Digital environment of vocational education in the Russian Federation

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Abstract. The article presents the formation of a digital educational environment for vocational education in the Russian Federation. Particular attention is paid to pedagogical approaches, the architecture of the digital educational environment, the experience of the St. Petersburg State University of Industrial Technologies and Design in the field of its use for training forest industry.

1. Introduction

According to HeadHunter, the largest Russian Internet recruitment company, the level of competition for personnel in forestry companies is growing. Almost every fifth resume is posted by applicants of mature age - 46–55 years. Employers aiming at long-term business development and experiencing a serious shortage of specialists of various profiles need to adjust their hiring strategy. One of the alternatives is the organization of training and advanced training of company employees using remote methods. The creation of an open training platform for forest industry workers will help ensure the sustainability of the staffing situation [1].

In the Russian Federation, certain experience has been gained in organizing distance vocational education. To achieve a new quality of professional education, focused on the real needs of the labor market and digitalization processes, a search is underway for new models aimed at training a competent specialist. Scientists apply diverse new approaches (integrative, institutional, competency, etc.) and principles (humanization, individualization, continuity, etc.). One of the ways to achieve a new quality of education is the competency-based approach.

2. Experimental Part

The digital vocational education environment is represented by open and closed segments. According to the portal "Modern educational environment in the Russian Federation" 125 universities have placed 1236 mass open educational courses (MOOK) on 39 platforms. [2] The closed segment is represented by the digital educational environment of educational institutions with controlled access, which actively interacts with the open segment.

The educational digital environment includes several components: digital educational resources, technical support, staffing, regulatory support. Electronic educational resources include educational
courses of various formats, including video lectures, tests and assignments, training simulations, expert interviews, educational literature, including in interactive form, as well as materials from various Internet publications, such as periodicals, presentations by scientists and practitioners, scientific articles, materials of scientific associations, content of video channels, encyclopedias, messages of social networks. Currently, there is an accumulation of electronic educational resources and primary selection, approbation of formats and technologies.

The technical component involves access to high-speed Internet, the availability of a sufficient number of computers (including a server) with licensed software and certain additional equipment necessary for the effective implementation of the educational process (demonstration complexes, audio-visual systems, digital laboratories, including VR and AR laboratories). The technical component assumes the availability of software to ensure the security of the system, the use of machine learning technologies and artificial intelligence.

The personnel component of the digital educational environment is represented by the following groups of specialists: educators-creators of educational content, tutors, analytical analysts, technical specialists, specialists in the field of intellectual property protection, administrators. A teacher working in a digital environment should understand modern trends in the development of online learning, be proficient in the content of the subject area, apply reliable and objective methods for evaluating online learning, and be able to motivate students. Not all teachers have the skills necessary for working in a digital environment. Currently, regional centers of competencies in the field of online learning are being created, where participants in the digital educational environment can take a professional test and receive training in the necessary skills. Such centers operate in all Federal districts.

Vocational training has always been aimed at the formation of skills. The modern competency-based approach is the result of the development of pedagogical technologies, has systemic links with leading theoretical concepts and approaches that make up the scientific foundations of modern education. The main position of the activity approach is the provision on the leading role of activity in the process of personality formation (L S Vygotsky and others) [4]. The development of the personality is ensured by purposefully organized activities, when the focus of the teacher's attention is not so much on the acquisition of knowledge, but on the process of involving the learner's intellect in solving the educational problem. In the works of L.S. Vygotsky repeatedly emphasized the idea that any training should be realized by students. Thus, the ideas of developing education can serve as the basis for solving problems, the need for solutions to which led to the introduction of a competency-based approach in the education system.

Bloom's Taxonomy is a tool for planning educational goals for developing high thinking skills. The goals of education are divided into three areas: cognitive (requirements for mastering the content of the subject), psychomotor (development of motor, neuromuscular activity) and affective (emotional and value field, attitude to the student) [5].

Foreign authors have developed other options for taxonomies. For example, the taxonomy of SOLO (Structure of the Observed Learning) by J Biggs and C Collis [6]. The authors propose to consider declarative and functional knowledge. The classification of cognitive processes contains four levels: monostructural, multistructural, the level of connections and relationships, the level of abstraction and the creation of a new one.

If in the educational triad “goal - process (means) - result” Russian researchers pay the greatest attention to the learning process, then American taxonomies are technological: they offer a set of active verbs for each category of cognitive processes, examples of goal formulations and learning outcomes for various disciplines. The teacher can choose the taxonomy that is closer to his teaching style. Classification of educational goals is a tool that allows, during the joint activities of the teacher and students, to formulate developmental tasks, draw up problematic tasks for students, select methods of assessment and self-esteem that are adequate to the goals, in the “teacher-student” interaction, conduct reflection on the learning outcomes.
The SAMR model developed by Ruben Puentedura describes the degree to which technology is used in the learning process [7]. With this tool, the teacher can evaluate how much the use of technology contributes or does not contribute to raising the level of training compared to if it would have happened without them. The model reflects four levels of integration of information technology in the learning process. Each subsequent level involves a deeper degree of student involvement and the use of computer tools. Using the SAMR model, the teacher clearly determines for what purpose and to achieve what results he integrates certain tools into training.

