Innovative Technology of Teaching Moodle in Higher Pedagogical Education: from Theory to Practice

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Summary

Relevance. Innovative activities in education should be aimed at ensuring the comprehensive development of the individual and professional development of students. The main idea of modular technology is that the student should learn by himself, and the teacher manages his learning activities. The advantage of modular technology is the ability of the teacher to design the study of the material in the most interesting and accessible forms for this part of the study group and at the same time achieve the best learning results. Innovative Moodle technology. it is gaining popularity every day, significantly expanding the space of teaching and learning, allowing students to study inter-faculty university programs in depth. **The purpose** of this study is to assess the quality of implementation of the e-learning system Moodle. The study was conducted at the South Ukrainian National Pedagogical University named after K. D. Ushinsky in order to identify barriers to the effective implementation of innovative distance learning technologies Moodle and introduce a new model that will have a positive impact on the development of e-learning. **Methodology.** The paper used a combination of theoretical and empirical research methods. These include: scientific analysis of sources on this issue, which allowed us to formulate the initial provisions of the study; analysis of the results of students 'educational activities; pedagogical experiment; questionnaires; monitoring of students' activities in practical classes. **Results.** This article evaluates the implementation of the principles of distance learning in the process of teaching and learning at the University in terms of quality. The experiment involved 1,250 students studying at the South Ukrainian National Pedagogical University named after K. D. Ushinsky. The survey helped to identify the main barriers to the effective implementation of modern distance learning technologies in the educational process of the University: the lack of readiness of teachers and parents, the lack of necessary skills in applying computer systems of online learning, the inability to interact with the teaching staff and teachers, the lack of a sufficient number of academic consultants online. In addition, internal problems are investigated: limited resources, unevenly distributed marketing advantages, inappropriate administrative structure, and lack of innovative physical capabilities. The article allows us to solve these problems by gradually implementing a distance learning model that is suitable for any university, regardless of its specialization. The Moodle-based e-learning system proposed in this paper was designed to eliminate the identified barriers. Models for implementing distance learning in the learning process were built according to the CAPDM methodology, which helps universities and other educational service providers develop and manage world-class online distance learning programs. **Prospects for further research** focus on evaluating students ' knowledge and abilities over the next six months after the introduction of the proposed Moodle-based program.

Keywords:
education, innovative technologies in education, distance learning, e-learning, module, Moodle learning technology, models for implementing online education.

1. Introduction

The modern pace of economic and social development of society requires modern youth to be able to quickly navigate and solve modern problems. Therefore, the development of the cognitive and intellectual abilities of the younger generation today comes to the fore. The development of these abilities is mainly carried out through education. However, the renewal of technologies, forms, and methods of the educational process, in some cases, lags behind the needs of society. Without updating, education cannot happen renewal of social life, so the extremely significant and urgent social problem is to develop a strategy to improve the education system, taking into account the social order accumulated by experience. The traditional educational process was focused on the standardization of student and teacher personalities. Until now, many educational institutions have actually retained traditional methods of education. Modernity dictates the need for diversity of forms and methods of education and the upbringing of students [1]. The widespread introduction of progressive forms of work organization affects the forms of organization of students' learning activities. There is a

contradiction between the requirements for student training and the actual practice of education, especially in the process of theoretical training. Innovative activities in education should be aimed at ensuring the all-round development of the personality and professional development of students. The search for effective ways of achieving professional competence led the International Labor Organization back in the early '70s to the concept of modular learning. The modular system of professional training was designed to respond effectively and quickly to the ever-changing demand of society. The main idea of modular technology is that the student must learn by himself, and the teacher manages his learning activity. Unlike the existing methodological system, aimed at solving problems: what to teach and how to teach, the technology of modular learning solves the problem: how to teach effectively.

