ORIGINAL ARTICLES. PHYSICAL EDUCATIO)N

Use of the moodle information and educational environment in the distance learning system for forming the physiological literacy of future coaches

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Abstract

Background and purpose

The correct choice of the information and educational environment base for teaching natural science subjects in distance learning conditions is an important issue for higher education institutions, especially for students of the Faculty of Physical Education and Sports, whose health and life depend on physiological literacy, and those who are actively involved in sports. The purpose of the study is to analyse the effectiveness of using the Moodle system in blended and distance learning for teaching physiological subjects and its impact on the success, quality of knowledge and professional competence of students, future physical education specialists.

Material and methods

The methodology used in the article includes theoretical and empirical research: observation, measurement, comparison, description, survey and communication with Faculty of Physical Education and Sports students; analysis, synthesis and generalization of results. Comparison of performance indicators and quality of knowledge in different forms of education was carried out, namely: the discipline "Physiological foundations of adaptation to muscular activity" (FOAMD) - analysis of learning outcomes in 124 students (55 + 44 + 25) for three academic years; "Psychophysiology" - in 182 students (58 + 39 + 85) for three academic years; "Human Physiology" for nine academic years (2018 - 2025 academic year), a total of 497 students. Success takes into account all grades higher than unsatisfactory (3, 4, 5), and reflects the overall level of mastery of the material. Quality takes into account only high grades (4, 5), which shows the depth and strength of knowledge, and not just the fact of passing the exam.

Results

Based on the study of materials from scientific conferences and primary sources, as well as the search for digital platforms suitable for the implementation of blended and distance education formats, it was found that for teaching natural science subjects at the higher education institution of the T.H. Shevchenko National University «Chernihiv Colehium», it is most appropriate to use the Moodle system. It meets the criteria of e-learning, covers all components of the educational process and satisfies its requirements: it has a high level of customization (adaptation to a specific audience) and scalability (ability to expand without loss of quality).

Conclusions

The development of the ENC and the successful integration of the Moodle system for the purpose of teaching natural science subjects contributed to the adaptation of students to distance learning. The Moodle platform is an effective tool in the professional training of future coaches and physical education teachers in distance learning. Its use contributes to the formation of motivation, self-learning, productive thinking of students, their physiological literacy and professional competence. An increase in the quality of education indicators was recorded for master's students, and an increase in success rates for bachelor's students. The largest number of visits to the Moodle platform by students was recorded during testing.

Keywords Moodle system, electronic course, students, distance learning

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Анотація

Жиденко А., Савонова О., Паперник В. Використання інформаційно-освітнього середовища Moodle у системі дистанційного навчання для формування фізіологічної грамотності майбутніх тренерів

Обґрунтування і мета	Правильний вибір бази інформаційно-освітнього середовища для викладання дисциплін природничо-наукової підготовки в умовах дистанційного навчання є важливим питанням для закладів вищої освіти, особливо це стосується студентів факультету фізичного виховання і спорту, від фізіологічної грамотності яких залежить здоров'я та життя, тих, хто активно займається спортом. Метою дослідження є аналіз ефективності використання системи Moodle у змішаному та дистанційному навчанні для викладання дисциплін фізіологічного спрямування та її вплив на успішність, якість знань і професійну компетентність студентів, майбутніх фахівців з фізичного виховання.
Матеріал і методи	Використана у статті методологія включає теоретичне та емпіричне дослідження: спостереження, вимірювання, порівняння, опис, опитування та спілкування зі студентами факультету фізичного виховання і спорту; аналіз, синтез та узагальнення результатів. Проведено порівняння показників успішності та якості знань за різних форм навчання, а саме: дисципліна «Фізіологічні основи адаптації до м'язової діяльності» (ФОАМД) – аналіз результатів навчання у 124 студентів (55+44+25) за три навчальні роки; «Психофізіологія» – у 182 студентів (58+39+85) за три навчальні роки; «Фізіологія людини» за дев'ять навчальних років (2018 – 2025 н.р.), загалом у 497 студентів. Успішність враховує всі оцінки, вищі за незадовільну (3, 4, 5), і відображає загальний рівень засвоєння матеріалу. Якість знань враховує лише високі оцінки (4, 5), що показує глибину та міцність знань, а не лише факт складання іспиту.
Результати	Спираючись на дослідження матеріалів наукових конференцій та першоджерел, а також пошуку цифрових платформ, придатних для реалізації змішаних та дистанційних освітніх форматів, встановлено, що для викладання дисциплін природничо-наукової підготовки у закладі вищої освіти НУЧК імені Т.Г. Шевченка найбільш доцільно використовувати систему Moodle. Вона відповідає критеріям електронного навчання, охоплює всі компоненти навчального процесу та задовольняє його вимоги: має високий рівень кастомізації (адаптації під конкретну аудиторію) та масштабованості (здатності до розширення без втрати якості).
Висновки	Розробка ЕНК та успішна інтеграція системи Moodle з метою викладання дисциплін природничо-наукової підготовки сприяли адаптації студентів до дистанційного навчання. Платформа Moodle є ефективним інструментом у професійній підготовці майбутніх тренерів та викладачів фізичної культури в умовах дистанційного навчання. Її використання сприяє формуванню мотивації, самонавчання, продуктивного мислення студентів, їх фізіологічної грамотності та професійній компетентності. Для магістрантів зафіксовано підвищення показників якості навчання, для бакалаврів – успішності. Найбільшу кількість відвідувань платформи Moodle студентами зафіксовано під час проходження тестування та захисті лабораторних робіт.
Ключові слова	система Moodle, електронний курс, студенти, дистанційне навчання

