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MODEL OF DIDACTIC PRINCIPLES FOR USING THE SYSTEM OF COLLABORATIVE OPEN LEARNING IN THE TRAINING OF FUTURE COMPUTER SCIENCE TEACHERS

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Abstract. Modern education faces significant challenges associated with the rapid development and integration of information technologies into the learning process. In this context, the effective training of future computer science teachers becomes a priority task of higher education. One promising approach to addressing these challenges is the system of Collaborative Open Learning (COL), which combines didactic principles with modern educational technologies and creates conditions for active and student-centered learning. The relevance of this study is determined by the need to adapt the educational process to individual learning styles, learning rates, and educational needs of students. Such adaptation can significantly increase students' motivation, engagement, and academic performance. In addition, COL revises traditional teaching methods by expanding opportunities for collaboration, experiential learning, and joint knowledge construction. These characteristics are especially important in the preparation of future informatics teachers, who must be able to work effectively in a dynamic educational environment.The aim of this study is to analyse and justify the didactic foundations of using collaborative open learning in the training of future teachers of informatics. To achieve this aim, the following tasks are set: to analyse theoretical aspects of informatics education, to identify key didactic principles underlying the educational process, and to review

existing practices of implementing COL in higher education.The subject of the study is the process of using the collaborative open learning system within educational programmes for training future computer science teachers. The object of the study includes students, teaching staff, educational programmes, and methods of teaching informatics. The research methodology is based on analysis of scientific literature and an analytical review of pedagogical practices. The analysis of theoretical and practical aspects of collaborative open learning demonstrates its potential in the professional training of future computer science teachers. These findings support the integration of COL into higher education practice.

Keywords: collaborative open learning, education, technology, didactic foundations, future educators, training process

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БОЛАШАҚ ИНФОРМАТИКА ПӘНІНІҢ ОҚЫТУШЫЛАРЫН ДАЯРДАУДА БІРЕККЕН АШЫҚ ОҚЫТУ ЖҮЙЕСІН ПАЙДАЛАНУДЫҢ ДИДАКТИКАЛЫҚ ПРИНЦИПТЕР МОДЕЛІ

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Аннотация. Заманауи білім беру ақпараттық технологиялардың маңыздылығының артуына байланысты біршама қиындықтармен бетпе бет келуде. Болашақ информатика мұғалімдерін тиімді даярлау осы тұрғыда негізгі міндетке айналды. Бірлескен ашық оқыту жүйесі (БАО) дидактика принциптері мен заманауи білім беру технологияларын біріктіретін әлеуетті перспективалық тәсіл, Сол себепті оны зерттеу өте өзекті. Студенттердің оқу қарқыны мен оқу стилі әртүрлі. БАО білім беру процесін студенттердің жеке

қажеттіліктеріне бейімдеуге мүмкіндік береді, бұл олардың мотивациясы мен оқу тиімділігін арттыра алады. Сонымен қатар БАО технологиясы белсенді және практикалық оқытудың жаңа мүмкіндіктерін ұсына отырып, оқытудың дәстүрлі әдістерін қайта қарайтындығына байланысты. БАО-ның дидактикалық аспектілерін зерттеу информатика мұғалімдеріне оқыту тәсілдерін қайта қарауға және оларды заманауи талаптарға бейімдеуге көмектеседі. Бұл зерттеудің мақсаты – болашақ информатика мұғалімдерін дайындауда БАО-ны қолданудың дидактикалық негіздерін талдау және негіздеу. Осы мақсатқа жету үшін келесі міндеттер қойылды: информатиканы оқытудың теориялық аспектілеріне және білім беру процесінің негізінде жатқан дидактикалық принциптерге талдау жасау. Зерттеу пәні болашақ информатика мұғалімдерін даярлаудың білім беру бағдарламасында бірлескен ашық оқыту жүйесін қолдану процесі болып табылады. Зерттеу нысаны: студенттер мен педагогикалық қызметкерлер, сондай-ақ білім беру бағдарламасының өзі және информатиканы оқыту әдістері. Зерттеу барысында әдебиеттерді талдауды, сондай-ақ қолданыстағы тәжірибелер мен педагогикалық әдістерге аналитикалық шолуды қамтитын кешенді әдістеме қолданылды. БАО-ның теориялық және практикалық аспектілерін талдау осы жүйенің болашақ информатика мұғалімдерін даярлаудағы әлеуетін анықтауға мүмкіндік берді. Зерттеу нәтижелері БАО-ны білім беру процесіне біріктіру бойынша ұсыныстарды әзірлеу үшін негіз бола алады және оның тиімділігі туралы қорытынды жасауға мүмкіндік береді.

