APPLICATION OF MODERN EDUCATIONAL TECHNOLOGIES IN TEACHING MATERIALS SCIENCE

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https://doi.org/10.5281/zenodo.10547061

Abstract. *The article discusses the use of modern educational technologies in teaching the discipline "Materials Science ". The conducted experiment to study the influence of the use of modern educational technologies on the quality of education showed positive effects.*

Keywords: *materials science, learning motivation, problem-based learning, project- based learning, research activities, game technologies, collaboration pedagogy, portfolio, distance learning.*

INTRODUCTION

Materials science is the science of the nature, properties and behavior of materials based on metals, non-metallic elements of oxide systems, non-oxide metal-like and non-metallic compounds, as well as the laws of the processes of their production, structure formation, connection and destruction. Materials science is a science that establishes principles for the “design” and creation of new materials, the development of their technologies, and the establishment of areas of application.

The main objectives of teaching materials science and technology are the formation of knowledge and skills in students. First, selecting the best materials for the product. In addition to descriptive and theoretical courses, a large laboratory workshop is required in order to “feel” the material and see how it behaves under various loads. Secondly, the study of exactly those operational loads that are most typical for this industry [1,2].

The use of modern methods and approaches, equipment and technologies makes it possible to conduct the educational process at a high level, which in turn directly affects the quality of training of a specialist of the 21st century. It is especially important to note the need to use modern technologies in the pedagogical practice of teaching technical disciplines, including materials science.

To implement the cognitive and creative activity of students in the educational process, modern educational technologies are used, which make it possible to improve the quality of education, use study time more effectively and reduce the share of reproductive activity of students by reducing the time allocated for homework.

It is difficult to overestimate the need to develop distance education methods in our time. Thus, the transition of the Uzbek higher education system to European standards of education required a significant reduction in classroom time for the study of almost all disciplines; discipline programs were revised towards intensification of training and possible integration of courses [3]. These changes have led to a significant increase in the role of distance education in the training of full-time education specialists, allowing more intensive study independently under the guidance of a teacher.

MATERIALS AND METHODS

The formation of learning motivation is one of the main problems in modern education and is a matter of public importance; its relevance is due to the updating of the content of education, the setting of tasks for the formation of techniques for students to independently acquire knowledge and cognitive interests. Motivation is the most important component of the structure of educational activity, and for an individual, developed internal motivation is the main criterion for its formation. Motivation includes many different motivations: the meaning of learning, the motive of learning, the purpose of learning, emotions accompanying the learning process, self-knowledge, responsibility. Motivation is the key to the student's soul, which opens all corners of his consciousness, ready to learn and experience.

To form cognitive motives, you can use the following techniques: planning goals together with the student; connection between theoretical material and practice; various forms of lessons, including non-traditional ones (KVN, lesson - presentation, lesson - conference, What, Where, When?. I want to know everything); organization of creative, research activities (project activities, abstracts, mini-research); organizing a situation for the success of each student (differentiated learning - feasible tasks for each student, drawing up variants of tasks by students, drawing up tests, drawing up tables - classifiers, puzzles, crosswords). Open lessons are held. During lessons, students work with reference tables, write technical essays, technical dictations, compile classifier tables, study the microstructures of alloys, and present new material in the form of presentations. Open lessons allow you to increase the level of students' educational activities and strengthen social and personal motives in the lessons.

The technology of problem-based learning is based on the theoretical principles of the American philosopher, psychologist and teacher D. Dewey. Today, problem-based learning is understood as such an organization of educational activities that involves the creation, under the guidance of a teacher, of problem situations and the active independent activity of students to resolve them, as a result of which the creative mastery of professional knowledge, skills, abilities and the development of thinking abilities occurs. In materials science lessons, a favorable atmosphere is created for introducing elements of problem-based learning, since in a problem-based way it is advisable to study material that contains cause-and-effect relationships and dependencies, which is aimed at the formation of concepts, laws and theories.