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Introduction

In the context of the current security situation in Ukraine, when air raids have become a daily reality, higher education institutions (HEIs) face restrictions on the organization of the full-time educational process. The lack of stable electricity supply, heating, and a safe educational environment necessitates the active development of distance education (DE) as a strategic direction of educational policy. The first discussions on the prospects of DE in the higher education system began after 2001, which was later reflected in scientific research, in particular in the dissertation work of Stefanenko P.V. "Theoretical and methodological foundations of distance learning in higher education" [1]. The normative regulation of this form of education is Order No. 761 of 14.07.2015 [2], which defines modern approaches to the organization of distance learning (DL).

The problems of distance learning, its advantages, theoretical and methodological foundations, quality criteria, features of implementation and evaluation of results are actively studied by both domestic and foreign scientists [3–6]. Among the main advantages of distance learning, according to the authors [7-8], are the possibility of obtaining education without separation from professional activity; flexible combination of educational content to create individualized programs; personalization of the educational process; access to quality education for people with disabilities or those who live in regions without proper educational infrastructure. In addition, distance learning opens up the possibility of using a wide range of educational tools and building a more effective system of educational process management compared to the traditional face-to-face form [2-5].

Theoretical justification of the feasibility of forming a single knowledge bank as the basis of a distance dogmatic system and criteria for its quality were proposed by Professor Stefanenko [1]. Krasylnyk [6] developed theoretical and methodological principles for designing distance learning in higher education institutions (HEIs) and its methodological modelling, and also noted that distance learning is a set of modern psychological, pedagogical and telecommunication technologies, methods and means that provide the opportunity to obtain education without physically visiting HEIs [6-8].

Anikina, et.all [9] focus on the practical conditions for implementing distance learning, emphasizing that its main advantage is the ability to study at home, at work, in an online classroom - in general, in any place where there is a personal computer with Internet access. At the same time, the implementation of distance learning involves the creation of a specialized learning environment, the development of which depends on the level of information and communication technologies [9]. The use of digital technology [10] has the potential to increase the effectiveness of learning both theoretical and practical materials with a wide range and not limited to space and time. The learning process increased in terms of mastery of pencak silat skills, exceeding the achievements of the direct teaching method [10].

The problem of assessing the success of higher education applicants in the conditions of personalized distance learning, which is especially relevant due to differences from the traditional classroom format, is considered in the works [4, 11]. The authors of Kholod, Lysenko, Shtangrekt [4] emphasize the need to revise the structure of assessment, types and principles of application of success criteria that allow objectively certifying students. A rational approach is to use several assessment methods depending on the specifics of the educational direction, because each specialty has its own requirements for the formation of competencies and a practical component [4]. Comparative analysis of knowledge control on both standardized and non-standardized testing shows that combining standardized and non-standardized tests with problem-solving tasks significantly enhances knowledge assessment in technical disciplines, demonstrating the methods' interdependence and complementarity. The study [11] thus recommends a balanced approach, incorporating both methods to ensure an effective and high-quality assessment and knowledge control strategy in higher education. For the effective implementation of online courses in the Ukrainian language and literature, the authors [12] refer to the principles of the New Ukrainian School, in particular, to the principle of compliance of educational technologies with new models, forms and methods of teaching in the distance format. Such methods include computer conferences, debates, video conferences, project and creative independent work, discussions [12], which correspond to the methods of teaching humanities. Authors research [13], emphasizes the importance of increasing basic technological literacy among students in online learning environments.

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In the context of teaching disciplines of the medical and biological cycle, the correct choice of the platform (information environment database) for the accumulation of methodological materials is important. Karpukhina [14] considers the use of Google Classroom, KSU Online, Viber and Zoom platforms to be effective for teaching the course "Human Physiology" [14]. To verify the effectiveness of distance learning, an anonymous online survey was conducted, the results of which showed that most students positively evaluate distance learning, but 70% of them want to combine it with the traditional form [14].