Түйін сөздер: біріккен ашық оқыту, білім беру, технология, дидактикалық негіздер, болашақ мұғалімдер, дайындық процесі

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МОДЕЛЬ ДИДАКТИЧЕСКИХ ПРИНЦИПОВ ИСПОЛЬЗОВАНИЯ СИСТЕМЫ СОВМЕСТНОГО ОТКРЫТОГО ОБУЧЕНИЯ В ПОДГОТОВКЕ БУДУЩИХ УЧИТЕЛЕЙ ИНФОРМАТИКИ

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Аннотация. Современное образование сталкивается с вызовами, связанными с растущей значимостью информационных технологий. Эффективная подготовка будущих педагогов информатики становится ключевой задачей в этом контексте. Система совместного открытого обучения (СОО) представляет собой потенциально перспективный подход, который объединяет принципы дидактики и современные образовательные технологии, исследование которого крайне актуально. Студенты имеют разные темпы обучения и стили обучения. СОО позволяет адаптировать образовательный процесс к индивидуальным потребностям студентов, что может повысить их мотивацию и результативность обучения. Актуальность также обуславливается тем, что СОО пересматривает традиционные методы обучения, предоставляя новые возможности для активного и практического обучения. Исследование дидактических аспектов СОО может помочь педагогам информатики пересмотреть свои подходы к обучению и адаптировать их к современным требованиям. Таким образом, целью данного исследования является анализ и обоснование дидактических основ использования СОО в подготовке будущих педагогов информатики. Для достижения этой цели ставятся следующие задачи: провести анализ теоретических аспектов обучения информатике и дидактических принципов, лежащих в основе образовательного процесса. Предметом исследования является процесс использования системы совместного открытого обучения в образовательной программе подготовки будущих педагогов информатики. Объектом исследования являются студенты и педагогические работники, а также сама образовательная программа и методы обучения информатике. В ходе исследования использовалась комплексная методология, включающая в себя анализ литературы, а также аналитический обзор существующих практик и педагогических методов. Анализ теоретических и практических аспектов СОО позволил выявить потенциал этой системы в подготовке будущих педагогов информатики. Результаты исследования предоставляют базу для разработки рекомендаций по интеграции СОО в образовательный процесс и позволяют сделать выводы о его эффективности.

Ключевые слова: совместное открытое обучение, образование, технология, дидактические основы, будущих педагоги, процесс подготовки

Introduction. Currently, the main vectors of the state policy of higher professional education development are compliance with the realities of the modern digital world, introduction of methods and formats (contact and non-contact) of work with students, application of distance education technologies, as well as introduction of the system of joint open learning. By 2024, the education system in Kazakhstan should be qualitatively modernised. This will make it possible to prepare a sufficient number of literate users with the necessary digital competences for the digital future. Improvement of the education system within the framework of the digital economy implementation is aimed at the use of predominantly domestic

software in educational institutions, full translation (or digitisation) of document management, as well as providing secure access to high-speed Internet. Therefore, each educational institution should provide all participants of the educational process with access to a secure information and educational environment, including:

- information and educational resources;
- electronic library system;
- a student's personal account, allowing him / her to plan the learning process, record the progress and results of the educational process, form a portfolio for the entire period of study, organise interaction between the participants of the educational process;
- controlled access to resources on the Internet;
- collaboration with other institutions.

