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RESEARCH ARTICLE

Pedagogical Mechanisms of Developing Information-Projecting Competence of Future Specialists

Jamshid Khakimov
Tashkent State Technical University named after Islam Karimov, Republic of Uzbekistan, Tashkent, Uzbekistan

Firuza Rakhmatova
Tashkent State Technical University named after Islam Karimov, Republic of Uzbekistan, Tashkent, Uzbekistan

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Abstract

The article presents the classification of the issues of professional activity qualities and skills of future specialists; In professional activity, a classification of tasks based on the triad of "skills to use computer design - types of tasks - personal qualities" was developed. The level of readiness of future specialists for the use of information and communication technologies in pedagogical activities and computer design activities was studied diagnostically; the method of organizing the process of preparing them for the use of information and communication technologies in their professional activities and for computer design activities is proposed.

KEYWORDS

Future specialist, information and communication training, computer design, method, professional activity, skills, types of tasks, personal qualities.

INTRODUCTION

The analysis of the pedagogical theory and practice of the information-design competence of future specialists, as well as the generalization of the experience of computer design and its application in the professional training of specialists in the technical fields of a technical higher educational institution, shows that the science of computer design occupies an important place in the study of compulsory and optional subjects provided for in the curricula of training future specialists in higher educational institutions.

We consider the improvement of the information-design competence of future specialists by means of computer design as a didactic system.

Based on the nature of cognitive activity of future specialists, the didactic tasks included in the system can be classified as reproductive, productive and creative tasks. Acquiring the above-mentioned skills and knowing the didactic tasks of using computer-aided design in professional activities are important for every modern teacher.

METHODOLOGY

– In order to simplify the procedure of diagnosing students in the system of preparation for the use of information and communication technologies in professional activities and computer design activities, we distinguish the following organizers: motivational, cognitive and functional. They can be described as follows:

– motivational component – the level of perception of the possibilities of using computer-aided design in the educational process, motivation, interest in the experience of using the possibilities of information and communication technologies in teaching their subject;

– cognitive component –the level of mastery of knowledge about information and communication technologies, knowledge about the theoretical and methodological foundations of using computer-aided design in solving educational and professional problems;

– activity component – the level of formation of skills and abilities in the practical application of information and communication technologies, knowledge, practical skills and abilities in using computer-aided design in professional activities.

In accordance with the considered components, the level of readiness of future specialists for the use of information and communication technologies in pedagogical activities and for computer design activities was investigated diagnostically.

We offer three minimum, medial, and optimal levels of preparation of future specialists for the use of information and communication technologies and computer design activities in their future professional activities.

Based on the analysis of pedagogical literature [1, 2, 6] and based on the concept of readiness of future specialists to use information and communication technologies and computer design activities, we distinguish the following criteria:мотивация ва амалий фаолият жараёнида ахборот-коммуникацион технологиялардан фойдаланиш ва компьютерли лойиҳалаш бўйича билимларни эгаллаганлик даражаси;

– the level of formation of skills in the use of information and communication technologies and computer design in future specialists;

– the level of development of creativity in future specialists (the creative level of mastering knowledge about information and communication technologies and computer design).

The classification of tasks in professional activities based on the triad "skills in the use of computer design - types of tasks - personal qualities" is presented in Table 1.

Table 1.

Classification of issues of professional qualities and skills of future specialists (taking into account the use of computer-aided design methods)

Computer-aided design skills	Professional issues to be resolved types	Qualities of professional activity
Skills in using standard tools of information processing	– issues related to the analysis and evaluation of the capabilities of information processing tools; – issues related to knowledge of the basic concepts of information processing tools; – issues related to mastering information processing tools; – issues related to the use of information processing tools in the educational process and computer design activities; – issues related to the use of information processing tools in research work and computer design activities; – issues related to the use of digital information processing tools and computer design activities; – issues related to understanding and correcting proposed schemes for solving professional problems in the use	– the ability to search for the necessary information using information and communication technologies and use it in the context of performing tasks; – independent thinking; – systematic thinking; – critical thinking; – dialectical thinking; – ability to make pedagogical discoveries; – ability to self-manage and self-organize.

	of information processing tools; – issues related to the distribution of responsibilities during the implementation of collaborative projects using information processing tools.	
Skills for the use of instrumental systems intended for pedagogical tasks	– issues related to the selection of instrumental systems intended for pedagogical tasks in accordance with the goals of education and training; – issues related to the development of fragments of software-methodical tools; – issues related to the analysis and evaluation of created programs; – issues related to the independent creation of algorithms for solving certain categories of pedagogical problems; – issues related to the planning of activity stages during the creation of software tools.	– ability to demonstrate one's potential; – pedagogical discovery ability; – independent thinking; – ability for pedagogical improvisation; – technological thinking.
Computer diagnostic skills	– issues related to learning to work in test shells; – issues related to the development of diagnostic (diagnostic) programs for determining the level of learning of students; – issues related to the maximum use of computer tools and computer design activities in the research of the pedagogical object; – issues related to self-knowledge using diagnostic programs.	– ability to know oneself; – ability to determine the level of learning of students using diagnostic programs.
Skills in using tools for working in global networks	– issues related to mastering the basic concepts of computer communications; – issues related to mastering the capabilities of the "Inform-education" network; – issues related to mastering working on the Internet; – issues related to selecting the necessary resource for a professional pedagogical problem using the Internet; – issues related to developing the ability to communicate and exchange information with colleagues on a pedagogical	– interpersonal communication ability; – to be able to find the necessary information using communication tools.