A module is a target functional unit, which combines learning content and the technology of mastering it. The content independently (or with the help of the teacher) achieves specific goals by working with the module. Modular development is based on a person-centered approach, based on the theory of developmental learning. It allows replacing reproductive forms of learning, which do not meet the challenges of today, with more effective interactive, creative ones. The unit-module form of presenting information is at the head of the modular technology of organizing the educational process. The teacher breaks down the learning material by topics, semester, and session. Thus, blocks of study are formed, which have their own internal logic and sequence. During the study of the unit, a step-by-step control and correction of knowledge are made. A new form of student-teacher relations is the basis of modular learning. The ability to organize students' independent work expands. It is the modules that allow transferring learning to the subject-subject basis. The module allows to develop the student's intellect and aptitudes, independence, the ability to manage educational activities, within the study topic the module, the student can independently adjust the rate of learning material and performance of practical tasks, depending on the personal forms of thinking and cognitive interest.
For a differentiated approach, knowledge assessment is translated into a point system and a rating control is carried out. The student with the highest rating can be exempted from the test or exam. Thus, the advantage of modular technology is the ability of the teacher to design learning material in the most interesting and accessible forms for a given composition of the training group and to achieve the best learning outcomes.

As the Internet spreads across industries, colleges and universities have also turned to online software. Thus, distance learning is gaining popularity every day, greatly expanding the teaching and learning space, allowing students to explore interdepartmental university programs in depth. Computer technology allows for the meaningful exchange of information at any distance within the "student-teacher" system. In addition, this mode of learning has many advantages over the traditional model because it allows students to learn at their own pace and in their own space. It is pertinent to note that the institutional adoption of e-learning is reflected in the strategic commitment of institutional leaders. These strategic goals attach great importance to planning and financial support for distance education. In today's educational environment, the success of distance learning depends largely on teachers' perceptions. Many of them question the effectiveness of online education and cite time factors and technical problems. However, it should be considered that today's needs of online teachers should include appropriate financial support, a limited workload, and regular evaluation of the quality of online learning. Teachers' attitudes toward the transition to distance learning remain inadequate without addressing these needs. To increase reciprocal interaction, distance learning systems must consider not only cognitive and behavioral components but also social factors. However, most campus universities are not prepared to tutor non-traditional students on a massive scale in terms of institutional etiquette, culture, structure, and governance. The maximum amount of time a student works independently. The article presents the most optimal and universal model of online education based on Moodle, designed to eliminate the identified problems. The implemented system meets the principles of student-centered learning and helps to increase the interest of students and teachers in developing a comprehensive system of distance learning.

It may be noted that even though the discourse regarding distance education is popular, the Ukrainian e-learning market has many institutional barriers. Even in the academic environment, branding is crucial. Thus, large universities will have a greater competitive advantage by positioning themselves as experts in creating educational materials of the necessary quality. They will also be more competitive because of the economic benefits of the reach achieved. Metropolitan universities are increasingly promoting their educational services in the regions by opening branches and offices. This forces regional universities to focus on more innovative principles of teaching. Thus, the purpose of this study is to assess the quality of the implementation of the e-learning system Moodle. The study was conducted at K.D. Ushinsky South Ukrainian National Pedagogical University to identify barriers to the effective implementation of innovative technology of Moodle distance learning and implementation of a new model that will have a positive impact on the development of e-learning. The modular approach as an effective learning system is noted based on the analysis of professional training in developed countries [34]. At the same time, the authors emphasize the presentation of the modules in foreign practice as a certain

amount of training information necessary to perform a particular professional activity as peculiarities of modular training [16]. The popularity of modular education in universities in developed countries stimulates interest in the state of the problem of learning theory in this pedagogical direction. The study of foreign literature shows that the greatest importance for learning outcomes foreign authors give to the structuring of learning content under the conditions of modular technology [25]. Thus, the module structure is characterized as a set of autonomous parts of the training material.

This module structure allows individualization of learning through the creation of alternative modules, providing adaptation of the training material by the abilities and interests of students [17]. Further development of modular learning was its variation, which received control functions. The next step in improvement is the concept of units of learning content, originally called "micro-courses". According to this concept, a small part of the training material could have the status of Autonomous and be included in the training program. Thus, the new concept of learning content units merged with the system of programmed learning and was called "modular learning technology" [17] Modular technology has become very popular in universities in the United States, Germany, England, and other countries. Analysis of theoretical and practical experience allowed to formulate the basic principles of modular learning [15]. Moment modular learning acquired the status of a combined didactic system. The principles of modular technology are not opposed to general didactic, but as if represent their new facets, opening in the light of a different organization of the educational process. The modular approach is a natural result of the evolution of pedagogical theory due to the logic of social system development and scientific and technological progress [13]. Over the past two decades, the idea of modular learning has allowed forming a certain direction of psychological and pedagogical theory. Problems of transition from the traditional model of the educational process to modular technology in higher education are analyzed by many scientists [20]. The impact of modular learning on the basic mental processes that make up the nature of personal self-development is analyzed by Beese, J. [7]. Noting the problems of human self-development, it is pointed to the biosocial organization of the individual, due to two life programs: social, controlled, and biological, controlled by the subconscious and physiology. The activity of consciousness arising based on informational reflection of reality is considered. The author proves that the construction of learning based on modular technology provides the organization of the learning process by the nature of the activity of the cognitive subject, creating fruitful prerequisites for its self-development.

