

IMPROVING THE INTERDISCIPLINARY INTEGRATED SOFTWARE AND METHODOLOGICAL SUPPORT OF THE EDUCATIONAL PROCESS

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Annotation: *In order to effectively organize the educational process and achieve the intended goal, it is advisable to reflect the main issues of scientific and technical development in the subject programs. In organizing the educational process using modern techniques and technologies, pedagogical technologies and didactic means of teaching, effective results can be achieved by using didactic principles in their place. Didactic principles are described in terms of their content and essence, the sequence of their implementation in the educational process.*

Keywords: *Integration, innovation, program, software, computer, computer equipment, technology, electronic textbook, software laboratory, techniques and technologies.*

Enter. It is emphasized that there is no single interpretation of the tasks of integration in advanced pedagogical approaches, and it is appropriate to generalize the invariant task of pedagogical integration. The invariant tasks of pedagogical integration are interconnected with its various manifestations. The tasks of pedagogical integration and digital technologies are as follows: methodological, technological and developmental tasks are included. The tasks of pedagogical integration are considered a phenomenon that embodies the levels of activity that serve to solve specific problems and replace them.

Educational processes and electronic textbooks implemented through digital technologies, rather than replacing traditional books, turn the educational process into a more effective and versatile tool, and their main advantage is interactivity, as they allow students to learn new knowledge in each lesson not only visually, but also more deeply using audio and video materials. The use of electronic textbooks in teaching the subjects "Electrical Engineering, Radio Engineering and Electronics", "Technology and Design", "Fundamentals of Robotics" can be used to develop the technical and design competencies of future technology teachers, and to introduce a methodology for implementing their educational process in a meaningful, effective and interesting way.

Electronic textbooks, due to their interactive structure, contain various types of materials (audio files, videos, graphics, encyclopedia information), which creates new methodologies for teaching students. For example, through videos, students can see the practical processes of robotics, gain a deeper understanding of each stage of construction. Electronic textbooks also help students consolidate their knowledge by discussing various issues, completing tests and interactive tasks. All this allows students to actively participate in lessons, expand their thinking skills and develop a creative approach. In addition, the compactness and ease of use of electronic textbooks allow them to combine the space of several books in one program. Students can get the necessary information at any time and anywhere. This makes it easier for students to work independently, get acquainted with additional materials

in a timely manner and master lessons, and prepare more qualified, innovative and systematic thinking specialists.

The development of an electronic textbook on the subject "Fundamentals of Robotics" based on digital technologies addresses the issues of teaching the modern educational direction "Fundamentals of Robotics" in educational institutions that do not have a material and technical base through virtual constructor programs and simulation tools. The electronic textbook addresses the capabilities of the Lego Digital Designer, 3D TinkerCAD, Bricklink Studio 2.0 virtual constructor programs, as well as the problems of testing the created virtual robot models in the Virtual Robotics Toolkit, TinkerCAD-Arduino simulation environment. This collection is necessary for students of higher educational institutions 60112300 - Technological education - to create equally interesting projects for students and all students interested in robotics. In the 21st century, it is not necessary to tell the growing younger generation what robots are and where they can be found in everyday life. Because robots are on the list of necessary appliances in everyday life. Robot vacuum cleaners work in many homes, robotic washing machines are used, drones are often seen in the air, the news is full of stories about the achievements of robotics, attracting everyone. Today, many international robotics competitions are held, in which our children can successfully participate and take high places, it is very important to teach robotics from primary school age. Currently, you can find many ready-made kits for building robots on sale, or you can buy the necessary components separately and assemble your own design. Usually, such kits are expensive, and it is somewhat difficult for students in remote areas to purchase such kits. When an online survey was conducted in this regard, most young people expressed interest in robotics, and unfortunately, many cited a lack of equipment as the reason why they cannot study this field. This e-textbook will help you solve this problem. This e-textbook describes the issues of teaching today's modern educational direction "Robotics" through virtual simulation programs such as Lego Digital Designer, TinkerCAD, Scratch, Arduino, 3D TinkerCAD. Through this book, students can really create their own projects using virtual software tools and demonstrate their capabilities. As a result, the student will be able to analyze the principles of operation of household appliances and begin to better understand robotics and related disciplines. In this program, the implementation of projects is described in simple language step by step. The program is chosen in such a way that the complexity gradually increases, and the processes are briefly described in the electronic textbook, from simple tasks that a young beginner researcher can perform to very amazing tasks that will interest even experienced roboticists. The student independently creates his own robot using virtual applications.

