PREPARING FUTURE COMPUTER SCIENCE TEACHERS THROUGH USING INNOVATIVE TECHNOLOGIES

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ПОДГОТОВКА БУДУЩИХ ПРЕПОДАВАТЕЛЕЙ ИНФОРМАТИКИ ПОСРЕДСТВОМ ИСПОЛЬЗОВАНИЯ ИННОВАЦИОННЫХ ТЕХНОЛОГИЙ

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Abstract. This article presents theoretical and practical information and recommendations on the use of innovative technologies in the training of future computer science teachers, in particular Collaborative Learning technology in teaching the science of programming basics, and the development of students' digital and software-technological competencies. new approaches and issues are discussed.

Аннотация. Представлена теоретико-практическая информация и рекомендации по использованию инновационных технологий в подготовке будущих преподавателей информатики, в частности, технологии "Collaborative learning" в процессе преподавания дисциплины "Основы программирования", рассматриваются новые подходы и вопросы развития цифровых и программно-технологических компетенций у учащихся.

In the global context, integrating innovative technologies into the educational process, understanding their didactic foundations, developing innovative methods, enhancing students' creative and cognitive thinking, improving general competencies related to technology and science, modeling creative activities, teaching specialized subjects inclusively, selecting educational content, and effectively utilizing innovative and information technologies play a crucial role in advancing education.

The effective use of innovative technologies in preparing future computer science teachers ensures the efficiency of teaching professional subjects. It is necessary to utilize the required

technical and methodological resources, adapt existing methods and tools to modern requirements, and continually enhance the normative-legal and material-technical base to achieve this goal.

In Uzbekistan, the use of modern computer technologies in higher education, focusing on training highly qualified, competitive specialists, has been given significant attention. This has been reflected in the updated normative-legal and material-technical base as part of the new development strategy of Uzbekistan, which prioritizes ensuring open and quality education for youth at all levels.

The training of future computer science teachers poses pedagogical challenges and requires analytical information about the practical situation of teaching, integration of professional subjects with other disciplines, and a series of studies on the content and methodology.

Today's labor market not only values the professional knowledge and skills of future computer science teachers but also emphasizes their ability to think independently, solve various problems critically, utilize modern technologies to find rational solutions to issues, envision different ways of using existing knowledge, and foster the ability to generate new ideas [4]. Therefore, it is essential to ensure that the content of any subject being taught to future computer science teachers is continuously updated in a manner that is relevant to their professional activities. This is considered the mainstay of a system for training highly competitive personnel possessing advanced competencies.

In Uzbekistan, the introduction of innovative technologies into the education system, the use of information and communication technologies in organizing education, the improvement of the system for preparing future computer science teachers, and the development of a methodology for teaching computer science and information technology. Issues related to quantifying the education system in friendly countries, mechanisms for implementing distance education, the theory and practice of teaching computer science and information technology, and research on the theoretical and practical aspects of preparing future computer science teachers have been addressed. Foreign scholars who focus on the professional development of future specialists, have conducted research on shaping necessary professional qualities and skills, as well as the use of innovative methods in teaching and creating effective models in education. Research on logical and algorithmic thinking in students, as well as innovative approaches in teaching computer science subjects, has been explored by. These studies contribute to the ongoing development and improvement of teaching methodologies and the practical aspects of preparing future computer science teachers [1].

According to the results of the analysis, it has been identified that the majority of them lack sufficient research on teaching methods and the use of interdisciplinary integration. Additionally, there is a lack of attention to issues related to solving practical problems aimed at improving skills. Moreover, in the preparation of future informatics teachers in higher education institutions, insufficient attention has been given to teaching the Fundamentals of Programming using innovative technologies. Consequently, it is crucial to incorporate teaching methodologies that focus on logical thinking, decision-making, and drawing conclusions in the practical activities of students during Programming Fundamentals classes. Teaching topics such as the principles of programming languages, analysis and synthesis of logical schemes, and issues related to optimization are essential. In this context, conducting scientific research in this direction becomes imperative.

Currently, various methodologies and approaches are used to manage and direct learning. These include collaborative goals, developing strategies and tactics, active utilization of ideas and reflections, participants' responsibility, and features specific to teaching directed towards individuals by Agile technology [2]. Attributes such as convenience, curiosity, collaboration, and interactive features are incorporated. Mind maps have been specifically designed for systematic analysis and synthesis of words, ideas, tasks, or other features that are used to open up the main

concept or idea of a new topic [5]. Collaborative learning technologies [6], which are essential in developing competencies in students for the 21st century, such as critical thinking, creativity, communication, and collaborative skills, are also widely used in educational institutions [3].

In the current era, the use of modern learning technologies, as mentioned above, ensures high efficiency in teaching the "Fundamentals of Programming" subject. The main purpose of teaching the Fundamentals of Programming is to provide students with the ability to solve complex problems in mathematics, physics, chemistry, biology, create practical programs for digital devices, develop web applications for the Internet, and optimize teaching materials for educational institutions, enterprises, and organizations, as well as to teach methods of ensuring information security.