The goal of project-based learning is to create conditions under which students: independently and willingly acquire missing knowledge from different sources; learn to use acquired knowledge to solve cognitive and practical problems; acquire communication skills by working in various groups; develop research skills (ability to identify problems, collect information, observe, conduct experiments, analyze, build hypotheses, generalize); develop systems thinking. Educational projects can be used not only in class or in extracurricular activities, but also implemented using the Internet, so-called network (distance) projects. Life requires the use of modern information technologies, the use of a computer in the classroom, which is very relevant in our age of information technology. When working on a project, students present the results of their work in the form of presentations (done in MS PowerPoint), publications (done in MS Word, MS Publisher), entertaining experiments, mini-laboratory work, etc. The project methodology allows each student to master the creation of presentations and publications at a fairly good level, which undoubtedly increases interest in both information technology and materials science. The result of working on a project can be external and internal. The external result can be

seen, comprehended, and applied in real practical activities; the internal result (activity experience) becomes the property of students, combining knowledge and skills, competencies and values.

Research activity in general is understood as a form of organizing work that is associated with students solving a research problem with a solution unknown in advance. Within the framework of the research approach, learning is carried out based on the direct experience of students, its expansion in the course of search, research activities, and active exploration of the world.

Gaming technologies are of greatest interest in the educational process. Gaming technologies are associated with a gaming form of interaction between a teacher and students through the implementation of a certain plot (games, fairy tales, performances, business communication). At the same time, educational tasks are included in the content of the game. Entertaining, theatrical, business, role-playing, and computer games are used in the educational process.

Collaboration pedagogy is one of the technologies of personality-oriented learning, which is based on the principles:

- interdependence of group members;
- personal responsibility of each group member for their own successes and the successes of the group;
- joint educational and cognitive activities in a group;
- general assessment of the group's work.

Modern educational technologies include the "portfolio" innovative assessment system.

- A portfolio (in the broad sense of the word) is a way of recording, accumulating and assessing a student's individual achievements during a certain period of his education.
- An important goal of the portfolio is to present a report on the process of a teenager's education, to see the "picture" of significant educational results, in general, to ensure tracking of the student's individual progress in a broad educational context, to demonstrate his ability to practically apply acquired knowledge and skills.

In a broad sense, information and communication technologies (ICT) are the use of computer technology and telecommunications tools to implement information processes for the purpose of quickly and efficiently working with information legally. The introduction of ICT into the educational process is not so much an urgent need as a conscious process of technologization of routine processes in order to release the creative energy of the individual in modern society. The main goal of teachers is not only to organize and conduct the process of mastering solid basic knowledge and learning skills, but also to form a personality capable of adapting to the conditions of modern life. When moving to new forms of learning that use network technologies, a tendency arises to focus on a network of distributed educational resources of a new generation, which can be used in the mode of collective access of many educational institutions to common educational resources via the Internet.

In the context of the development of modern pedagogical science and new teaching aids, the issue of using computer technologies in the educational process is more often raised. Currently, the virtual environment as a capacious general scientific phenomenon is an integral part of information technology, which is advisable to use in various areas of the educational process [3]. A team gaming competitive method of teaching students using virtualization of the production process has been proposed [4]. The structure of a situational game consists of initial data, a list of

positions, a scenario revealing the responsibilities of the participants during the game (functions), active handling of information in an atmosphere of team play, creative and active use of previously accumulated knowledge, skills and abilities in simulated professional activities, analysis and summing up. The game is played on personal computers connected to each other by a network, with an installed program that simulates production processes. First, the initial data are selected in accordance with which the task is performed. Each trainee is assigned a position and functional responsibilities. In accordance with the position, the trainee performs a situational task, actively using the knowledge acquired in the classroom. During the process of a situational game, it is possible to include emergency situations, in the process of solving which additional theoretical skills in related disciplines are consolidated. The result of the game is the launch of the production process; if the result is negative, a team search for the existing error is carried out, correcting it in accordance with the positions received. During the preparation and conduct of the game, additional teamwork skills are developed, theoretical knowledge is consolidated, a sense of responsibility develops, and learning rates increase.

Distance educational technologies differ from traditional forms of learning in their flexibility, the opportunity for students to study the subject at any time convenient for themselves, students have the opportunity to access many sources of educational information - electronic libraries, data banks, etc. Modern telecommunications tools allow a student, geographically distant from the teacher, to contact him at any time [5]. Targeted communication of students with each other and with teachers allows the use of the latest achievements of information and telecommunication technologies in the educational process, allows the teacher to use international educational experience and share his educational and methodological developments, and makes it possible to organize monitoring of the educational process. The creative and intellectual potential of students increases due to self-organization, interaction with computer technology, and the need to independently make responsible decisions in the process of distance learning. Distance education renews the role of the teacher, he coordinates the learning process, improves the taught course, and improves his qualifications in accordance with global trends and innovations.