The problems and facts of structuring the content of specialties taught at the institute with the modular organization of the educational process are presented in the works of [3]. The attention of researchers in the field of learning theory is attracted by the laws of instructional content design, recognized in the overseas theory and practice of modular technology. For example, in secondary schools in England, the design of learning material, created on the principle of modularity, involves the integration of different types and forms of learning, which is presented as a condition for each student to achieve its didactic objectives [6].

Analyzing the experience of using modular training in foreign universities, scientists link the positive effect obtained as a result of such training with the flexibility of modular technology - the variability of training elements and modules. With the help of modular technology is achieved individualization of training, the possibility of the individual pace of learning activities, and, as a consequence, high learning outcomes [16].

Based on the experience of foreign higher education in the mode of modular learning, noted as a significant positive factor, the awareness of each student's learning prospects, represented by targeting in each module. Moreover, the need to differentiate identified learning objectives into integrated and private [18].

Some authors link the effectiveness of modular learning with the introduction of a system of questions, exercises, and tasks in the module structure to master the learning material presented in each educational element [22].

2. Materials and Methods

A combination of theoretical and empirical research methods was used in the work. They include: scientific analysis of the sources on this issue, which allowed to formulate the initial provisions of the research; analysis of the results of students' learning activities; pedagogical experience; questioning; monitoring of students' activities on practical exercises.

Currently, distance learning courses are actively developed by teachers of K. D. Ushinsky South Ukrainian National Pedagogical University and are widely implemented in the educational process. E-learning courses have been developed using Moodle LMS in Ukrainian and English language, history, psychology, pedagogy, and other disciplines on the website of distance learning at K.D. Ushinsky South Ukrainian National Pedagogical University. Such courses are open and available to full-time undergraduate students in different fields and specializations. The developed learning management system implements the following functions with Moodle LMS [26; 29]: delimitation of access rights; identification (as a manifestation of ability) and accounting of trainees; organization and management of training, its results, and control (often through testing); interaction of synchronous and asynchronous communication; collection and

preparation of analytical and statistical reports; connection with external information systems (for example, with the system "Dean's office").

Training materials and tests are created using content tools and placed in the Learning Management System database. It provides students with access to learning resources. At present, the information exchange system allows all participants in the learning process to exchange information both synchronously and asynchronously. A learning management system interface is built around content management tools [28].

The system allows the creation of both static texts and HTML pages using standard editors such as Microsoft Word and interactive resources with voice and animation elements. Multimedia programs are a means of creating interactive products [30].

The Moodle LMS allows you to perform the following functions: asynchronous communication - e-mail, forums, message boards; synchronous communication - video conferencing, voice and computer chat, use of joint software products [27].
Moodle LMS provides each student with personalized opportunities for effective course learning, and the instructor with data for designing training programs, the timing of controls, collecting reports on learning outcomes, organizing communication between the parties of training [9]. Students are enabled by the system to access the learning portal, which is a starting point for delivery of teaching and learning materials, selection of appropriate controls, use of additional learning resources (lecture and practical/laboratory materials, tests and quizzes, collaborative tools, and discussion) [29].

OpenSource LMS Moodle platform is known in more than 100 countries and is widely used in education. Moodle differs from the well-known commercial LMS by the features provided: it is distributed in the public domain; there is an opportunity to adapt the system to the features of a selected educational project; if necessary, there is an opportunity to build the necessary modules [31].
Moodle is focused on collaborative learning technologies - collective action, the common nature of group work, collegiality, cooperation, and interaction. It is possible to organize learning through common solutions to tasks, information, and knowledge sharing, which has a wide range of opportunities for communication - one of the strongest points of Moodle [14]. The messaging service promptly informs course participants or individual groups about ongoing events. Through chat and forums, instructors organize the discussion of urgent problems. Files of any format can be connected as forum messages [3;4].
Both faculty and students can use the message evaluation feature. There is a real-time discussion of problems in the chat room [11]. The "comment" and "messaging" services are used for individual instructor consultations with students, as well as for reviewing completed work.