The effectiveness of distance education has also been tested in emergency situations, in particular during the COVID-19 pandemic and in war conditions. These aspects are considered in the studies [15-18], who emphasize that distance learning has become the only possibility to continue the educational process in crisis conditions. Its features allow for an individual approach to each student, taking into account the peculiarities of perception of the material and the learning environment.

In higher education institutions, various platforms are used to support distance learning: Moodle, WebTutor, STELLUS, Microsoft Learning Gateway, Google Classroom, SOCMED-WhaYoZo, WhatsApp, Edmodo, Future Learn, SVS [19-22]. The results [20] of this study suggest that universities should support and encourage Modern ICT: SOCMED-WhaYoZo to improve technical skills, performance, expression of ideas, arguments, and student achievement for sustainable development [20]. A number of authors [23-26] argue that the Moodle system meets the main criteria of e-learning: functionality, reliability, stability, modularity, convenience and ease of use. Due to its structure, Moodle covers all components of the educational process, from presenting material to assessing the results of students' educational activities. The Moodle system was proposed by Martin Dugiamas in 2002 as a tool for developing online courses and improving educational interaction [24; 26]. The Moodle system, according to Trius [23], provides the organization of a full-fledged educational process, including learning tools, a system for monitoring and evaluating students' educational activities. Its use provides benefits to educational institutions, teachers and students, and can also be used to support traditional learning in a blended format [23]. Thus, the integration of the Moodle platform into the distance learning system and its effectiveness is an important issue for higher education institutions, especially for students of the Faculty of Physical Education, whose health and life depend on physiological literacy and professional competence, and those who are actively involved in sports, so this topic requires further research.

Based on the above, **the purpose** of this study is to analyse the effectiveness of using the Moodle platform in blended and distance learning for teaching physiological disciplines and its impact on the success, quality of knowledge, and professional competence of students, future physical education specialists.

Material and methods

Theoretical and empirical research: observation, measurement, comparison, description, survey and communication with students of Physical Education faculty; analysis, synthesis and generalization of results. A comparison of performance indicators and quality of knowledge in different forms of training was carried out, namely: the discipline "Physiological foundations of adaptation to muscular activity" (FOAMD) - analysis of learning outcomes in 124 students (55 + 44 + 25) for three academic years; "Psychophysiology" - in 182 students (58 + 39 + 85) for three academic years; "Human Physiology" for nine academic years (2018 -2025 academic year), a total of 497 students of Physical Education faculty. Success takes into account all grades higher than unsatisfactory (3, 4, 5), and reflects the overall level of mastery of the material. Quality takes into account only high grades (4, 5), which shows the depth and strength of knowledge, and not just the fact of passing the exam. In Fig. 1, 3, 5, the vertical axis shows the indicators of success and quality of knowledge of students, calculated using the appropriate formulas: Success (%) = ((Number of "5" + Number of "4" + Number of "3") / Total number of grades) × 100%; Quality (%) = ((Number of "5" + Number of "4") / Total number of grades) × 100%.

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Results

During 2015–2016, at scientific conferences [7], along with the characteristics of blended and distance learning of students, the advantages of digital platforms suitable for the implementation of such educational formats were analysed. Researchers [7] note that the use of LMS Moodle contributes not only to interactive interaction between the teacher and the student, but also allows for diagnostics and monitoring of primary changes in health using the electronic resources "ValeoBase" and "My Health". According to the observations of Bolyubash N.M. [27], the Moodle information environment provides multimodal presentation of educational content, supports interactive network communication, parallel work and data exchange, automates control and monitoring processes, and also promotes the implementation of active learning methods. These platform capabilities contribute to the activation of students' cognitive activity, the formation of positive motivation for learning, the development of strong-willed qualities, independence, and professional competence [28].

In accordance with the order "On approval of the Regulations on the accreditation of educational programs..." dated 05/15/2024 No. 686, attention is focused on the preparation of higher education applicants as a key element of external quality assurance of education in Ukraine [29]. Ensuring the quality of education at all stages and levels, in accordance with social needs and labour market requirements, is defined as a strategic task of modern educational policy. The active introduction of nonlinear pedagogy in physical education [30], of innovative technologies into the educational process is considered a strategic priority for the sustainable development of the educational sector [23]. Research [31] introduces a pioneering Deep Learning Enabled Exercise Monitoring System aimed at enhancing the online education experience for trainers. The study employs a skeleton-based approach utilizing the PoseNet model to monitor and provide real-time feedback on physical exercises such as pull-ups, sit-ups, squats, and bicep workouts [31].