Thus, the development of digital culture of a future computer science teacher is obvious and justified by the need to choose effective means and methods of teaching. An excursion into the history of integrating collaborative open learning into the educational process allowed us to distinguish (depending on the influence on the formation of educational content and the functions it performs) the main types of incorporating online courses into educational programmes:

- embedding the system of collaborative open learning in a blended learning format;
- substitution of part of face-to-face courses of the educational programme (modules, sections) or activities (lectures, practical classes, independent work, etc.) for online disciplines;
- expansion of network educational interaction between students and teachers in the format of «collaborative open learning»;
- the system of joint open learning as a resource model implies the use of online course materials as an educational resource, an electronic teaching aid in the study of a discipline taught in person.

Thus, in the training of future teachers of computer science the system of joint open learning is a form of distance education based on e-learning technology and the use of the Internet, types of network communication (online consultations, feedback forums). The system realises the principle of openness and accessibility of education:

- combining the experience of teaching disciplines (educational content of high quality with different types of learning activities: lecture notes and presentations, video lessons, wikimedia environment, interactive mind-maps, the volume of authentic scientific literature offered for compulsory study);
- information about course instructors (addresses and contacts), assignment due dates, technical assistance and support (notifications about availability of materials, plans for the week of the course, and evaluations of the previous week's assignments).

Literature review. The relevance of the new educational model increased in the beginning of the 21st century, when the traditional form of education ceased

to meet the requirements set to it by society and production, to meet the increased needs of the population in obtaining quality information, primarily in the field of interest. In theoretical studies, various aspects of collaborative open education have characterised E.A. Amanbekov, M. Jensen, R. Moore, J. Hatch, D.W. Johnson, R.T. Johnson, E. Holubec, D. Aituarov, L.N. Daupbaev, R.L. Moore et al. The technological approach to its design, based on the introduction of interactive methods and forms of learning, is presented in the studies of B. Sabitzer, I. Groher, J. Sametinger, G. Tan, P.B. Gallo, G.M. Jacobs, C. Lee, H. Khalil, M. Ebner, A.A. Zubrilin, R.E. Slavin et al. At the same time, in domestic pedagogical science there is still no unified definition of collaborative open learning, there is no complete picture of the essence and trends of its development in our country, and there are no fundamental works of theoretical and methodological nature.

Materials and methods. Today, computer science is perceived as a fundamental, general education discipline designed to form students' skills related to the creation of information models. Most of the teaching material is devoted to the study of information technologies, so the learning process is characterised by rapid changes in learning content and continuous growth of requirements to the qualification of specialists. In the conditions of high rate of development of information technologies, the task of training specialists in the field of teaching IT-disciplines by pedagogical universities becomes urgent. Moreover, the requirements for professional training of a computer science teacher are constantly undergoing changes in accordance with the changing content of educational material and different approaches to its presentation.

Professional training of a future teacher of informatics at the pedagogical university meets the demands of the school, associated with the need for specialists with high qualifications, able to take an active part in the modernisation of the educational process, using computer-based learning tools and Internet resources in their work (Amanbekov, 2016). However, the dynamics of IT-technologies development dictates the demand for advanced training of future teachers of informatics. In our opinion, the content of the collaborative open learning system is currently determined by the following factors:

- development and introduction of ideas of media education;
- the growing need for specialists capable of teaching IT disciplines in educational institutions of various profiles and at advanced training courses;
- the need for constant updating of IT and IT-discipline teaching programmes adapted to the specifics of different groups of students;
- the need to introduce distance learning methods into the educational process;
- the presence of trends in the emergence of new teaching methods based on information and communication technologies;
- the presence of requests for the formation of an information model for the functioning of educational institutions.

The subject is the interrelated components of the system: a specific social personality, educational institution, social practice, science.

In the course of analysing the system of collaborative open learning in the training of future teachers of informatics, we have identified indicators of their evaluation and developed a methodology for their study based on the model of analysis of learning effectiveness by Donald Kirkpatrick and Jack Phillips (Figure 1).