Currently, the most widespread e-learning platforms in the world are Blackboard and Moodle. In the Moodle system (Modular Object-Oriented Dynamic Learning Environment), a teacher can create courses, filling them with the necessary content. A course in the Moodle system looks like a structure of complementary elements that differ in their type and purpose. In addition to standard learning elements, such as lectures, assignments and tests, the Moodle system uses a glossary, wiki, blogs, forums, and workshops, which help diversify the learning process. On the forum, you can discuss any issues in groups, rate messages, and attach files of any format to them. In private messages and comments, you can discuss a specific problem with the teacher personally. Discussion of any issues is possible in real time - in the chat. That is, the system has excellent opportunities for direct and feedback between student and teacher. The teacher can evaluate students' knowledge on all elements of the course, including arbitrary scales created by the teacher himself.

Separately, it is worth noting the wide possibilities for monitoring and updating knowledge, remote control and execution of classes. Thus, a special multi-level selection of tasks allows you to update the knowledge gained in lecture classes or in the process of distance learning of theoretical sections of the course, before conducting practical classes. Conduct a check of readiness to perform laboratory work, knowledge of the theoretical foundations of the experiments

being carried out and readiness to independently carry out research in accordance with methodological instructions, understanding of the order and conduct of the experiment and its scientific idea. Using the appropriate methodological instructions, also located in the complex, students have the opportunity to independently prepare for laboratory and practical classes.

RESULTS

Undoubtedly, the basis for studying materials science is theoretical knowledge obtained from courses in mathematics, physics, chemistry and computer science. Therefore, one of the tasks of teaching materials science comes down to ensuring a smooth transition from abstract concepts of natural science disciplines to the study of a variety of real materials and devices [6]. Obviously, to ensure this transition, visualization of educational material, laboratory practical work, and direct connection with production are of particular importance, allowing students to better understand the practical significance of the discipline being studied.

As part of the study of the influence of the use of modern technologies on the quality of education at Urgench State University, the following experiment was carried out: in two groups of correspondence students, classroom classes were conducted in the discipline “Materials Science” with and without the use of modern technologies.

When teaching the discipline in the first group, multimedia lectures and workshops were used.

In the second group, training was carried out according to the traditional scheme, with the material depicted on the board.

The evaluation of the studies was carried out using a final test (exam) and control of residual knowledge.

As a result, students from the first group showed a higher level of knowledge. In addition, a sociological survey conducted showed a positive perception by students of multimedia lectures and an increase in the degree of visibility of information. It should also be noted that the use of presentations made it possible to increase the volume of readable material by one and a half times, reuse it and easily update it, providing relief from routine work.

This example is just one of many that prove the feasibility of using modern educational technologies in teaching materials science.

DISCUSSION

Students' awareness of their motives in educational activities and the dominance of their social and personal motives in learning contributes to the conscious assimilation of general technical knowledge, skills and abilities, which allows them to increase the level of mastery of program material and develop students' logical thinking.

The development of electronic content for electronic textbooks at the first stage certainly requires significant time investment from the teacher. However, if the structure of the teaching aid for teaching the basics of materials science is simultaneously formed in the Moodle distance learning system, it allows you to simultaneously dynamically change the content of courses, clarify the individual learning path for groups of students and streams, develop information and communication competencies, skills in creating educational and assessment tools for working in electronic learning environment. The developed and streamlined environment of the electronic textbook in the distance learning system makes it possible to simplify many non-creative functions for the teacher of the discipline. At the same time, there is a reorientation towards personalized learning, in addition to the exclusive function of the lecturer, the teacher has additional time for

individual work with students, specialized communication on the network, conducting individual consultations, reviewing works, creating specialized forums, advising young specialists at the initial stages of work and etc.

CONCLUSIONS

- The use of a wide range of pedagogical technologies such as: problem-based learning, project-based learning, research activities, gaming technologies, collaborative pedagogy, the innovative assessment system “portfolio” makes it possible to productively use study time in teaching the discipline “Materials Science” and achieve high results.

- The use of modern information technologies in teaching materials science makes it possible to achieve many positive effects: visualization of educational information, modeling of the processes and phenomena being studied, conducting laboratory work on a computer in real-life conditions, monitoring with error diagnosis and feedback, self-monitoring and self-correction of educational activities, individualization the learning process, strengthening learning motivation, creating a culture of cognitive activity, which in turn inevitably improves the quality of education, and consequently the level of specialist training.

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