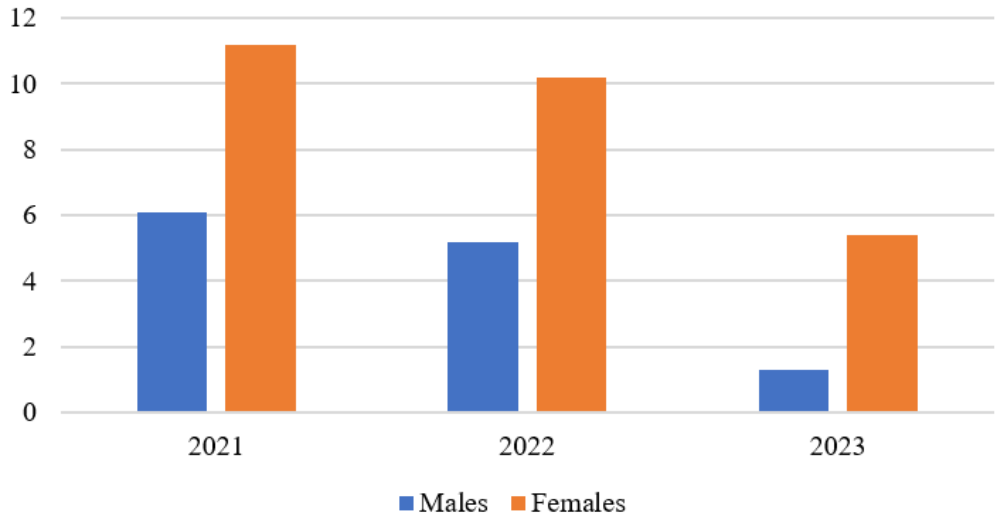

Figure 2. The number of unemployed people aged 15-24 in 2021-2023.
Source: National Institute for Strategic Studies (2023), State Employment Center (There are 112,300 officially unemployed..., 2023).

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Contemporary trends in education and the sports sector significantly influence human resources and societal expectations for these professionals. Technological advancements (Industry 4.0) are progressively broadening the spectrum of physical skills and activities: online training (individual and collective), fitness platforms, and social media groups have experienced substantial growth in recent years (Bashtannyk et al., 2020; Joseph & Aviv, 2025). This illustrates the significant interest of consumers in trainers, teachers, and similar professionals. The study results indicated that educational programs for training such professionals rely on conventional approaches that do not permit students to select particular facets of their instruction (proportion of the optional component in the educational program). The Bachelor's degree offers general theoretical and practical understanding about the organisation of training or contests, whereas the Master's degree encompasses more specialist expertise. In the educational course 014 of the second (Master's) level of higher education, practical training constitutes 33.3% of the total credits in the European Credit Transfer and Accumulation System. Simultaneously, pedagogical practice fails to furnish pupils with the requisite experience to adequately prepare for professional endeavours. Internships or dual education could substantially enhance this situation.

Students' actions in the digital realm encompass not only the acquisition of professional abilities but also the adaptation to contemporary reality. As previously stated, the majority of educational institutions have transitioned to distant and/or blended learning formats. The Strategy for the Development of Higher Education in Ukraine for 2022-2032 permits students to select their preferred educational model, including individual and distant learning options (Order..., 2022). Graduates of physical education faculties must possess the competencies to operate in a remote format, including proficiency in educational platforms (Moodle, Padlet, NZ, etc.), interactive technologies conducive to distance learning (Learning, Kahoot, Canva, Google Space for Education, etc.), and electronic textbooks. The curricula for specialities 014.11 and 017 at Ternopil Volodymyr Hnatiuk National Pedagogical University include the courses 'Digital Technologies and Metrological Control in Professional Activity' and 'Information and Technical Teaching Tools', totalling 10 credits. To ensure the effective training of specialists, it is recommended to implement blended learning