American educator Edgar Dale in 1969 on the basis of their research led "cone gain experience", which can be used in education. According to Dale’s results on the study of the effectiveness of various ways of gaining knowledge, the least effective are traditional teaching methods - reading, listening, viewing pictures. While the integration of activities related to obtaining real experience and performing an action is the most effective approach to the learning process [8].

Thus, we have established that the competency-based approach is closely linked with leading theoretical ideas and approaches that constitute the scientific foundations of modern education. At the same time, the approaches under consideration themselves intersect to a large extent with each other. The analysis of the provisions of leading educational approaches and technologies allows us to identify factors that contribute to the formation of key competencies in education: the active nature of learning, the transfer of emphasis in learning from increasing the amount of information to the formation of the skills to obtain and use it; development of student independence and responsibility for the results of their activities; cooperation in the construction of educational activities, a variety of forms of interaction. When designing the educational process and choosing types of activities, it is necessary to use the capabilities of information technologies that allow teachers to increase the effectiveness of training by addressing the applied teaching methods, which is reflected in the results achieved by the student in personality growth, the development of certain qualities, skills, and actions that are in demand today's reality.

There is no specialized open educational platform for professional training of forestry specialists in the Russian Federation, however, distance education and training using modern information technologies is being conducted. These resources are possessed by companies operating in the Russian Federation for organizing corporate training and educational institutions that train specialists for this field.

At the St. Petersburg University of Industrial Technology and Design, a digital educational environment has been developing for seven years. Currently, the educational environment is of a closed type, however, cooperation with the most popular platforms, such as Coursera, Open Education, Arzamas, Lectorium, etc. is ongoing. The direction of distance learning technologies works with students on all educational programs. Distance learning covers more than five thousand students. Particular attention is paid to the development of disciplines using distance learning technologies in engineering specialties. Online learning is seen as a tool to improve education and material delivery. [9]. The university pays special attention to the training of specialists for the forest sector. For 80 years, engineers, technologists, mechanics, thermal power engineers, specialists in automation of technological processes for the pulp and paper industry have been trained here.

The university has extensive experience in organizing training with elements of distance learning technologies and applying various methods of active learning using a virtual learning environment. The educational process is organized on the basis of the Moodle virtual learning environment, which makes it possible to learn from a distance. The Moodle system is closed. Access is allowed only for registered users who receive a password from the system administrator.

A team of experienced teachers has developed electronic courses in curriculum disciplines. The student receives not the usual set of teaching aids with assignments, but lecture texts, tests, assignments for independent work and for the final test of knowledge, as well as workshops and guidelines for laboratory, practical and term papers (projects).

Thanks to such an e-learning system, it is possible to conduct video lectures and online consultations, as well as to control students individually or groups of students throughout the training.
With the help of distance learning technologies, online consultations, continuous monitoring of effectiveness, as well as intermediate certification are conducted. After studying each section, the student must answer the control questions. To improve the control of educational material, tests are created so that students can answer them only after studying theoretical material. The whole system is based on constant reporting, students report to their teacher for each section studied, and only after that they begin to study the next.

Particular attention is paid to the use of technology for problematic education, which allows students to participate in the study of complex special disciplines related to the pulp and paper industry. A joint solution of the cases of students and specialists of industry enterprises is practiced.

The digital educational environment promotes close interaction between the university and enterprises.

Final certification and laboratory work, if necessary, are carried out by traditional methods during laboratory - examination sessions. There is the possibility of solving a number of issues using video conferencing or conducting conferences (consultations) in real time, where students can ask questions of interest to them and answer the teacher's questions. A wide range of electronic distance education programs allows not only to study theoretical material, but also to conduct laboratory work independently, with the help of teachers who are at a distance.

The most common form of distance learning associated with study groups. Training is possible, both in a mode based on a tight schedule (schedule), and on the constant synchronization of acquired knowledge and the curriculum. There are successful case studies on individual schedules. As part of distance learning, students have the opportunity to choose the form, place, and duration of study. The interaction of the student with the teacher can be carried out both on the initiative of the student and on the initiative of the teacher. The teacher gives explanations to the student on the content of the course being studied and answers his questions. In the learning process, the teacher initiates various training and control activities. Mastering disciplines with the use of distance educational technologies allows you to switch to the schedule of the educational process with one full-time session in the academic year.

The Department of Distance Learning Technologies has two departments: the organizational and methodological department (OMO) and the department of information and technical support (OITO). OMO is engaged in the development of documents necessary for the implementation of the work of BAT, and there is also a tutor in this department. The tutor is responsible for the uninterrupted and necessary communication between the educational platform, teachers and students. The department of information technology provides technical support for the site and helps participants in the educational process to organize access to the educational materials of the site. The Department of Distance Learning Technologies conducts continuing education courses for teachers to make their work more comfortable on the distance learning website.

Learning with elements of distance learning technologies at the university is actively developing for the seventh year, to a greater extent for students of correspondence learning, but is also actively used in full-time education. In total, about five thousand students are covered. There are currently over 400 disciplines on the distance learning site.

3. Conclusion
The digital environment of Russian vocational education is being formed. There is the creation and accumulation of educational resources, the selection of methods for the supply of educational material, the approbation of pedagogical technologies. Trial and error teachers are mastering new digital pedagogical technologies. Mass training of teachers for work in the digital environment is just beginning. Training materials are still far from being consulted, therefore mass open educational courses for vocational education do not practically offer. Due to the specifics of the initial stage, competition in this area is practically absent.

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