Professional problems between teachers are discussed in the service "Teachers' Forum".
A distinctive feature of Moodle is the creation and storage system for each student's portfolio: all completed and attached to the tasks, evaluation, and comments on the work of the teacher [3; 4].

Within the framework of the discipline the developer uses a convenient evaluation system, marks are stored in the summary sheet of the course. The system also allows you to control attendance and record the activity of students, recording the time of their academic work in the course [5]. The quality of implementation of the e-learning system in the educational process of K. D. Ushinsky South Ukrainian National Pedagogical University will be evaluated by analyzing the experience of using e-learning courses for training bachelors, primarily bachelors of teacher education. The study involved 1250 students aged 20 to 22 years from 11 faculties of K.D. Ushinsky South Ukrainian National Pedagogical University. Male students (513) comprised 41.04% and female students comprised 58.96% (737). The majority of participants were third-year students-894 (71,52%).

Since distance education is currently very relevant, it is fully implemented at the university. Every teacher at the university develops electronic teaching resources that are widely used at K.D. Ushinsky South Ukrainian National Pedagogical University in traditional modes. Students are mandatorily enrolled in these courses and are taught according to strict rules.

Data were collected between November 2020 and January 2021. Written permission from respondents to use their personal data allowed the survey to be conducted and the results analyzed. No one refused to participate in the survey. The statistical margin of error was 2%.
The first stage of testing was to identify the main problems and concerns of students about online learning. The questionnaire consisted of five questions.
The structure of the questionnaire is shown in Table 1

Table 1: Contents of the questionnaire

№	Question
1	Do you like working in an online environment? Why?
2	Describe the main advantages and disadvantages of distance learning.
3	How do your university professors register for online learning?
4	What do you know about the e-learning courses offered at your university?
5	In your opinion, what are the main obstacles to the full implementation of distance learning principles at your university?

Source: author's own development

The data were collected, then placed in a database to track and organize the information. The number of relevant post-survey forms was 1,238. Quantitative data were interpreted using descriptive analysis.

Based on the questionnaire analysis and the study of the quality of the educational process, the main problems of implementing the principles of distance learning were identified. The main reasons that complicate the active implementation of e-learning are [1]:

1) lack of original (own) e-learning resources;

2) high cost of extraneous online courses of leading universities;

3) unreadiness (technical, psychological) of many teachers to master new information and communication resources and technologies;

4) lack of necessary regulatory framework in the field of e-learning, including gaps in copyright, which makes teachers reluctant to put their developments in the public domain;

5) the unwillingness of the administration of universities (except large national research universities) to adequately pay for the development of electronic educational resources.

The Moodle-based e-learning system proposed in the paper was designed to eliminate the identified barriers.

Thus, three blocks of distance learning were tested. The learning approach was shaped by the P-3 learning process model and included 8-week courses with eight learning modules [2]. The experiment involved students working with online learning materials individually and under the guidance of an instructor. The learning tools were email, content materials, discussion forums, video conferencing solutions, online tests, and the Moodle learning management system. The latter software is an open-source project with no licensing costs.

The university administration has made structural changes to improve the quality of the programs and educational services, as well as the success of the program. Thus, a special unit responsible for organizing and managing the principles of distance learning was created. The unit has 2 representatives of the university administration and 2 students per faculty, who have performed the research and organizational work of the university to a high score. In each structural unit of the university were allocated teachers responsible for the quality implementation of the implemented system (n = 24, two teachers for each faculty). Members of the unit held regular meetings on problematic issues and options for upcoming work. In addition, additional wireless laptops were provided to enhance student access to computers.

To determine the impact of Moodle LMS on the organization and motivation of students in the organization of the learning process in the teacher training college, forums, discussion activities, practice surveys (questionnaires), assignments were organized in the training courses. The purpose of the discussions was to find out the effectiveness, attitude, and convenience of course organization (motivation and willingness to use this way of learning, practical and technological effectiveness, changes about learning, and interaction in groups).

3. Results

The survey was conducted to identify students' attitudes towards distance learning. Students were asked if they liked learning through online courses, and 90% of the respondents answered positively, stating that they could learn the subject at any time (within the limits of the subject). It should be noted that distance learning requires a high degree of independence from students, but the results showed that not all students are willing to work independently.