models, such as the 'Flex Model', 'Online Driver Model', 'Face-to-Face Driver', and 'Rotation Model, which will enable students to cultivate and enhance their proficiency in digital technologies. This study demonstrates that physical education teacher training programs encompass full-time educational formats, including lectures, seminars, practical classes, laboratory sessions, and practical training. Blended learning integrates conventional educational methods with distance learning technologies (Pavliuchenko, 2023). This form of learning is more focused on individual personality and offers greater academic flexibility for pupils. From 2021 to 2023, the educational process at Ternopil Volodymyr Hnatiuk National Pedagogical University occurred in full-time, distance, and blended learning formats.

Current trends in educational development necessitate that specialists remain competitive, swiftly adjust to changes in professional practices, and acquire novel technology (Tyshchenko et al., 2019; Brovina & Sallaku, 2025). This can be accomplished through the combination of academic disciplines and knowledge from many scientific sectors. The execution of the NUS Concept encompasses interdisciplinary integration, the application of information from associated fields, and the establishment of an extensive network of interdisciplinary connections to create a holistic framework of ideas about the world and enhance systemic thinking abilities. The examination of the educational curricula for specialities 014.11 and 017 reveals the presence of two disciplines: 'Biochemistry' and 'Biomechanics', both worth 3 credits.

The transformation of the labour market due to technological advancement has resulted in the emergence of soft skills, including interpersonal communication, conflict resolution, creativity, leadership, critical thinking, and teamwork. These talents facilitate rapid adaptation to societal norms, integration into teams, and effective collaboration and cooperation. The findings of this study indicated that physical education teacher training programs encompass disciplines that cultivate hard skills, specifically those associated with practical work and foundational knowledge. In contrast to soft skills, they are highly specialised and delineate the general competencies of professionals. This study indicates that future physical education and sports specialists are educated through conventional methods and curricula that also emphasise the development of soft skills.

The incorporation of these competencies into educational curricula constitutes a facet of the modernisation of educational content, executed through the integration of specific educational elements (conflict resolution, collaboration, leadership development), the organisation of training sessions, workshops, and seminars (in-person or hybrid) for experience sharing, and the application of interactive and innovative pedagogical techniques (project-based activities, gamification, role-playing, etc.). The distinctiveness of training for physical education and sports specialists lies in the continuity of education, encompassing advanced training courses, self-directed learning, and both non-formal and informal education. This framework enables graduates to enhance their professional competencies and to implement and cultivate innovative teaching methods and forms in their practice.

Discussion

The research indicates that the education and training of physical education teachers, coaches, and instructors possess unique characteristics, focussing on the cultivation and enhancement of abilities intended to assist stakeholders in preserving social, physical, and mental well-being. Their activities encompass the development of group or individual wellness programs tailored to the needs and capabilities of each person, the utilisation and implementation of modern digital technologies for physical condition restoration, partial diagnosis, or maintenance, and the construction of individualised educational trajectories, among other functions.

The study's results exhibit partial or complete correlation with the research of other authors. The findings of this study align with those of Backman and Barker (2020), who underscored the necessity to reevaluate the content of pedagogical expertise in physical education teacher training. Australia's experience demonstrates that teaching future specialists is more effective when grounded in empirically acquired knowledge. The crux of the matter is that, in light of societal changes, the notion of education must be redefined, as the scope of physical activity has expanded, necessitating the adaptation of educational programs for physical education instructors. Diverse pedagogical tactics and models ought to be employed, and their adaptable integration will enhance the efficacy of the educational process. British scientists Casey and Kirk (2020) underscore the obsolescence of old teaching approaches and the necessity of replacing them with more contemporary models. Included are learning models and curricula, each comprising distinct social, cognitive, and psychomotor competencies aimed at providing a superior alternative to conventional learning methods.