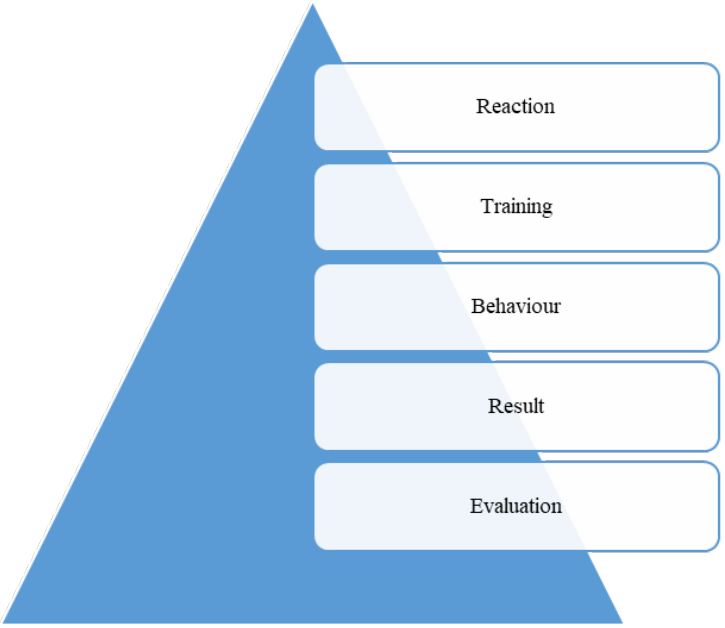

Figure 1— Evaluation model for a collaborative open learning system

Results. We believe that the system of collaborative open learning allows solving the identified pedagogical problems through their active implementation in the training of future computer science teacher. The openness of learning, firstly, ensures the interconnectedness of educational institutions, their distribution (location in space and functioning in time); secondly, promotes the inclusion of an individual in the diverse activities of the educational institution. Of course, such a methodological attitude cannot be called complete, but it is, in our opinion, self-sufficient for building a theoretical model of collaborative open learning as one of the forms of open society expression (Jensen, Moore, Hatch, 2002). Its subject is the interrelated components of the system:

- a specific social personality (the image of a future computer science teacher);
- educational institution;
- social practice;
- science.

In addition, collaborative open learning exchanges with the external environment a variety of resources: informational, human, material. The openness of the content of collaborative learning (information resource) of future teachers of informatics is manifested in:

- designing educational programmes taking into account modern ideas about the subject of learning;

- creation of didactic and methodological conditions for bringing the content into the learning process by students;

- promptly going beyond the content standard (if necessary);

- curriculum, lesson plan (e.g. Internet search and application of the information obtained directly during the lesson) (Sabitzer et al., 2019).

Thus, examples of the most famous international platforms of joint open learning in the training of future teachers of computer science are «Coursera», «EdX», «Udacity», «FutureLearn», «Khan Academy», «Udemy». Among the Kazakhstani platforms we can highlight the «National Platform Open Education», «University without Borders» and others. D.W. Johnson, R.T. Johnson, E. Holubec noted that «in time all universities-developers of the system of joint open learning will find themselves in a situation where their educational services will compete with a huge number of similar courses» (Johnson and Holubec, 2020).

Modern systems of collaborative open learning in the training of future teachers of computer science have a homogeneous structure, divided into separate modules. Each module includes theoretical and practical material, assignments for independent work, and diagnostics of learning achievements. Their mandatory structural elements are the organisation of document management (storage of information about course participants and their achievements), organisation of joint work of a methodologist and an organiser with students through the use of chat rooms and forums, organisation of joint work in the «learner-learner» format (Tan et al.,1999). It is important to understand that the system of collaborative open learning is not a substitute for face-to-face teaching, but a didactic learning system «aimed at engaging future computer science teachers in active cognitive and cognitive activities» and designed to provide additional education in order to reinforce the students' learning material.