Almost all students (95.6%) positively evaluated the effectiveness of using Moodle distance electronic courses. They noted that the advantage of such training is that a wide opportunity to study the material and perform tasks anywhere and in any free time. Students noted the great variety of assessment materials developed in e-courses: tests and assignments, creative assignments or case studies, online group projects, essays, interactive lectures, hyperlinks, group chat, and forum. In addition, students noted that the Moodle e-course is enriched with a lot of background information through links to specific sites, e-textbooks, videos, etc. This aspect is very important for learning the course.

Regarding the quality of distance learning, students noted both its advantages and disadvantages: 85.14% of students mentioned the accessibility of distance learning as its advantage. Any electronic course can be taught anywhere with the help of any electronic device with Internet access. As it turned out, the psychological aspect of learning with a distance learning course is also important for the student. So far, 57.01% of respondents have experienced an anxiety reduction when completing control tasks (e.g., tests, credit tests).

In addition, the recorded responses indicate that distance learning courses promote independent study skills. The student can determine for himself/herself how much time he/she needs to complete the same module and/or unit of the course.

Students noted the opportunity to communicate not only with the instructor (student-teacher interaction) during such courses but also among themselves (student-student interaction) throughout the course.

The main disadvantages of distance learning are the lack of full communication with teachers and classmates (about 44% - 541 students), the lack of skills necessary to work with online learning computer systems (57.9% - 712 respondents), and the critical attitude of parents to this type of activity (39.7% - 488 respondents). As for the positive aspects, almost all participants noted the opportunity to

expand their own space (89.7% - 1103) and save free time (80.9% - 995 students).

Analysis of the responses also showed that the most common problems associated with Moodle distance education were concerns about not being able to interact with instructors (55.3% - 680 students) and not being able to ask for help if needed (35.8% - 440) students). Thus, respondents also noted a lack of sufficient academic advisors online (25.8% - 292 students). Less than one percent of respondents (3) wrote that the size of their academic group was not appropriate for online learning.

It is pertinent to note that students with high confidence levels face significantly fewer barriers to social interaction and various administrative challenges when using online learning technologies.

Although students are well aware of Moodle online learning opportunities, only half of them (623 students - 50.65%) were able to name specific e-learning courses for areas that are already in the university.

At the same time, 84.00% of the respondents believe that the process of implementing distance learning in the educational process in universities is just beginning, while 16.00% note that Moodle distance learning technologies are used at a high level. This suggests that at present the potential of distance learning is not fully realized to improve the competitiveness of universities. Many teachers still intend to use the traditional mode of teaching, because they believe that the preparation of this course takes quite a lot of time. In addition, the lack of material compensation reduces the interest of teachers in using problem-developmental tasks. This, in turn, reduces the effectiveness of distance learning. The majority of teachers (78.06%) were in favor of combining distance learning with face-to-face teaching.

Students were asked what e-courses were taught at the university, and most students (79.6%) named the ones they had taken since their first year at the university. The list of e-courses included both required and elective courses. At this point, 16.05% of respondents named courses not taken, but learned about them from the university website; 3.09% of respondents had difficulty answering.

Once the barriers to implementing distance learning have been identified, the internal barriers need to be carefully analyzed and evaluated. Therefore, the first internal problem that needs to be addressed is an incorrect assessment of the university's potential. As strategic goals are set, the university administration needs to assess capacity, which is to see how all types of distance learning contribute to the goal. This means evaluating the project across the board, including costs, financial and non-financial benefits, and payback ratios.

Even if external factors are ignored, it is necessary to determine the market potential of the university, estimate sales of educational services, calculate costs, and predict efficiency throughout the implementation of the Moodle distance learning project. In this regard, the principles of distance learning can be implemented in the teaching and learning process at the university in different ways.

Based on the analysis of these models, we can conclude that at this stage of development of modern education it is advisable to use a mixed model of learning, combining elements of distance education with the traditional educational process in different proportions. This model is widely used in universities at the present stage of social development. However, it seems that the face-to-face mode will be completely replaced by distance learning. Therefore, distance education should be supplemented by direct contact with highly qualified teachers with relevant skills, as well as practitioners with practical experience in the field. Thus, let us consider the three proposed models (Fig. 1). Thus, models 2 and 3 can be applied to radical changes in the institution, while model 1 is essentially an independent approach that will not fully facilitate change but will facilitate rapid and cost-effective entry into a new market. This indicates that the institution is a strategic target for distance learning and presents a vision of what we want to achieve in this area of work.