The analysis of the educational programs in this study revealed that the programs for specialisations 014.11 and 017 do not encompass the notion of digital health. Global digitalisation and technologisation necessitate fundamentally new outcomes in the professional development of educators and trainers. Chatterjee et al. (2021) also underscore this in their essay regarding the digital influence on human life and health. The research underscores the capacity of digital technology to enhance, sustain, and assist an individual's physical well-being. This subject is also examined by Ronquillo et al. (2023). The researchers underscore the significance of digital health, particularly the utilisation of mobile devices to monitor and modify physical activity.

This study concentrated on employing novel technology to enhance training outcomes. These encompass the gamification of the educational process, hybrid educational games, among others. The findings about the significance of employing such technology align with those of other studies. The study by Barba-Martín et al. (2020) also addresses this topic, highlighting the utilisation of educational games as a means to cultivate technical skills, enhance decision-making in various contexts, and promote physical activity. Moreover, instructional games cultivate and enhance soft skills such as teamwork, initiative, and critical thinking. Gil-Arias et al. (2020) also examined hybrid instructional games. The implementation of hybrid games markedly enhances the competency development of educators and elevates student accomplishment, hence influencing their motivation.

This study's review of educational programs revealed the absence of a cooperative learning mechanism analogous to hybrid games. Nevertheless, its efficacy is considerably elevated. Bores-García et al. (2021) also underscore this point. The study's findings indicated that cooperative learning can be implemented at various educational stages, as it fosters teamwork, guides the direction and intensity of physical activity, and influences motivation and self-assessment of performance.

of response to the increase of children with special educational needs, the curricula of preschool and secondary educational institutions have been modified. This has also impacted the educational programs of higher education institutions. One academic profession focusses on the nuances of functioning within an inclusive setting, necessitating that curricula and calendar planning be developed with the individual features of each kid in mind. Demchenko et al. (2021) and Lieberman et al. (2024) also addressed this topic. The researchers assert that the technique of operating within an inclusive environment diverges from conventional teaching models, as it inherently incorporates a personalised development program derived from the findings of an inclusive resource centre.

The modernisation of society invariably necessitates alterations in schooling. The demands of online education due to the COVID-19 pandemic and military conflicts in several regions of Ukraine have markedly expedited the implementation and advancement of information and interactive technologies in the educational framework (Marino-Jiménez et al., 2024). This encompasses the utilisation of virtual reality and augmented reality in the educational process. A diverse array of applications, including mobile platforms, for virtual reality technology enhances the efficacy of learning, rendering it more interactive, practical, visual, and contemporary. This subject was examined by Liu et al. (2022), Putranto et al. (2023), and Tarangul and Romaniuk (2022). They underscore the efficacy of employing VR and AR in the teaching of physical education instructors and coaches.

These technologies aim to enhance the methodological resources available to educators for a more efficient teaching process. The training environment, primarily characterised by distant learning, facilitates the utilisation of computer-simulated scenarios to augment professional development. Virtual sports facilities and training sessions closely replicate real environments, enabling students to safely cultivate their skills. Khmil et al. (2023) examined VR and AR in Ukrainian education, highlighting the potential applications of these technologies in the educational process and analysing the primary stages of implementation, along with the advantages and disadvantages of VR and AR in education. The findings of this study align with those of the aforementioned scientists.

Chiva-Bartoll et al. (2020), García-Rico et al. (2021), and Pérez-Ordás et al. (2021) elucidated the characteristics of service learning: it encompasses a collection of professional and personal competencies developed in prospective physical education instructors in response to societal requirements. Consistent with the findings of this study, the research underscores the fundamental nature of the strategy, which entails the integration of theoretical and practical knowledge (with a pronounced emphasis on practical application) and the cultivation of social, professional, and soft skills. They demonstrate the beneficial outcomes of integrating service learning for physical education teachers, instructors, and coaches.