Among the digital platforms used in higher education institutions for organizing distance learning, Moodle demonstrates high compliance with the criteria for ensuring quality education. Teaching of disciplines of the medical and biological cycle is characterized by specific requirements, in particular the need for laboratory classes. As noted by Bolyubash [27], the Moodle platform provides a wide range of tools for posting educational content: files, web pages, audio and video materials, interactive trainings and training programs. These tools not only provide access to content, but also contribute to the implementation of active, group and individualized teaching methods, as well as effective monitoring of educational activities. Therefore, the implementation of network technologies based on the Moodle platform is the most effective for the formation of professional competence of future physical education teachers and trainers. Among the key functional capabilities of the platform are the division of students into groups, flexible assessment, providing feedback, forming a task schedule and monitoring educational activity. The teacher gets access to a set of pedagogical tools: reference and information, communicative, analytical and management, covering the processes of collecting, processing and storing data on the course of education. This allows you to effectively plan, coordinate and adapt the educational process in accordance with the chosen learning strategy [32]. Teacher support has a significant impact on student motivation, self-efficacy and engagement in the process of continuous blended learning and promotes their sustainable development [33]. The authors also noted [34] that, according to to the experience of the participants, the lecturers with pedagogical and social-personal skills were able to emphasize and encourage the attractiveness of online learning [34].

According to the order of the Ministry of Education and Science of Ukraine No. 761 [2], individual teachers of the Department of Biological Foundations of Physical Education and Sports (BOFVS) of the Faculty of Physical Education, having assessed the advantages of the Moodle platform for natural science disciplines, began developing electronic educational courses (EEC) in 2016. The methodological aspects of the preparatory stage of their creation were highlighted in the publication [3], which focused on the need for clear structuring of educational and methodological materials in accordance with the logic and schedule of studying the discipline (lectures, practical and laboratory classes, independent work, thematic or modular control, final test or exam).

In the 2016–2017 academic year, individual courses were tested as part of a pedagogical experiment that involved the implementation of the Moodle platform for teaching natural science subjects and organizing independent work of students at the Chernihiv State Pedagogical University named

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after T.G. Shevchenko (now T.G. Shevchenko National University "Chernihiv Collegium"). At the Department of Physical Education, Health and Sports (now the Department of Biological Foundations of Physical Education, Health and Sports - BOFVZS), ENCs were created in the following disciplines: “Psychophysiology”, “Human Physiology”, “Physiological Foundations of Adaptation to Muscular Activity”, “Methodology of Preservation and Strengthening of Health”, “Fundamentals of Psychovaleology”, “Fundamentals of Medical Knowledge”, “Physiology of Motor Activity” [3].

As stated in the study [32], the control of students' knowledge, skills and abilities is an important component of the educational process, and the quality of learning is determined by the results of the assessment. In the traditional format, oral interviews, written works, and testing are used. In terms of distance learning, it is advisable to use informal tests [32]. In our own studies, we also used traditional forms of control - current control during the study of the module, final control during exams, as well as informal tests and creative tasks, which contributed to the development of creativity and motivation of students to independently acquire knowledge.

Fig. 1 and 3 present an analysis of the results of teaching the disciplines of the Department of Physical Education and Sports, the methodological developments of which were the first to be integrated on the Moodle platform, in particular the courses “Psychophysiology” and “Physiological foundations of adaptation to muscular activity” (FOAMD) during three academic years. The curriculum of the normative discipline FOAMD was developed in accordance with the educational programs for the training of masters in the specialties 014.11 “Secondary education (Physical education)” and 017 “Physical education and sports”. It included a work program, a workshop and other methodological materials that were integrated into the Moodle information environment. According to the curriculum, the discipline provided for 90 hours (3 ECTS credits), of which 16 hours of lectures, 14 laboratory classes, 10 individual creative projects. The rest of the time was allocated for independent work, which included preparation for computer testing (66 tests), performance of control work (54 tasks of a problematic and diagnostic nature) and other types of activities. The final control was carried out in the form of an exam [35].

Fig. 1 shows the dynamics of success indicators and the quality of knowledge of master's students from the course "Physiological foundations of adaptation to muscular activity".

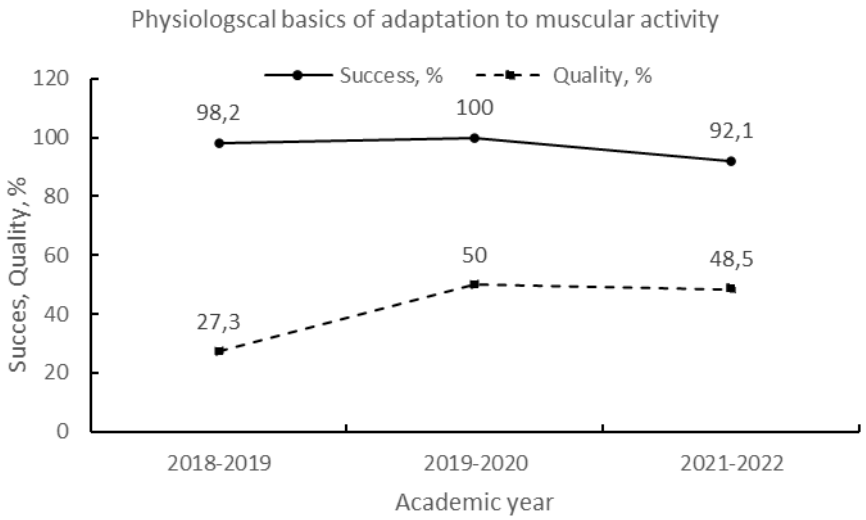

Fig. 1. Dynamics of performance indicators and quality of knowledge of students in the FOAMD course: Vertical axis: Indicators of student success and quality of knowledge are calculated using the following formulas: Success (%) = ((Number of "5" + Number of "4" + Number of "3") / Total number of grades)× 100%. Quality (%) = ((Number of "5" + Number of "4") / Total number of grades) × 100%