In connection with the transition of higher education institutions to new educational standards, there is a need to use in electronic format various educational and methodological materials used as an additional tool in lecture, seminar and laboratory classes in the discipline, as well as for the effective organisation of independent work of future teachers of computer science. In the training of bachelors and masters of the direction «Pedagogical education» the system of collaborative open learning acquire a fundamental character (Aituarov and Daupbaev, 2020). They are actively used in the creation of educational blogs as an effective means of organising the learning process, in the modelling of engineering education, in the development of intellectual games and expert systems.

Thus, the use of information technologies in conjunction with the system of collaborative open learning implies the design of new methods and forms of learning in order to improve the effectiveness of the educational process in higher education. Professional training of future teachers of informatics relies on technologies and teaching models necessary for effective and quality training of

modern pedagogical staff. Serious attention of researchers is paid to the problems of personality-oriented approach in education and various methods for assimilation of theoretical and practical material in the educational process.

Discussions. The course of the system of joint open learning in the training of future teachers of informatics contains seven modules. The initial module is devoted to the basic provisions of the course, it contains an explanatory note with the goals, objectives of the discipline, competences to be formed, as well as a calendar-thematic plan and the necessary bibliographic list. This module contains flow charts for the organisation of the learning process of full-time and part-time students. They list the main forms of work of students during the semester and criteria for their evaluation according to the point-rating system used in the educational process. This block also contains a list of questions for credit and a page of assessment of students' personal qualities. The next four modules are devoted to the topics of the discipline. They contain theoretical materials on educational sections with examples of solving typical problems and descriptions of tasks performed by future teachers of informatics. The sixth module contains a laboratory practice, which takes into account the specifics of working with students, describes the studied material on theory in more detail, and partially modifies the tasks offered to students. The main emphasis in the study of the topic is placed on the independent work of students and remote communication with the teacher (Khalil and Ebner, 2017). The last, seventh module contains the final test on the discipline, including 10 theoretical and practical questions randomly selected from the task bank containing 10 variants of test tasks. Thus, the environment of the collaborative open learning system allows to form a separate test for each student, the time of fulfilment of which is limited to 40 minutes. It should be noted that all answers are automatically evaluated by the computer and the student has the opportunity to directly familiarise himself / herself with the results of the tasks.

The most common tool in the controlling module is a fully or fully automated system of intermediate and final tests, which allows to get the result «here and now», to stimulate future teachers of computer science to achieve better results. A rating system can also be used through gamification tools in the form of, for example, a system of badges, ranks or awards. The module should necessarily include the possibility of self-assessment or cross-assessment of completed practicals or essays, and in some situations this may also be a way of monetising the course. The self-assessment process, according to experts, should be automated and offered to students as a platform service (Zubrilin, 2021). Another important element of the supervisory module is the completion of a qualification paper as a final control of the course. The assessment process should be simplified and automated as much as possible. Already in this module, a small element of interaction of the whole group studying the course can be envisaged in the form of a discussion platform (forum) in the organisation of the evaluation process.

Immediately, besides understanding the structure of a collaborative open learning system, it is necessary to consider its duration and costs. Here there are different

schemes that can be found at leading providers, but the established practice shows that most often a short-term course of collaborative open learning lasts about 2-4 weeks, medium-term courses - 4-9 weeks, long-term courses - from 9 weeks (a year) and more. When considering the cost of completing course modules, it is worth considering that it is better to allocate no more than 10 hours per week to the study of one topic or course element, and this is easy to calculate, as all content is presented in electronic form and is clearly scalable (Slavin, 2017). It should be noted that, as a rule, information technologies are not created specifically for solving educational tasks, i.e. technologies turn out to be primary and independent of didactic content. For example, the emergence of multimedia technology was in no way connected with the desire of teachers to increase the visibility of their lectures. First, some new technology is developed, then the question of the possibility and expediency of its use in the training of future teachers of informatics is solved. On the other hand, the use of ICT in solving any pedagogical task is not an end in itself - it is determined (as, indeed, for any innovation) by the didactic effect achieved with its help.

