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STAGES OF IMPROVING THE SOFTWARE AND METHODOLOGICAL SUPPORT FOR TEACHING COMPUTER SCIENCE AND ITS TEACHING METHODS

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Today, technological progress is rapidly entering the education system. Information technologies are becoming increasingly important not only in higher education, but also at the primary education stage. Teaching informatics and information technologies starting from primary grades helps students acquire modern knowledge and skills, develop their thinking, and increase digital literacy. A number of reforms are being implemented in Uzbekistan to introduce informatics and information technologies into the education system. Despite the fact that primary school students are still young, their familiarity with technologies should be high. Because in today's modern world, technological literacy is becoming one of the main requirements for any profession. Therefore, teaching informatics and information technologies in primary education is one of the important scientific and practical issues. This process allows students to form the ability to use technological tools correctly and effectively. The integration of informatics and information technologies into the educational process serves to increase students' interest in the lesson, expand opportunities for independent learning, and increase the effectiveness of teaching. Through electronic textbooks, multimedia resources, online platforms, and interactive programs, students' interest in science increases, and independent thinking and problem-solving skills are formed in them. At the same time, there are a number of problems in the introduction of informatics and information technologies in primary education [1]. In particular, factors such as the lack of sufficient technical



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equipment in all schools and the lack of sufficient knowledge and skills of teachers in the effective use of information technologies can affect the effectiveness of this process. Therefore, improving the methodology of teaching informatics, conducting special training for teachers, and strengthening the technical base are of great importance. This article analyzes the role of informatics and information technologies in primary education, their impact on students, and their advantages in the educational process. Also, methods of effective application of technological approaches and ways to eliminate existing problems are considered. The introduction of informatics and information technologies at the primary education stage plays an important role in increasing the efficiency of the educational process. This subject serves to form students' initial technological skills, develop their thinking and improve their problem-solving abilities. Through informatics lessons, students have the opportunity to work with software, develop computer literacy, understand the principles of information security, and master innovative technologies. The introduction of informatics and information technologies in primary grades not only increases students' interest in science, but also develops their logical thinking skills. Using interactive teaching methods, students are given the opportunity to independently obtain knowledge, complete assigned tasks with a creative approach, and apply modern technologies in practice. This paves the way for students to succeed in any profession in the future. The integration of information technologies into the educational process is carried out in several main areas. Firstly, the use of modern educational platforms and online resources expands students' opportunities for independent learning. For example, through electronic textbooks, interactive educational programs and games, students can learn science in an interesting way. Secondly, through presentations, animations and video lessons using multimedia



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technologies, the process of students' learning becomes more understandable and effective. In addition, it is important to take into account the age characteristics of students when organizing computer science lessons in primary education. For young children, working with computers and digital technologies should not only be interesting, but also an integral part of the learning process. Therefore, the use of interactive games, visual materials and experience-based tasks in computer science lessons will yield effective results. At the same time, the use of computer science and information technologies in primary education also requires teachers to acquire new skills. Teachers must be able to use modern technologies, work with digital resources and apply innovative approaches. Therefore, it is important to establish special seminars, courses, and advanced training programs for educators.

The process of enhancing software and methodological support for teaching computer science involves multiple structured stages aimed at improving the quality and effectiveness of education. Initially, the diagnostic and analytical stage is crucial, where educators and developers assess the existing software tools and teaching methodologies. This evaluation includes identifying shortcomings, such as limited interactivity, outdated content, or insufficient alignment with educational standards. Simultaneously, feedback from teachers and students is gathered to understand practical challenges. Through data collection and analysis, stakeholders develop a clear picture of current gaps, which forms the foundation for informed improvement efforts. Following the diagnostic phase, the conceptualization and design stage takes place. Here, based on identified needs and objectives, the goals for both software and pedagogical methods are defined. Theoretical frameworks, such as constructivist learning theory and cognitive development theories, guide the design process to ensure age-appropriate and



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cognitively suitable content. Developers and educators collaborate to outline the functionalities required in new or improved software tools, focusing on usability, engagement, and adaptability. Methodologically, this stage involves designing new teaching approaches that emphasize active learning, problem-solving, and integration of technology as a medium rather than an end[2].