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All methodological materials, namely lecture presentations, videos, assessment criteria, and control tools were posted on the Moodle platform. Particular attention was paid to laboratory work during the course, which allowed students to investigate the influence of proprioceptive activity on cognitive processes, test motor abilities, determine the level of anxiety, performance, self-assessment of the influence of the projective technique on the behaviour and results of the athlete's achievements; measure the threshold of sensation, amplitude of movements; and also carry out psychophysiological regulation of the athlete's condition [35].

Fig. 2 shows part of the course teaching materials stored on the Moodle platform.

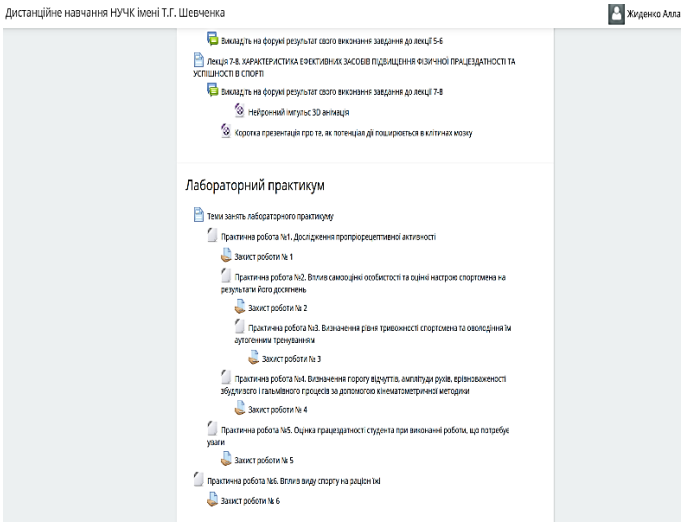

Fig. 2. Example of methodological developments from the FOAMD course (Moodle platform: lectures, videos, laboratory practicals, thesis defense)

The repository of the library of the National University "Chernihiv Collegium" named after T.H. Shevchenko contains an educational and methodological publication for this course [36].

For undergraduate and graduate disciplines, electronic training courses were developed, the first of which was the course “Psychophysiology”. This is a relatively new direction in physiology, which contributes to the formation of high motivation of students for continuous learning [28]. Fig. 3 presents the dynamics of success rates and quality of knowledge of students in the course “Psychophysiology” over three academic years (2017-2020 academic year). The course began in a face-to-face format, later it was adapted to blended and distance learning. Analysis of exam results over these years shows minor differences, but positive dynamics are observed - an increase in success rates by 4-6%. This is due to the adaptation of the educational process to the individual needs of students, especially in distance learning, where a personalized approach was implemented when performing creative tasks and an individual project “Composing a purposeful behavioural act according to P.K. Anokhin” [37].

An important advantage is the ability of students to send conclusions to laboratory work in PDF format, which provides convenience for both parties and supports constant feedback between the teacher and the student (Fig. 4). In addition, the use of game and simulation methods contributes to the acquisition of professional competencies, the desire for self-realization and the achievement of personal goals. Since the 2020–2021 academic year, the discipline “Psychophysiology” has ceased to be independent - it has been integrated into the course “Physiology of Motor Activity” as a separate module (Module 2). Fig. 4 presents a fragment of the methodological developments of this module, which retain the identity with the initial course “Psychophysiology” in the Moodle system.

The largest number of observations and results (success and quality of learning) falls on the discipline “Human Physiology” (FL) - from 2016/2017 academic year (beginning of the development of ENC for the formation of an educational environment based on innovative approaches) and until 2024/2025 academic year (active use of all the advantages of the Moodle system). It was studied that the implementation of ENC for all the disciplines described has a positive impact on the success and quality of learning indicator: for FL in 2017/1018, compared to 2016/2017 (Fig. 5), for FOAMD in 2019/2020, compared to 2018/2019 (Fig. 1) and for PF in 2018/2019, compared to 2017/2018 only for the success indicator (Fig. 3).