It should be noted that we cannot ignore the introduction of distance learning as an internal characteristic of the institution to enter this field of activity. The structure of the educational market and competition are the main factors contributing to the success/failure of the institution, but not its internal characteristics and potential.

Since distance education is enhanced and supported by technical innovations and infrastructure, supportive staff and a well-functioning structural system are necessary to successfully enter the distance education market. Higher education institutions usually do not have a sufficiently high level of technological infrastructure, while the necessary internal skills are also low. Nevertheless, the institution should analyze the capabilities and availability of technological infrastructure before deciding to develop a Moodle distance learning program. All elements of the technology infrastructure, including administrative support and elements of the production cycle and presentation of instructional materials, must meet state standards. This infrastructure is strategic because instructional materials are transformed into high-quality distance learning data. There are two areas of concern in this perspective: writing instructional materials to standards and in an appropriate form; and turning prepared material into a form that allows students to learn at any time and take advantage of what they have learned in any situation.

Therefore, unlike the face-to-face mode, Moodle distance learning allows the potential of the technological infrastructure to be realized in such a way that the most intense educational experience can be provided. For example, test questions do not need to be extended as learning material through the online mode. Therefore, you need to make arrangements to update and maintain the

technical resources in working mode. In addition, the IT system in distance education is effective due to the availability of a constantly monitored backup system, which is especially important if students' study in different time zones.

4. Discussions

It can be noted that teachers from different countries and universities use Moodle to post notes, videos, and try to give students insight into the content and tasks of different academic subjects [6]. The C-3 model we applied has already demonstrated the ability to provide the highest possible level of student learning. Thus, in 2013, the number of students taking at least one online course in the United States increased to 6.7 million [10]. At this point, the Pew Research Center found that while 77% of American college presidents reported that their institutions offered online courses, only 50% of them agreed that these courses were at the same level as traditional classes. classroom [12]. Institutional recognition of distance learning is important for multinational societies. Our findings are consistent with research conducted in Iran and Taiwan [16]. Distance education is evolving due to the goals set to improve the efficiency, speed, and accessibility of educational technology [21]. Unfortunately, computer literacy among students remains low enough to fully utilize the systems [23]. Legitimate distance education continues to be the fastest-growing area of higher education [32]. However, there are still some institutional and financial barriers to the holistic implementation of distance education, such as the lack of qualified teachers [33] and the lack of technical equipment [36], and weak government support [37]. The effectiveness of implementing the Moodle modular learning technology is expressed in the guaranteed achievement of the current level of professional competence of students. Leading didactic conditions are reproduction in classroom conditions in a didactically transformed form of fragments of production and professional relations of specialists working in the field of education. The forms of problem lecture and lecture discussion allow reproducing the process of interaction between specialists discussing theoretical issues. The subject and social contexts of students' professional future are realized in laboratory works, where simulation and game models are introduced into the structure. Active formation of educational content by students themselves is achieved in the course of course work performance and defense, in practical classes, with the simulation object being the subject basis of a fragment of quasi-professional activity, implementation of which requires systematic application of different knowledge and skills, which creates necessary conditions for gradual cognitive transition. activity type to professional. Traditional forms of learning in the conditions of modular technology do not lose their properties and opportunities.

Their use provides a gradual, natural transition from the purely educational activity of students through quasi-professional to professional [35].

Moodle's modular learning technology is based on general functional systems theory, neurophysiology of thinking, pedagogy, and psychology.

Studies in these fields show that the human brain with its modular structure responds better to quantum information (in other words, certain input).

Modular learning allows to solve the following modern problems of professional education [24]:

1. Module-optimization and systematization of learning content based on content that provides program flexibility;
2. Individualization of learning;
3. Monitoring the effectiveness of learning at the level of practical activities and observation of the evaluation of observed actions;
4. Activation of the learning process based on professional motivation, the full realization of independence, and learning opportunities.

Within the framework of different concepts modular training programs including different content and structures are presented in different forms, but all of them contain the following three main components: target content program; Bank of information provided in different forms; methodological guidelines for students

Modular learning technology is developed and implemented by the accepted principles of learning.

