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PRINCIPLES FOR USING BLENDED LEARNING TO DEVELOP STUDENT COMPETENCE IN OBJECT-ORIENTED PROGRAMMING LANGUAGES

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Abstract. *In this article, the principles used in the use of digital educational technologies to improve the effectiveness of teaching subjects were studied, and the principles relied on for the use of blended learning in the development of students' competence in object-oriented programming languages were clarified.*

Key words: *digital educational technology, blended learning, object-oriented programming, principle, Flipped Classroom, information-education, educational portal, website.*

Today, due to the widespread application of information and communication technologies to all areas of society and the improvement of computer technologies, there is a need to develop software products suitable for them. This, in turn, requires the development of students' interest in programming, including object-oriented programming, creativity and competence development in higher education institutions. Therefore, in accordance with the methodological features of pedagogical research in the training of information technology specialists, it remains urgent to develop modern approaches to increase the effectiveness of teaching object-oriented programming languages and develop students' programming competence.

Earlier research was devoted to this problem and aimed at developing the competence of students studying information technologies in Java, Python, C++, Ruby, C#, JavaScript, Objective-C, PHP programming languages.

In order to develop students' competence in object-oriented programming languages, it is necessary to first clarify the principles on which the use of blended learning technology is based and, if necessary, improve it.

In order to clarify or improve the principles that will be relied upon to apply mixed educational technology to programming practice, it is necessary to first analyze the principles recommended by scientists in the use of digital educational tools to increase the effectiveness of teaching subjects. Because digital educational tools are used in the application of mixed education technology. Therefore, digital educational tools serve as the main foundation for the application of blended learning technology.

In this regard, i.e., studies on the principles of using modern educational tools, didactic electronic learning resources, distance learning systems, and information-educational environments to improve the effectiveness of teaching subjects, M.H. Lutfillayev [1], A.O. Norbekov [2], U.B.

Bakhodirova [3], U.M. Mirsanov [4], A.B. Janzakov [5], J.A. Elmurodov [6], P.M. Jalolova [7], J.J. Karbozova [8], A.V. Obrubova [9], H.B. Nikadambayeva [10] were researched.

In particular, M.H. Lutfillayev clarified the principles that are based on the teaching of natural sciences with the help of electronic educational resources. In his research, he developed principles for e-learning resources to be created for natural sciences [1]. A.O. Norbekov improved the principles of the use of information-educational environments in the teaching of "Computer support" in higher educational institutions of pedagogy [2]. U.B. Bakhodirova developed the principles based on the use of virtual educational technologies in the teaching of microbiology [3]. U.M. Mirsanov theoretically and practically based the principles used to increase the effectiveness of teaching mathematics with the help of practical programs in general secondary schools [4]. A.B. Janzakov scientifically substantiated the principles used in teaching geography using information technology tools in general secondary schools [5]. J.A. Elmurodov recommended the principles used in the use of open information-educational environments in the teaching of geometry in general secondary schools [6]. H.B. Nikadambayeva developed principles that are based on the teaching of geography in higher education institutions with the help of an electronic teaching-methodological complex [10]. J. J. Karbozova improved the principles used in the teaching of informatics and information technologies in higher education institutions using didactic electronic learning resources [8]. A. V. Obrubova developed the principles that are used in the teaching of visual arts using distance learning systems [9]. P.M. Jalolova recommended the principles based on the use of information technologies in the laboratory sessions on "Atomic Physics" in higher education [7].

Such studies are in the articles of N.N. Khakhonova [11], T.V. Plakhotya [11], I.V. Serjenko [12] and R. Hamdamov [23], U.Sh. Begimkulov [13], N.I. Taylakov [13], L.A. Mierin [14]. , N.N.Bikova [14], Ye.V.Zarukina [14], F.L.Ratner [15], V.A.Krasilnikova [16] and their methodological works.

According to these scientists, the main ideas of the principles of education depend on the basis of any elementary theory, law, concept of education. A set of principles constitutes a conceptual system with a certain methodological or ideological basis. Different pedagogic systems (technologies) may differ in their views on education and the system of principles they apply to practice. Therefore, on the one hand, principles describe some methodological bases of educational theory, on the other hand, they perform tasks such as normative requirements for organizing practical activities.

However, depending on the content of the subjects, the psychological characteristics of the students, and the availability of instructional manuals, the content of the principles relied on varies. For example, if the principle of instructiveness is useful in the process of teaching mathematics when showing graphs, spheres and geometric shapes, it can be useful to use such things as showing grammar tables, writing on the board, and drawing drawings in language teaching [4]. In programming, the principle of instruction requires the use of video lessons in programming problems and preparing practical programs that manage various objects. Therefore, it is necessary to clarify the principles based on the characteristics of the subjects, the educational tools used, and the uniqueness of the educational technologies.

Therefore, within the framework of the research, based on the analysis of the scientific and methodological works of the above-mentioned scientists, the principles relied on for the use of mixed education technology in the development of students' competence in object-oriented programming languages were clarified:

The principle of effective use of digital tools. This principle implies the formation of cognitive thinking and visual education in students by demonstrating educational objects, processes and events [13]. This principle implies the use of digital technologies to improve the effectiveness of teaching programming languages. In this regard, according to U.M. Mirsanov [17], the use of various digital educational tools (video lessons, practical programs for analyzing program codes, guiding and teaching pedagogical software tools) in teaching programming languages, learning the subject significantly increases the effectiveness of teaching. Therefore, when teaching object-oriented programming languages, it is necessary to use electronic interactive educational materials prepared on the basis of methodological, psychological, psychophysiological and technical principles and adapted to the web. It allows students to independently learn object-oriented programming languages with the help of such tools. Therefore, in the development of students' competence in object-oriented programming languages, it is necessary to rely on the principle of using digital tools of mixed educational technology.
The principle of sequence. This principle implies following a sequence in teaching to improve the effectiveness of teaching object-oriented programming languages and to develop the competence of students: first, the student learns the material related to the new topic, then the professor-teacher acquire theoretical knowledge and then apply it in practice. That is, it is necessary to develop software products that manage various visual projects and objects. To a large extent, this principle is compatible with the flipped classroom model (Flipped Classroom technology). "Flipped Classroom" technology - students are given a new lesson topic as a task for independent study. In this, students listen to video lessons on the topic, search for and analyze theoretical information.