A number of modern and promising ICT-technologies can be singled out precisely from the standpoint of a significant and proven positive result of their use in the teaching process. Cloud technologies allow the teacher to create information resources and save them in networked information repositories. The undoubted advantages of such technologies are:

- mobility - the user has no permanent attachment to a single workplace; documents are stored in the cloud and, therefore, access to it for study or editing is possible from any device connected to the Internet;

- cost-effectiveness - the user does not need to buy expensive computers and software, many cloud services and applications are free of charge;

- reliable storage of information.

Examples of comprehensive cloud-based collaborative open learning solutions include Google Apps for Education and Microsoft Live edu, which provide communication support in the form of instant messaging programmes along with an address book and assignment scheduler. Document creation applications are also provided, allowing you to work with text, spreadsheets and presentations, as well as create websites. These documents can be co-edited with other users. Future computer science teachers are given a significant space for storing documents of all types, which are available to them even after graduation. Let us consider some of the key theoretical aspects and didactic principles:

- a constructivist approach to teaching computer science emphasises the importance of the learner's active role in constructing their knowledge. The learner constructs an understanding of computer science through interaction with materials and peers. A collaborative open learning system, by providing opportunities for working together and sharing experiences, is consistent with this principle.

- information technology plays a central role in computer science learning. A collaborative open learning system allows the use of a variety of educational

technologies such as online platforms, web services and collaborative tools to make learning more interactive and accessible.

- the didactic systems approach involves viewing computer science education as a complex system involving the interaction of learners, educators, learning materials and technologies.

- didactic principles of activity and autonomy imply stimulating students to study computer science independently. A collaborative open learning system can provide tools for independent information retrieval and problem solving, which contributes to the development of self-education skills.

- each student is unique and the educational process should be adapted to his / her needs and abilities. Collaborative open learning allows for individualisation of learning by giving students the opportunity to choose and personalise their learning path.

- collaborative learning tends to stimulate the sharing of knowledge and experiences among students. Collaborative open learning fosters the development of teamwork, communication and co-operation skills, which is important in computer science, where complex problems are often solved in teams.

- didactic principles involve continuous assessment of student understanding and performance. The collaborative open learning system allows collecting data on the learning process and providing feedback to both teachers and students.

Analysing these theoretical aspects and didactic principles provides a framework for understanding how a collaborative open learning system can be integrated into computer science instruction. This allows for the development of strategies that are subject-specific and student-centred, as well as facilitating a more effective and interactive educational process.

The environment is built and developed by the learner himself, including all components required for mastering educational programmes - content, tools, and communication. The environment is certainly expandable - as new disciplines appear, the student (future teacher of informatics) creates corresponding sections in it. A significant argument in favour of such an environment is the possibility of its development and use after graduation, which provides practical support for the concept of distributed lifelong learning. Of course, the teacher has the opportunity to place in the environment all the necessary teaching materials or links to them and the necessary cloud-based tools.

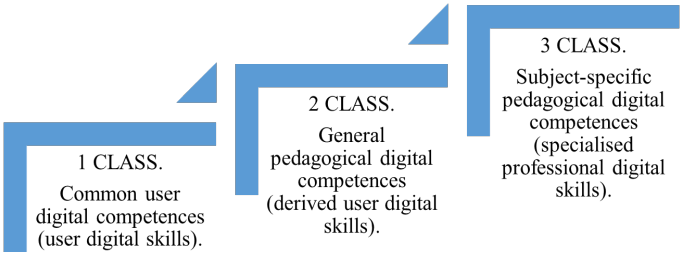

Figure 2 — Classes of digital competences of a future computer science teacher within the framework of the system of collaborative open learning

The experience of implementing the system of collaborative open learning in the educational process of the university has revealed the wide possibilities of the used software environment, which allows applying various forms of dialogue communication with students (future computer science teachers) (Moore, 2014). The importance of the last factor is connected with the fact that with a small amount of time it is possible to increase the efficiency of the educational process in higher education institutions. The organisation of the system of joint open learning includes such elements as:

- classless coursework - it implies block-modular construction of courses, content and time modules;

- mobile (dynamic) timetable - allows to ensure the rational use of teaching time and differentiated approach to the distribution of teaching load.