The modular learning technology is based on the following principles [19]:

1. Principle of action: this principle means that modules are formed according to the content of the specialist.

According to this principle, modules can be structured based on scientific activity or system approach. The scientific activity approach in modular learning technology requires the development of modules as a result of curriculum and program analysis. In a systemic approach, the module unit is based on the analysis of the expert's professional activity.

2. Principle of equality. This principle defines the nature of the subject-subject relationship between the teacher and the student.

This means that modular learning design belongs to the category of personalized technology. In other words, modular learning design is adapted to the personal psychological characteristics of the individual.

The organization of the learning process can be seen as an integral part of the modular learning system.

One of the features of the modular learning system Moodle is the acceleration of the learning process, which can be explained by two aspects [34].

The most effective form of organizing the learning process is weekly modular lesson planning and assessment of students' knowledge. That is, one module (2-3 lectures and their practical and laboratory work) should be scheduled for

one week, which should be completed by assessing students' knowledge with tests or other forms of control.

The content of the module provides the following benefits (Moore & Kearsley, 2020):

− ensuring the continuity of learning between modules and interdisciplinary modules;

− development of methodological justifications for all types of learning within and between each module;

− flexibility of the modular structure of science;

− regular and effective monitoring of students' knowledge (after each module);

− stratification according to students' immediate abilities (after the initial modules the teacher can recommend individual students to master the subject);

− optimization of hours allocated for lecture, practice (internship), individual and independent work as a result of "compression" of information, acceleration of learning, effective use of classroom hours, and content of classes. As a result, the student will have sufficient knowledge, skills, and qualifications.

Modular learning technology, based on a science-based approach, is implemented with pedagogical and technological maps developed for each module [25]. Currently, the university is put in the position of a subject of the market of services due to socio-economic conditions. In this market, Moodle distance learning is gaining popularity. The technology of modular learning fits perfectly into the scheme of the distance learning organization.

Distance learning is economically and socially expedient right now, under conditions of market formation, forming a certain contingent of potential users. These include those wishing to obtain education in an additional specialty; employees of various public and private organizations undergoing retraining and professional development; correspondence students [21].

General education disciplines are characterized by a high level of information saturation. The problems of knowledge generalization, the development of procedures for checking their correctness and operational use are relevant. In this regard, it may be promising to use the concept of knowledge as an extension of the methodological basis of innovative modular learning technology Moodle in general education disciplines. Knowledge is a field in the theory of artificial intelligence, which contains as its main tasks the development of models of knowledge representation, methods of their augmentation, and processing. The success of implementing modular learning technology Moodle in the pedagogical reality of the university requires the development of psychological support for this innovation. Insufficient development of the theoretical aspect of the socio-psychological problem of implementing educational technology entails the rejection of the changes by teachers and unprepared students for them. Creating a theoretical

model for the implementation of modular learning technology Moodle in educational practice will contribute to the formation of the acmeological professional position of the teacher, which determines the high performance of the pedagogical activity.

5. Conclusion

Technology and modern and innovative methods must be used to lead to the development of the educational system, facilitate the education of individuals, and enable educational personnel to perform their tasks and functions in a well-organized manner. The main benefits of innovation and educational technology are that tasks become less time consuming, easier to edit and change, communication, which leads to a fundamental transformation in the education system, generating ideas to solve problems, maintaining the learning cycle, promoting consistent and effective assessments, creating data standards. and strong information platforms, improving productivity and efficiency and developing technology to implement management functions.