The main window of the "Fundamentals of Robotics" electronic textbook provides users with the following content: introduction, module, videos, animation, presentations, glossary, information about authors, literature analysis, and tests (see Figure 1).



Figure 2.1. Main window of the electronic textbook Fundamentals of Robotics

In the modular part of the electronic textbook, the sections of lectures and practical exercises are structured in accordance with the content of the subject, each exercise is interconnected and based on the principles of sequence and coherence. This allows the educational process to be explained to students in a logical and consistent manner. Each section is provided with complementary information and is useful for completing practical tasks (see Figure 2).

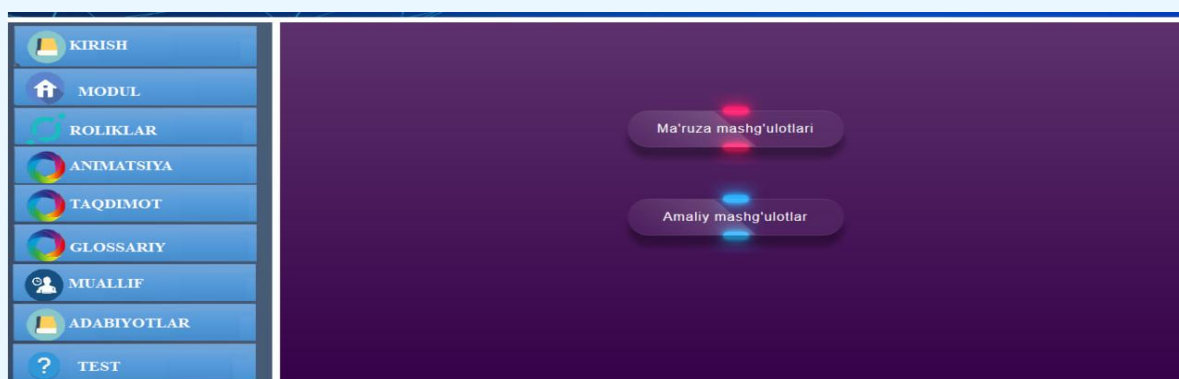
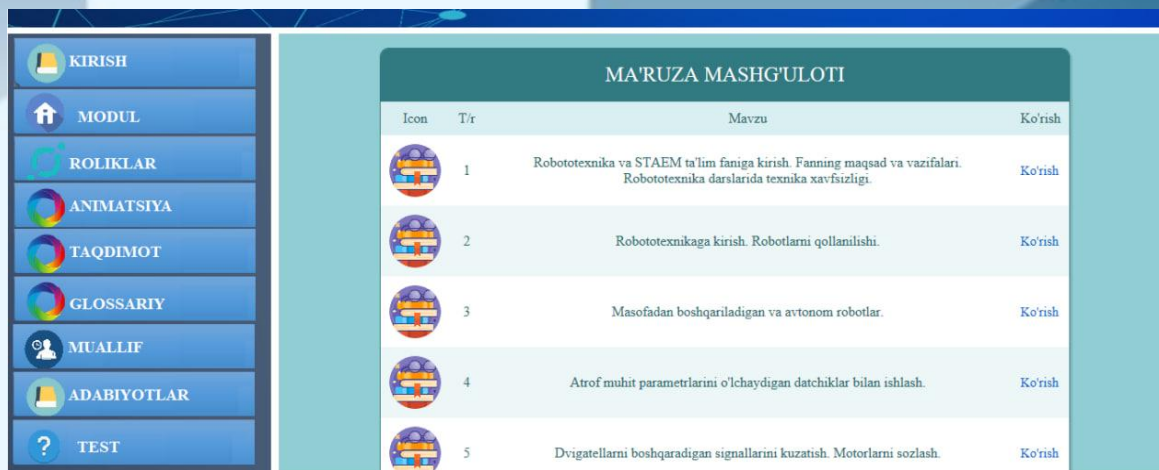


Figure 2. Module of the electronic textbook "Fundamentals of Robotics" with lectures, practical exercises, and exercises

The components of the electronic textbook "Fundamentals of Robotics" include lectures and practical exercises on the subject, and in the lecture exercises, the topics are explained in a related, sequential, and consistent manner (see Figure 3).