At the same time, the importance of the "Flipped Classroom" technology allows students who have previously familiarized themselves with the training material to identify their unclear aspects, apply the knowledge they have acquired, and also share practical experience with each other. During the training, the professor-teacher is a consultant, and students are directed to work both individually and in groups [18].

Taking into account such possibilities of the "Flipped Classroom" technology, it should be used to increase the effectiveness of teaching object-oriented programming languages and to develop students' programming competence. This, in turn, requires that mixed education technology relies on the principle of sequence.

A practice-oriented principle. This principle requires applying theoretical knowledge to practice. In this regard, according to P.M. Jalolova [7], U.M. Bakhodirova [3], A.O. Norbekov [2], this principle requires ensuring the interdependence of theoretical and practical training of science. This requires practical application of theoretical information about object-oriented programming languages. According to O.I.Vaganova [19], I.V.Vyatkina [20], J.V.Smirnova [19], A.V.Trutanova [19], the practice-oriented approach changes the educational and cognitive activity of the learner from the passive object of pedagogical influence. makes it possible to become an active subject. They say that the didactic goals of the practice-oriented approach are: strengthening and systematization of theoretical knowledge; acquisition of skills and competencies in science and formation of new skills and competencies; bringing the educational process closer to real life conditions; learning new methods of scientific research; development of initiative and independence**.**

Through the practice-oriented approach of students, their practical skills are formed from Java, Python, C++, Ruby, C#, JavaScript, Objective-C, PHP programming languages. It involves modeling various issues with the help of computer technology, solving and analyzing issues based on programming with the help of object-oriented programming languages. In this process, the collective activity of students is created, based on the implementation of practical projects for object management, there is an opportunity to develop their necessary programming competence.

The principle of continuity. This principle performs a methodological task in pedagogical and didactic research. In increasing the effectiveness of teaching object-oriented programming languages, the principle of continuity in the application of mixed educational technology means continuous education using educational environments located at the addresses of the global network. Because designing various applications and software products that manage objects using object-oriented programming languages requires a lot of time and several levels of practical knowledge. Therefore, following the principle of continuity, students are required to independently search for new information about object-oriented programming languages from information-educational environments, educational portals, and educational websites. Therefore, it is important to rely on the principle of continuity in learning object-oriented programming languages when using blended learning technology.

Principle of support. This principle requires that students can quickly answer questions about object-oriented programming languages by asking the professor online without waiting for the next face-to-face class. It is effective to conduct online quizzes using virtual environments.

The principle of training personalization. This principle requires students to take advantage of their unique learning needs when learning object-oriented programming languages and performing various projects. Therefore, it is important to approach learning object-oriented programming languages based on the needs of each student, not a group. Also, the principle of personalization of training is considered important in increasing the effectiveness of teaching object-oriented programming languages and in developing the competence of students**.**

The principle of personalization includes the following: 1) The principle of increasing the democratic nature of education. This principle implies using the capabilities of the global network, i.e. educational environments for programming, in teaching object-oriented programming languages and developing students' logical, algorithmic thinking about programming; 2) The principle of independent education. This principle envisages the independent learning of students to prepare various practical projects using object-oriented programming languages. Students learn object-oriented programming languages independently. This implies the use of information-educational environments and virtual environments; 3) The principle of self-assessment and control. This principle provides for students' self-assessment and control of object-oriented programming languages. It is considered appropriate to use programs that determine the correctness or error of the program code and tests of various levels. In this way, students will have the opportunity to analyze and synthesize software products, generalize results, and improve logical thinking using object-oriented programming languages.

The principle of using virtual environments. This principle refers to the remote use of virtual environments by students to learn object-oriented programming languages and to prepare projects as a team. Learning to program as a remote team in a virtual environment is significantly different from learning individually. "Because students working as a remote team in a virtual environment correct the shortcomings of their peers and offer their own solutions by discussing the program code of a given problem online based on interactive ideas. This, in turn, helps to

develop students' logical and algorithmic thinking about programming and to develop the competence of designing various complex practical projects. Therefore, today it is necessary to form a culture of remote team learning of programming using virtual environments in the independent educational activities of students" [17]. For this, it is necessary to pay attention to the following: 1) forming the culture of students to learn programming as a team from virtual environments, increasing their motivation and creative ability, and involving them in solving scientific and practical problems; 2) perform practical tasks related to programming languages using educational environments; 3) formation of skills in the use of distance learning systems related to programming languages.

As a result, the skills of students to create practical programs that manage various objects using virtual environments are formed. Also, every student has a desire to create the necessary information base for themselves. In this process, the culture of working as a team is formed in students to solve the problem set by the professor, and they also have the opportunity to enrich their knowledge with their peers. In this process, educational environments enriched with new knowledge serve as an effective tool for them.

In conclusion, it is recommended to use the principles identified in the research in the development of students' competence in object-oriented programming languages, i.e. Java, Python, C++, Ruby, C#, JavaScript, Objective-C, PHP, using blended learning technology. .

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