Customizing educational materials based on the individuality of the subject in all specialized disciplines enhances the quality of learning. However, there is still an issue that the knowledge base of students in higher education institutions is not uniform. This results in different outcomes when students perform assignments given in various subjects. The solution lies in students gaining mutual experience, shaping approaches to solving various problems, and teaching collaborative learning technologies in imparting education effectively. This is particularly important in preparing future informatics teachers. The technology that synthesizes the important aspects of preparing future informatics teachers has been studied in the course of the conducted research. Collaborative Learning in teaching the Fundamentals of Programming has two main forms: live and online collaborations.

1. In live collaborations, students are taught in groups, utilizing methods that shape collaboration, such as working in small groups, intellectual attack, keys technologies, and others, during the research, topics of the "Fundamentals of Programming" subject are divided among students for independent work, and group assignments are given for the students to complete. Notably, solving issues related to the "Fundamentals of Programming" requires significant time and effort from students.

2. On the other hand, online collaborations involve teaching the "Fundamentals of Programming" subject within the framework of classroom lectures through authoring software products (mobile applications or platforms) and other online learning platforms (Moodle, Hemis and others). The Collaborative Learning technology provides the student with a specific assignment during the "Fundamentals of Programming" subject, for which he must use online collaborations based on the software product for authoring, managing virtual training sessions (LMS), managing internal content management systems (CMS), public open online courses (MOOC) to collect materials, and effectively use global network search systems.

As noted, the use of modern learning technologies plays a crucial role in ensuring high efficiency in teaching the "Fundamentals of Programming" subject. The collaborative learning technology is based on a systematic and active approach to education, and this technology shapes the development of new knowledge, skills, and abilities in students through independent work with information. In preparing future informatics teachers, the technology of teaching the "Fundamentals of Programming" subject using collaborative learning technology has two forms: live and online collaborations. In live collaborations, teaching the "Fundamentals of Programming" subject is given to students in groups by shaping collaborative work methods, such as working in small groups, intellectual attacks, keys technologies, and others. During the research, it was revealed that solving issues related to the "Fundamentals of Programming" subject, especially in small groups, enhances the creativity and enthusiasm of students in practical work and improves the efficiency of group work. In some cases, collaborative learning in the "Fundamentals of Programming" subject with a large group or team can make it easier for students to create and complete projects.

Collaborative programming is the process of working on a project with multiple members or a team on the same code base. This is usually done by dividing the project into tasks and writing the code collectively or by testing each other's work. One advantage of collaborative programming is that fewer errors occur in the project since the code quality is improved, and the project can be finished more quickly. In some cases, even if one member of the team leaves the project, another member can take over their tasks, ensuring the continuity of the project.

In conclusion, collaborative programming in teaching the "Fundamentals of Programming" subject is an effective way to shape students' competencies. This method enhances logical thinking, improves attention and diligence, develops creativity, and sharpens problem-solving skills.

Collaborative coding is the joint work of several project members on a single code base. This typically involves changing the code to improve its quality and reliability, with members reviewing each other's work. As emphasized earlier, without choosing the right strategy, not all the advantages mentioned can be achieved. Therefore, before deciding to go the collaborative route, it is crucial to study both the positive and negative aspects related to a specific project. In teaching collaborative programming, students need to familiarize themselves with the necessary tools and platforms used in their projects. Collaboration tools in programming are software applications that facilitate collaboration on a project, enabling version control, code inspection, communication, and project management. During the analysis conducted, the platforms necessary for students to enhance their knowledge and skills, both in terms of collaboration in coding and using collaborative tools (Visual Studio Live Share, CodePen, Codeanywhere, CodeTogether and Cloud9), have been identified. These tools provide students with the opportunity to work collaboratively from any location and device on coding, editing, and managing projects.

Collaborative Learning technology is based on structured and active guidance, and this technology enables students to independently work with information during the "Programming Basics" classes, shaping new knowledge, skills, and abilities through independent work on information, such as creativity, cognitive thinking, and algorithmic thinking.

In the preparation of future computer science teachers, the teaching methodology of the fundamentals of programming should be refined through the integration of innovative technologies.

The following key points have been identified based on the results of scientific research in this area:

Organizing and Conducting Activities:

1. Utilize innovative technologies and effective didactic tools to organize and conduct activities in teaching "Programming Basics" to prepare bachelor's degree students in the field of computer science. Enhance the effectiveness of teaching programming languages by applying innovative technologies and didactic tools, ensuring the development of competencies related to programming.

2. Integration of Subject and Production:

Ensure the integration of subject matter and production in organizing and conducting activities for teaching "Programming Basics".

Develop a motivational-purposeful, active, competent, organized, technological, creative approach in pedagogical, psychological, didactic, creative, technological, integrative questions, and non-standard tasks to ensure the integration of the subject and production in organizing and conducting activities.

Use of Collaborative Learning Technologies:

1. Employ collaborative learning technologies and didactic tools effectively in teaching "Programming Basics" to enhance students' motivation for programming. Improve logical, algorithmic, creative, cognitive thinking, as well as the development of skills in preparing qualified

specialists by using Collaborative Learning technologies and applying didactic tools in organizing and conducting activities.

2. Recommendations for Future Computer Science Teachers:

Use the innovative methodological provision of the professional competency of the "Programming Basics" subject in teaching, taking advantage of Collaborative Learning technologies. In the preparation of future computer science teachers, it is advisable to use mobile devices and applications to shape the competencies related to the "Programming Basics" subject. This provides students with the opportunity to learn "anywhere, anytime" and promotes collaborative learning.

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