MA'RUZA MASHG'ULOTI			
Icon	T/r	Mavzu	Ko'rish
	1	Robototexnika va STAEM ta'lim faniga kirish. Fanning maqsad va vazifalari. Robototexnika darslarida texnika xavfsizligi.	Ko'rish
	2	Robototexnikaga kirish. Robotlarni qollanilishi.	Ko'rish
	3	Masofadan boshqariladigan va avtonom robotlar.	Ko'rish
	4	Atrof muhit parametrlarini o'lchaydigan datchiklar bilan ishlash.	Ko'rish
	5	Dvigatellarni boshqaradigan signallarini kuzatish. Motorlarni sozlash.	Ko'rish

Figure 3. Window displaying the topic of the lecture sessions of the electronic textbook

Video lessons and animations play an important role in e-textbooks, presenting theoretical and practical knowledge in a visual way, which helps students better understand the topics. Video lessons allow students to review the material studied, get answers to questions, and actively participate in an interactive way (see Figure 4). Also, when developing practical skills, for example, animations in the process of programming or assembling robots, show students real work processes and make it easier to understand (see Figure 5).

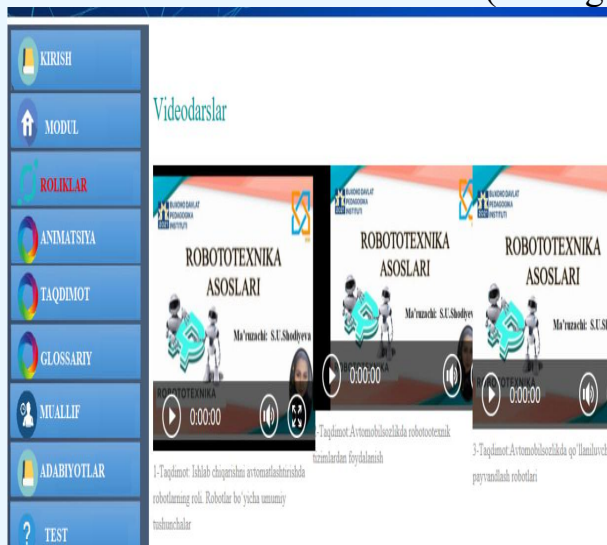


Figure 4. Window displaying video lessons

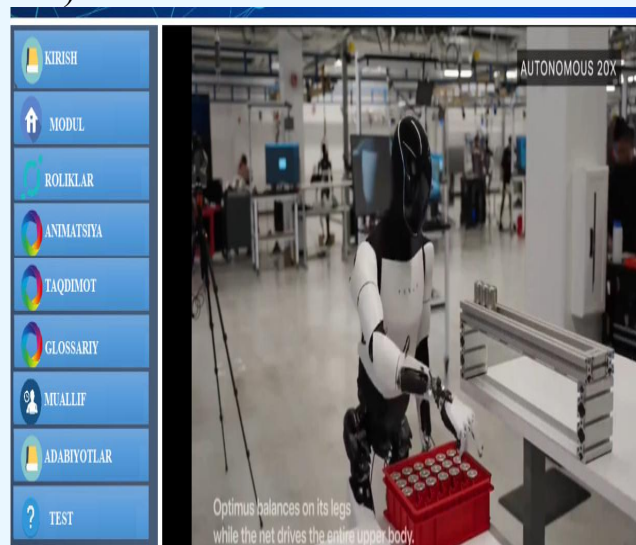


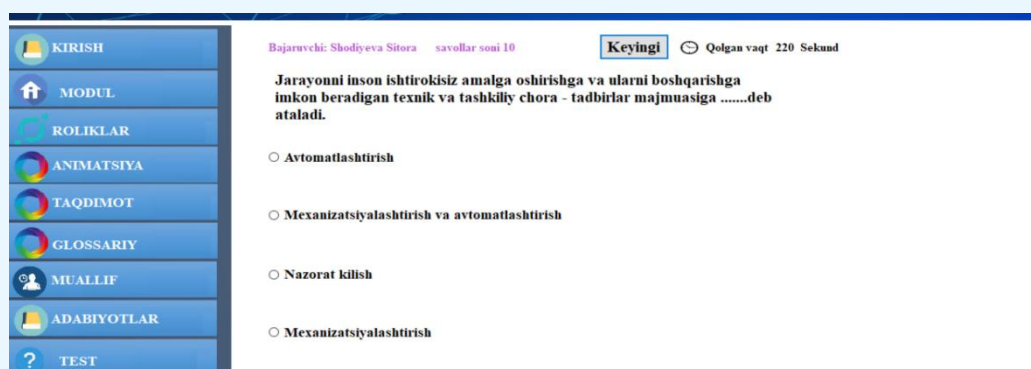
Figure 5. Clip from animations

Future teachers of the subject "Technology" will have the opportunity to test their knowledge using non-standard tests programmed at the end of the training to determine the knowledge and skills they have acquired from the electronic textbook "Fundamentals of Robotics", as well as to assess their level of mastery (see Figure 6).



**Figure 6. Main window of test tasks of the electronic textbook
"Fundamentals of Robotics"**

The tests are designed at varying levels of difficulty, helping students deepen and apply their knowledge (see Figure 7).



**Figure 7. Screenshot from the testing process of the electronic textbook
"Fundamentals of Robotics"**

The use of electronic textbooks in higher education institutions can become an important tool for increasing the efficiency of the educational process and improving students' knowledge and skills.

When developing an electronic educational and methodological complex for the subject "Technology and Design" based on digital technologies, it is necessary to take into account that it is an important tool for developing students' technical thinking and forming a creative approach to labor. In the conditions of a market economy, electronic textbooks provide modern educational materials and interactive opportunities for such important issues as bringing scientific and technical progress to a level consistent with world standards, improving product quality and increasing production efficiency. They help future specialists master knowledge, technical and technological skills related to creative activity. Electronic textbooks allow students to deeply study the technical, technological and design foundations of industrial production, prepare for practice and be ready for modern production activities. Electronic textbooks are a tool that contributes to the education of the younger generation as high-level specialists.

The main window of the electronic educational and methodological complex for the subject "Technology and Design" contains the following resources: modules, videos, presentations, a glossary, information about authors, literature analysis, and tests (see Figure 8).