Thus, the system of collaborative open learning in teaching informatics is an innovative approach that has the following advantages:

1. Interactivity and adaptability. Collaborative open learning system allows students to learn in an interactive environment, which is especially important in computer science teaching. Students can interact with learning materials, testing systems, and other students, which makes learning more engaging and effective.

2. Collaborative working. The collaborative open learning system promotes the development of teamwork skills, which is important in computer science, where team software development and complex problem solving are often required.

3. Individualisation of learning. The collaborative open learning system allows teachers to tailor materials and assignments to each student's individual needs and proficiency level. This helps students learn at their own pace.

4. Accessibility and flexibility. A collaborative open learning system can provide access to learning at any time and from anywhere in the world, which is especially relevant in computer science education.

5. Cost reduction. Online education using a collaborative open learning system can be more cost-effective than traditional present-based learning due to the reduced costs of physical resources and infrastructure.

6. Keeping up to date. Teaching using collaborative open learning system prepares students to use modern information technology and teaching methods, which is important for future computer science educators.

In turn, the evaluation of the effectiveness of using collaborative open learning system in the training of future computer science teachers depends on various factors, including the context and learning objectives. The table below presents the levels of effectiveness analysis.

Table 1 — Performance evaluation system

№	Levels	Essence
1	Level of achievement of educational goals	The effectiveness of the collaborative open learning system is assessed by the degree to which the educational programmes and students achieve the set educational goals. If students successfully assimilate the necessary knowledge and skills, we can talk about high efficiency.

2	Activity and participation of students	Effective learning with the use of collaborative open learning system implies active participation of students, their involvement in discussions, projects and assignments. This can be an indicator of the effectiveness of student involvement in the learning process.
3	Quality of feedback	Feedback and assessment of learning outcomes play an important role in evaluating effectiveness. The level of detail and usefulness of feedback to students is important.
4	Level of student satisfaction	Students' views on the quality and satisfaction with the training are also important indicators. Surveys and feedback from students can provide insight into their perceptions of learning.
5	Comparison with traditional teaching methods	In order to evaluate the effectiveness of a collaborative open learning system, it is useful to make a comparative analysis with traditional teaching methods. The effectiveness of COL can be measured against traditional computer science courses.
6	Specific indicators of success	Depending on the specific educational goals, specific success indicators can be established, such as successful completion of projects, passing exams, etc.
7	Long-term results	The effectiveness of a collaborative open learning system can also be evaluated by analysing long-term learning outcomes such as career development and student success after graduation.

In general, the effectiveness of a collaborative open learning system in the training of future computer science teachers depends on the extent to which it is adapted to the specific needs and objectives of the training programme. The evaluation should be comprehensive and take into account a variety of success indicators in order to give an objective picture of how well this teaching method meets the goals and expectations of the educational process.

Conclusion. In conclusion, it should be noted that collaborative open learning systems as an information and communication toolkit (a promising form of e-learning in higher education) sets a new vector of innovative development of the system of training future teachers of computer science:

- openness and individualisation of education;
- high potential of educational multimedia content, allowing to use technical and software capabilities of modern information technologies to the maximum;
- interactive mode with the use of network and mobile interaction services.

Compliance with the above conditions, which determine the methodological vector for the implementation of subject-oriented educational technology, the organization of training using a system of collaborative open learning, the transition to various forms of presentation and control of material, the development and implementation of network educational programs, will allow future computer science teachers to develop and develop by mastering educational information, new skills and abilities, manifested in the ability to integrate acquired knowledge, contextually apply, and therefore master the competencies necessary both for interpersonal dialogue and for a future profession.

The use of a system of collaborative open learning as part of the development of curriculum disciplines through the organization of extracurricular independent

work will allow students (bachelors of pedagogical universities) to formulate the content of their individual educational trajectory, as well as the skill of continuous development of a teacher's digital culture in future professional activities.

The study of the didactic foundations of using a collaborative open learning system in the preparation of future computer science teachers demonstrates the prospects of this approach in the modern educational environment and provides the basis for further research and practical implementation of this methodology in computer science teaching.

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