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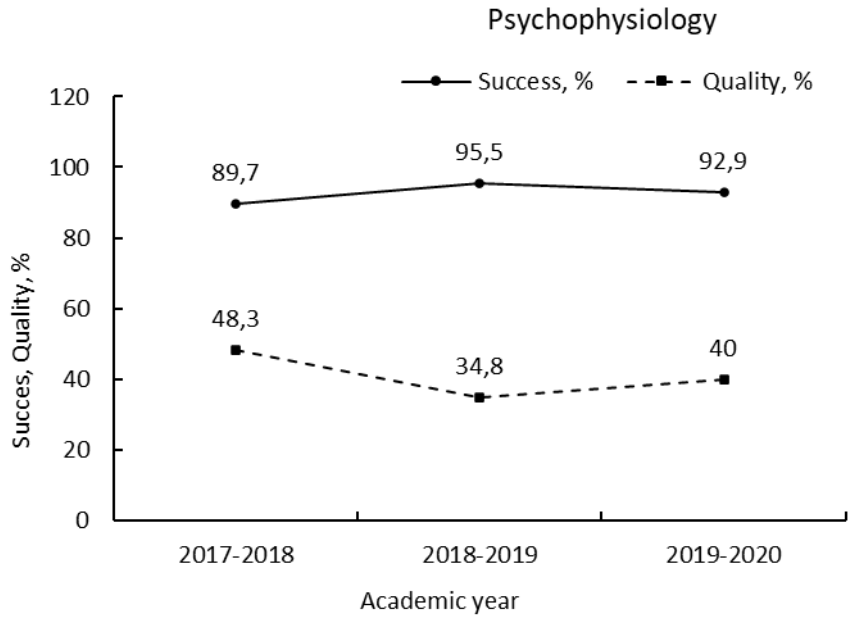

Fig. 3. Dynamics of performance indicators and quality of knowledge of students in the course "Psychophysiology"/ Vertical axis: Indicators of student success and quality of knowledge are calculated using the following formulas:
Success (%) = ((Number of "5" + Number of "4" + Number of "3") / Total number of grades)× 100%.
Quality (%) = ((Number of "5" + Number of "4") /Total number of grades) × 100%.

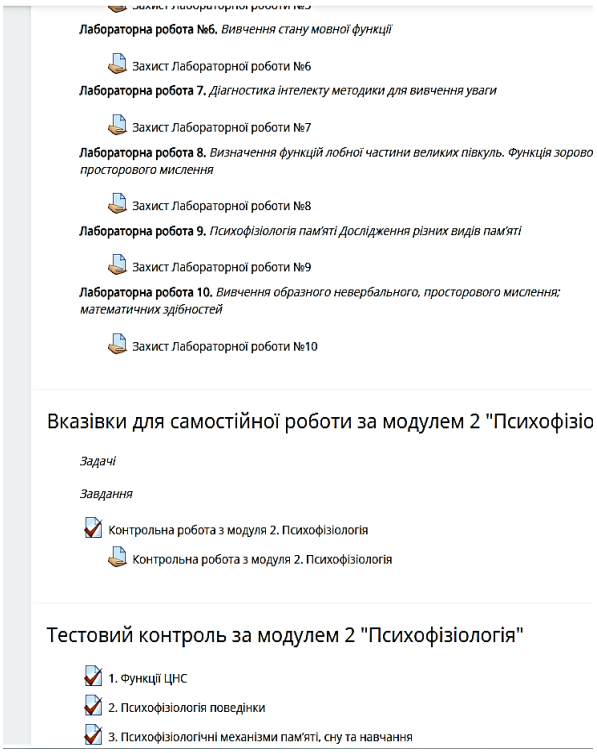

Fig. 4. Example of feedback and interactive interaction in the course "Psychophysiology" (Moodle platform Module 2 Psychophysiology of the FRD course)

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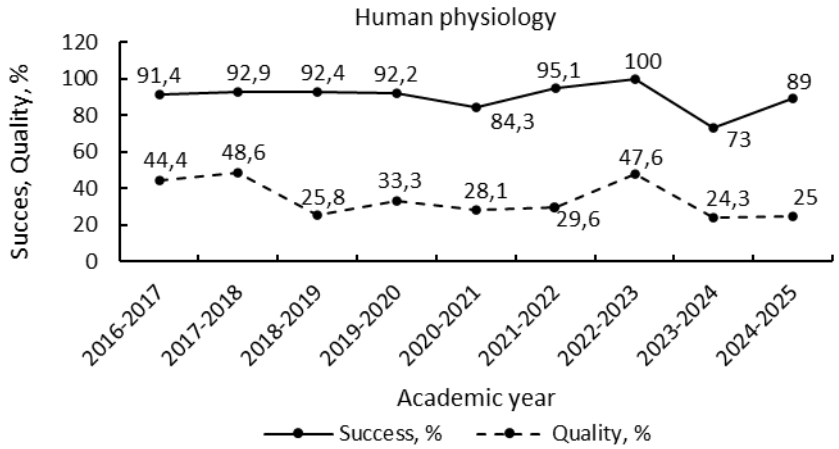