Figure 8. Main window of the electronic educational and methodological complex for the subject "Technology and Design"

Lectures and practical exercises of the electronic educational and methodological complex "Technology and Design" are presented according to a specific plan and based on the principles of interconnection. It is aimed at providing students with the necessary knowledge and skills at each stage in a timely and orderly manner so that they can effectively master the learning process. All materials in the electronic educational and methodological complex complement each other, simplifying the learning process and at the same time helping to understand the topics more deeply (see Figure 9).



Figure 9. The main window of the electronic educational and methodological complex for the subject "Technology and Design"

The module component of the electronic educational and methodological complex of the subject "Technology and Design" contains theoretical information for lectures and practical exercises of the subject, and presentations of lecture exercises are prepared for students in an interactive way. Presentations include the main concepts of each topic, theoretical materials and examples of their practical application. These presentations are also enriched with visual materials (graphs,

diagrams, videos), which help students to master complex concepts more easily and effectively.

In the electronic educational and methodological complex of the subject “Technology and Design”, videos, video lessons and presentations are presented in accordance with the plan, based on the principle of continuity and sequence. Information is provided about the authors of the developed software tools. Using the tests in the electronic educational and methodological complex of the subject “Technology and Design”, students test the studied material and determine the level of knowledge.

Tests help to consolidate topics, identify errors and show students that they need to pay more attention to technical and design areas. In this way, tests make the learning process more effective and ensure systematic assimilation of knowledge.

The electronic textbook on the subject “Fundamentals of Robotics” and the electronic educational and methodological complex on the subject “Technology and Design”, developed based on digital technologies, are distinguished by their ease of reading, clarity and completeness of all the necessary information. Each topic is covered with a separate approach and presented to students in an understandable and interactive way using animations, presentations, photo clips and video materials.

The advantage of the electronic textbook is that students can visualize various processes of robotics and processes that are invisible or difficult to understand in the study of technical design using video and 3D animations. For example, animations and simulations of real-life situations are used to understand how robots work, their movements, and how they adapt to different conditions.

As is known, based on the above considerations, the role of the information and educational environment in preparing future technology teachers for innovative professional activities is of great importance, and in this regard, the effective use of software educational tools based on digital technologies is considered appropriate.

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