To summarize, we can say that the innovative e-learning technology Moodle has great potential to set high standards of valuable learning experiences in virtual environments. The study involved 1250 second- to third-year students of K. D. Ushinsky South Ukrainian National Pedagogical University. The experiment showed that students aspire to online learning, but there are concerns about the quality of interaction with teachers and the underdeveloped technological infrastructure of the university. Thus, the internal and external factors that constrain the implementation of modern innovative Moodle distance learning technologies, such as limited scope and range of implementation; resource control problem; incorrect assessment of marketing preferences; limited resources, unsuitable administrative structure, etc., were identified. Prospects for further research focus on the assessment of students' knowledge and abilities in the next six months after the introduction of the proposed Moodle-based program.
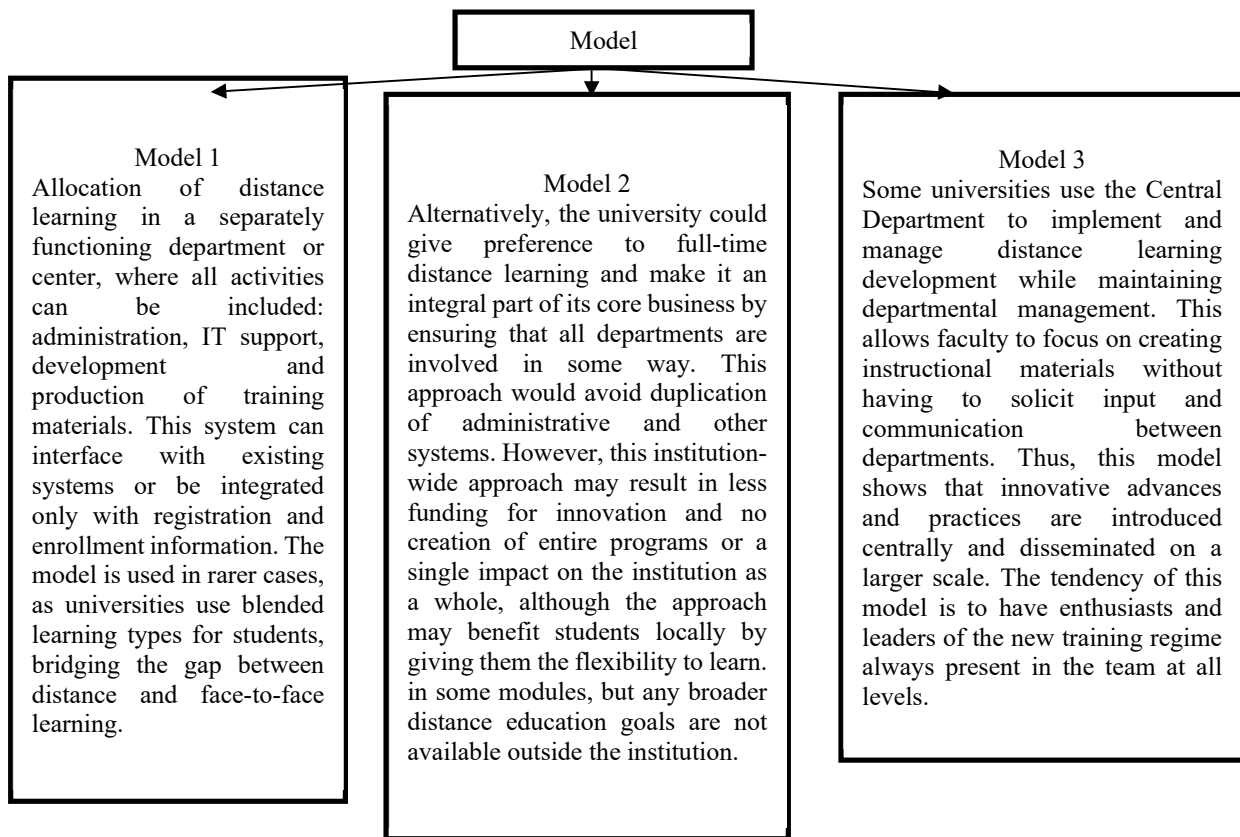
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                          ┌─────────────────────┐
                          │        Model        │
                          └─────────────────────┘
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Model 1
Allocation of distance learning in a separately functioning department or center, where all activities can be included: administration, IT support, development and production of training materials. This system can interface with existing systems or be integrated only with registration and enrollment information. The model is used in rarer cases, as universities use blended learning types for students, bridging the gap between distance and face-to-face learning.

Model 2
Alternatively, the university could give preference to full-time distance learning and make it an integral part of its core business by ensuring that all departments are involved in some way. This approach would avoid duplication of administrative and other systems. However, this institution-wide approach may result in less funding for innovation and no creation of entire programs or a single impact on the institution as a whole, although the approach may benefit students locally by giving them the flexibility to learn. in some modules, but any broader distance education goals are not available outside the institution.

Model 3
Some universities use the Central Department to implement and manage distance learning development while maintaining departmental management. This allows faculty to focus on creating instructional materials without having to solicit input and communication between departments. Thus, this model shows that innovative advances and practices are introduced centrally and disseminated on a larger scale. The tendency of this model is to have enthusiasts and leaders of the new training regime always present in the team at all levels.

Fig. 1. Implemented learning models. (Source: author's own development)

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