Fig. 5. Dynamics of performance indicators and quality of knowledge of students in the course "Human Physiology"/ Vertical axis: Indicators of student success and quality of knowledge are calculated using the following formulas: Success (%) = ((Number of "5" + Number of "4" + Number of "3") / Total number of grades)× 100%. Quality (%) = ((Number of "5" + Number of "4") / Total number of grades) × 100%

The variety of learning forms in Moodle has a positive effect on the overall success rate. In turn, the quality of learning largely depends on the individual characteristics of students and the influence of external factors. Thus, in 2018–2019 academic year, the COVID-19 pandemic and the transition to blended, and later - distance learning, affected the quality of learning. It was difficult for students of the Faculty of Physical Education to adapt, but already in 2019/2020 academic year, the indicators improved, which indicates effective adaptation to new conditions. In 2022/2023 academic year, a significant improvement in the studied indicators was observed, due to a decrease in the number of students studying the course "Human Physiology". The average number of students from 2016/2017 to 2022/2023 academic year was 95.2 (max.−108, min.−82), while in the 2022/2023 academic year−only 33.3 (max.−39, min.−25). This is due to changes in the educational program: the course "Human Physiology" was combined with "Physiology of Motor Activity". Such a change affected only bachelors of the specialty 017 "Physical Culture and Sports", while for the specialty 011.14 "Physical Culture" the course remained separate, which explains the decrease in the contingent. In the 2023/2024 academic year, the decrease in the studied indicators may have been influenced by social circumstances. Students living in the Chernihiv region studied remotely, often in conditions of shelling and unstable Internet. Most of them worked, forming individual educational trajectories in accordance with the OP, which involves choosing a Minor program (35 credits): “Choreography”, “Fitness”, “Sports Training” and additional elective disciplines (25 credits). In 2024/2025 academic year, the indicators improved again: according to a survey of students, their responsibility towards their studies increased, so the number of students with excellent grades increased. If earlier only one student in the group passed the exam with “excellent”, then in 2024/2025 academic year there were five of them. The Moodle system played a decisive role in this (according to the survey).

Although a significantly smaller number of students pay attention to “Recommended sources” and “News”, all actively use (according to the survey) lectures in the format of presentations that contain diagrams, tables, definitions, comparisons and theses. Many students create notes or save slides, because without this it is difficult to pass the exam. This is especially important for those who are unable to attend lectures. These materials are indispensable for preparing for laboratory work, testing and control tasks. Preparation for testing, which is a component of current control, covers all key topics of the course (Fig. 6B). Each test contains an average of 50 questions that must be completed in a limited time. The student has three attempts, after each of which an error analysis is performed.

The three tests include 123 problem-integrated tasks that activate students' independent educational and cognitive activities, contribute to the repetition and comprehension of the material, and the development of cognitive skills. For completing all planned types of tests, a student can score 75

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points, the exam is evaluated at 25 points. For the development of creative abilities, an individual task is provided for, for which additional points are awarded [38].

The information is evidence of the active use of the Moodle system by students to form professional competence and physiological literacy in order to become a highly qualified coach and teacher of physical education. Furthermore, “Moodle” satisfies next requirements: it has a high level of customization (adaptation to a specific audience) and scalability (ability to expand without loss of quality). The course "Human Physiology" covers the study of the processes of formation of physiological functions in ontogenesis, under the influence of external and internal factors, in particular, physical activity. Among all the methodological developments on the Moodle platform for this course, the largest number of visits by students was recorded for testing and laboratory work.

Discussion

The knowledge acquired by students in physiological disciplines is fundamental for mastering the following disciplines of the natural science cycle: "Sports Medicine", "Massage", as well as disciplines of professional and practical training: "Pedagogy", "Biomechanics", "Theory and Methods of Physical Education", "Life Safety". It is this knowledge that forms the basis for the development of physiological literacy of future specialists - trainers, lecturers and physical education teachers. The most complete overview and analysis of current trends in educational technologies, in particular the use of Moodle, artificial intelligence, adaptive learning and digital inclusion, is presented in the article [39]. The authors, based on Scopus and YouTube data [40], demonstrate that modern educational trends have not only academic, but also applied significance. They rightly emphasize that the solution to the problems of the quality of education should take place at the level of a specific student, taking into account his educational needs, and not through the introduction of advertised technological products. Education is not technology for the sake of technology, but a deep understanding and solution to real educational challenges [40]. The data obtained on the quality of knowledge of masters of the course "Physiological foundations of adaptation to muscular activity" confirmed the appropriateness of the selected laboratory works, within which students determined the level of development of their motor qualities, psychophysiological indicators and received individual attention and support from the teacher. In this context, ensuring the physiological literacy of students of the Faculty of Physical Education is a priority, which is consistent with the concept of literacy in physical culture [41], which was covered in detail by Yu. Pavlova, and which is relevant for the Ukrainian educational space. The authors [42] determine that according to the results, the factors affecting the e-learning quality of theoretical and practical courses are teachers' characteristics, technical characteristics of the educational system, content, student characteristics, and evaluation and feedback [42].