The psychological dimension is very pertinent in the education of prospective graduates from physical education faculties (Stankovska et al., 2013; Smolinska et al., 2024). The emotional and psychological well-being of students is as crucial as their physical health due to several variables. The ramifications of stress, PTSD, and special educational requirements need the training of physical education instructors in this domain. This is further underscored by the works of Karasievych et al. (2021), Demus (2021), and Sogokon and Kirilenko (2024). The socio-psychological competency of physical education teachers and coaches is equally significant as their teaching skills, since a harmonious development of the individual necessitates a balance of physical, social, mental, and psychological dimensions. The findings of this study indicate that the psychological aspect of the educational program should be more comprehensive, taking into account at-risk student populations.

Experts in physical culture and sports are members of the educational community, necessitating ongoing education. This encompasses sophisticated training programs and coaching. Educational trends evolve annually, and the array of innovative and interactive technologies is broadening; therefore, educators across all disciplines, particularly in physical education due to its connection to student health, must continually enhance their knowledge and skills and acquire proficiency in new technologies. The findings of this study indicate that the educational programs for specialisations 014.11 and 017 are intended for advanced training (Bachelor's and Master's degrees). Griffiths et al. (2022) and Stone et al. (2021) underscore the significance of in-service training and coaching for the professional growth of physical education instructors. Ward and Mars (2020) examined this subject, addressing the lifelong duration of professional development and highlighting the significance of continual evolution in the professional practices of physical education instructors. The study underscores the necessity for professional development and self-enhancement of prospective educators, concentrating on the integration of several contemporary technologies into the educational process.

Conclusion

The professional endeavours of physical education teachers, coaches, and instructors necessitate comprehensive training across multiple domains, ranging from digital literacy to the cultivation of resilience abilities. The efficacy of current educational programs influences the development of competences in future professionals; therefore, they must encompass essential elements that ascertain the quality of the final outcome - the graduate's professional level and skill set. The evaluation of the educational programs at the Faculty of Physical Education of Ternopil Volodymyr Hnatiuk National Pedagogical University underscored the significance of integrating dual education models, innovative technologies, and contemporary educational practices and methodologies, as well as revising the content of educational programs and their methodological frameworks. Key focus areas for advancing higher education should encompass enhancing the employability of future graduates, augmenting the professional competences of specialists, and elevating the standards of academic freedom and integrity, among others.

The research concluded that society requires highly skilled professionals in physical culture and sports, owing to the rise in physical activity, the swift expansion of diverse sports trends (such as the fitness industry, yoga, Pilates, etc.), and the advancement of digital and mobile technologies designed for diagnosing, monitoring, and enhancing individual physical condition. Consequently, educational programs and the educational process must be enhanced and tailored to the reality of Ukrainian education. This specifically encompasses the establishment of an inclusive educational environment, the modification of educational institutions and curricula for students with special needs, the facilitation of national and international mobility for higher education students (including studies at foreign institutions), assistance for vulnerable student demographics (such as internally displaced individuals or those from temporarily occupied regions), and the incorporation of research findings into educational curricula and models, among other initiatives. A crucial aspect requiring enhancement is the assurance of employment for graduates, particularly those educated through state funding, with the implementation of an interdisciplinary approach and integrated curriculum to cultivate essential professional and general competencies in specialists.

The integration of Ukrainian higher education into the European system necessitates a review and reform of the methodological and material support for the educational process, including best practices from other countries. Moreover, continuous monitoring of educational quality, an updated regulatory framework, and governmental financial and legal assistance are essential to ensure the efficacy of professional training for physical education and sports practitioners. Integrating social projects, communication campaigns, and social

initiatives into the educational process is as crucial as guaranteeing a high standard of ongoing professional development (advanced training courses).

The study was partially constrained by the absence of certain data due to wars and the compelled migration of pupils and educators. Future research opportunities may include the creation of pedagogical and methodological resources for physical education faculties, as well as the integration of modern technologies into the teaching process.

Data availability

Not applicable

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