The third stage, development of prototype software and teaching materials, transforms theoretical designs into tangible educational resources. Software developers create initial versions incorporating elements like interactive coding environments, visual programming interfaces, and gamified learning experiences targeted at primary or secondary education levels. Concurrently, teachers develop corresponding lesson plans, exercises, and assessment tools aligned with the new software features. Pilot versions of teaching methodologies that promote collaborative learning, project-based learning, and differentiated instruction are also formulated. This stage demands iterative testing to ensure compatibility between technology and pedagogy. Once prototypes are ready, the pilot implementation and iterative feedback stage begins. Selected schools and classrooms become testing grounds for the new software tools and teaching methods. During this phase, continuous monitoring and feedback collection from both teachers and students play a pivotal role. Issues related to software bugs, interface challenges, or pedagogical effectiveness are observed and documented. Moreover, the engagement levels and comprehension outcomes among students provide data on the success of the new approach. This iterative feedback loop allows developers and educators to fine-tune materials and software features before wide-scale deployment.

The next step involves the formal validation and refinement stage, which focuses on extensive testing and ensuring that improvements meet educational standards



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and learning objectives. This includes conducting controlled studies that measure the impact of the new software and methods on student performance, motivation, and skills acquisition. Academic experts and curriculum designers review and approve the content's alignment with the national or regional educational frameworks. Additionally, accessibility features and inclusiveness are carefully evaluated to guarantee support for diverse learners, including those with special educational needs. Subsequently, the training and professional development stage addresses the critical role of teachers in successful implementation. Without adequate preparation, even the most advanced software and innovative methodologies may fail to produce the desired educational outcomes. Thus, comprehensive training programs are organized to familiarize educators with new digital tools, pedagogical principles, and classroom management strategies needed for effective Informatics instruction. Workshops, seminars, online courses, and peer collaboration platforms serve to enhance teachers' confidence and competence, fostering a community of practice that supports ongoing improvement [3].

The seventh stage is wide-scale integration and continuous support. After successful validation and teacher training, the improved software and methodologies are introduced systematically across educational institutions. This integration requires supportive infrastructure such as reliable hardware and internet access, as well as ongoing technical assistance. Educational administrators and policymakers play a role in ensuring resources are allocated efficiently and sustainability measures are in place. Teachers benefit from continued access to help desks, refresher courses, and forums for sharing best practices to maintain high-quality delivery. Following integration, it is essential to engage in the monitoring and assessment stage, which constitutes an ongoing



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effort to evaluate the effectiveness and relevance of software and teaching methods. Data on student achievements, engagement, and attitudes toward computer science are gathered through formative and summative assessments. Surveys, classroom observations, and software usage analytics inform continuous improvement cycles. This stage ensures that the educational tools remain responsive to evolving technological trends and pedagogical research, preventing stagnation and obsolescence. The penultimate stage focuses on innovation and adaptation prompted by advances in technology and pedagogy. The rapid growth of fields such as artificial intelligence, virtual reality, and adaptive learning environments provides new opportunities for enriching computer science education. Systematic efforts are made to integrate emerging technologies into software, update curricula, and refine teaching techniques. Ongoing research collaborations between universities, industry, and educational institutions stimulate creativity and responsiveness to future skill demands.

Finally, the process culminates in the institutionalization and policy support stage, which embeds improvements into the broader educational ecosystem. This stage ensures that enhanced software and methodologies are not temporary initiatives but become standard practice supported by educational policies and continuous funding. Curriculum frameworks incorporate the updated computer science content and teaching approaches, standardized assessments reflect these changes, and national education bodies promote equity in technology access. Through policy and institutional backing, sustainable development of computer science education is secured, empowering students with the digital literacy and computational thinking skills essential for the 21st century.



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