The content of the course "Human Physiology" is the first to form the physiological literacy and professional competence of future specialists in the field of physical education, health and sports. Methodological developments of the Moodle information and educational environment should contribute to the acquisition of basic knowledge about the normal functioning of the body at rest and under the influence of stress factors, in particular physical activity. The implementation of individual tasks, in which students used the following forms: discussion, report with presentation, experiment, research with video recording, contributed to the development of their independence, planning skills and organization of their own learning. Solving problem-integrated tasks activated the educational and cognitive activity of students, contributed to the repetition and comprehension of the material, the development of cognitive skills. The Moodle platform provides quick feedback, the ability to adapt to the needs of the teacher and student, as well as innovative synchronization during classes [3, 7, 26, 28]. The course "Human Physiology" covers the study of the processes of formation of physiological functions in ontogenesis, under the influence of external and internal factors, in particular, physical activity. An important component is also self-assessment of physiological and physical literacy, as well as the level of physical training, especially for junior undergraduate students. At the same time, in our studies, master's students demonstrated more significant professional growth. As noted in the study by Pastor-Cisneros et al. [43], physical literacy is a reliable predictor of self-perception of physical fitness, which, in turn, is associated with the risks of mortality and concomitant diseases caused by

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physical inactivity in children and adolescents. This emphasizes the need to form motivation for physical activity and develop cardiorespiratory endurance at the stage of studying in higher education. The trainer should take these aspects into account when planning individual and group training programs.

The formation of physiological literacy primarily depends on the motivation of students to acquire this knowledge. In modern conditions, knowledge of the physiological mechanisms of mental processes and states that are formed within the framework of the course "Psychophysiology" is important for increasing the level of basic training of future physical education teachers and creating conditions for the development of their physiological literacy and professional competence. The constant perception of new information, which is provided by a cycle of lectures in the format of presentations on the Moodle platform, as well as the performance of laboratory work, contributes to the implementation of the principle of unity of learning and self-study, development and self-development, an acceptance model of inquiry-based teaching pedagogy [44]. The implementation of creative tasks and the individual project "Composition of a purposeful behavioural act according to P.K. Anokhin" contributes to the interest and development of creative abilities of students, which forms motivation to perform similar tasks in the future.

In the context of blended and distance learning, the use of the Moodle system is an effective tool for teaching physiological disciplines. This has a positive impact on the success and quality of students' knowledge, and contributes to the formation of professional competence and physiological literacy necessary for solving complex tasks in the field of physical education, health, and sports [41].

Thus, the goal of our study was achieved: the results obtained substantiate the feasibility of using the Moodle system, which meets the criteria of e-learning. The Moodle information and educational environment covers all components of the educational process [23, 25–27] and meets its requirements - it has a high level of adaptability to a specific audience and scalability. Surveys of master's students and the results of the exam in the discipline "Physiological foundations of adaptation to muscular activity" showed that this course was popular, and the quality of knowledge indicators increased by 22.7%. The course content covered the methodological foundations of the theory and practice of sports, the body's response to systematic physical activity, the principles of achieving high fitness and minimizing the physiological cost of the load, which met the criteria of physiological literacy and professional competence of specialists in this field.

Conclusion

Based on the study of materials from scientific conferences and primary sources, analysis of the advantages of digital platforms suitable for the implementation of blended and distance educational formats, it was found that for teaching natural science subjects at the higher education institution of the National University of Physical Education named after T.G. Shevchenko, the most appropriate is to use the Moodle system, which meets the criteria of e-learning and covers all components of the educational process from submitting material to evaluating the results of students' educational activities. The most effective is the implementation of the ENC on the Moodle platform, which allowed monitoring, analysis of the effectiveness and formation of professional competence of future coaches and teachers of physical education during the research process. This contributed to improving the success and quality of students' knowledge when teaching the "Physiological foundations of adaptation to muscular activity" course for undergraduates, in particular, quality indicators increased by 22.7%. For undergraduate disciplines, positive dynamics are also observed, especially for success indicators, but there is an influence of other factors, such as social circumstances, quantitative changes in the contingent, individual characteristics of students, and their internal motivation.

Methodological developments of courses that are placed on the Moodle platform for teaching physiological disciplines contribute to a deep understanding of physiological processes: respiration, digestion, excretion, regulation of movements, etc. It is especially important for students of the Faculty of Physical Education to know how physical exercises affect the cardiovascular system, musculoskeletal system, as well as how these processes are regulated by the nervous and endocrine systems. The largest number of visits by students to the Moodle platform was recorded for testing and laboratory work defence.

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