	problem of interest in the future; – issues related to the use of computer telecommunications and computer design activities in solving educational and educational tasks; – issues related to organizing information and communication services for the educational process.	
Skills in the use of information and communication technologies in science	– issues related to determining the goals of software tools aimed at various diagnostic tasks; – issues related to mastering the methods of using computer software tools in teaching a subject; – issues related to the selection of software tools; – issues related to designing learning situations related to the use of software tools in a subject; – issues related to the development of independence of pedagogical thinking in the teacher's professional activities in the subject, in the maximum possible use of information and communication technologies.	– ability to use information and communication technologies and computer design activities in teaching their subject; – independent thinking; – ability to improve teaching methods and methods with the help of information and communication technologies; – ability to avoid stereotypes in solving pedagogical problems.

At a minimum, the activities of future specialists are aimed at familiarizing themselves with the basic concepts and categories of informatization of education, as well as at forming the need to master a system of specialized knowledge that will allow them to use information and communication technologies in professional activities. Future specialists will become familiar with the basic methods and forms of using information and communication technologies in teaching and will acquire the skills to use information and communication technologies productively in solving professional tasks [5].

Future specialists acquire a system of skills to use information and communication technologies as a means of knowledge and research in their educational and professional activities. They use the data of their research on the use of information and communication technologies and computer design activities in order to creatively reconstruct the educational process.

The process of preparing future specialists for the use of information and communication technologies in professional activities and computer design activities should be organized in such a way that the positive aspects of the traditional education system are not lost, so that they can use pedagogical and information and communication technologies together and use information and communication technologies wisely in their professional activities.

Various organizational forms of teaching exist traditionally. These are lectures, practical trainings and their various types: seminars, laboratory work, practicum, research work of students, independent work under the supervision of a teacher, etc.

We have developed three interrelated blocks of systematic methods and forms based on the principle of compliance with the substantive types of activity of future specialists in the use of information and communication technologies. They are reflected in Table 2.

Table 2.

Forms and methods of preparing future specialists for computer design activities

Types of activities	Shapes	Methods
Educational activities on the use of computer-aided design methods	Lectures (problematic, explanatory-illustrative), lectures with pre-planned errors, practical seminars, laboratory exercises in computer classes, individual work on a methodological topic.	Explanation-illustrative, reproductive, problematic statement, partially exploratory; educational and business games, creative performances (information), analysis of situations.
Research activities on the use of computer-aided design methods	Problem-based lectures, problem-based seminars and practicals, work on research topics, educational and communication projects, independent work of students, conference.	Partly exploratory, exploratory; creative performances, educational-research game, design method, micro-research.
Practical activity	Scientific-practical conference, practicums in educational institutions.	Situation analysis, design method, study and analysis of educational problems, self-assessment.

Also, within the framework of research, we have developed a program of training for the use of information and communication technologies in professional activities and computer design activities.

The work on the creation and implementation of an improved system of preparing students for the use of information and communication technologies and computer design activities in their future professional activities requires a systematic approach and the cooperation of all departments involved in education.

Psychological-pedagogical preparation should be carried out in the process of mastering psychological-pedagogical subjects.

In the process of professional training of future specialists, it is possible to use the knowledge and skills acquired in the course "Information Technologies in Education". These knowledge and skills will be useful in the process of preparing for the use of information and communication technologies in professional activities and computer-aided design activities.

As an integral part of professional training, a special place is given to methodological training in this system. For example, elementary vocational education courses with a practicum on solving professional problems, studying a course on vocational education methodology using information and communication technologies ensure the formation of methodological skills in students for performing the main types of activities that they will have to carry out in their future activities.

The issue of the interrelation of methodological and special-methodical training requires separate consideration. Special methodological training occupies a special place in the entire system of preparing students for the use of information and communication technologies as educational tools and for computer-based design activities [7].

The task of the special course "Preparing future specialists for computer design" is to analyze the structure and content of teaching general and specialized subjects in professional educational institutions from the point of view of the possibility of computerizing its entire and individual components.

Among the additions to the lesson, a special place is occupied by independent works on the subject, organized using information and communication technologies, which are an integral part of the technology of professional training of future specialists.

Taking into account the recent widespread introduction of information and communication technologies into the educational process of vocational educational institutions and higher educational institutions, which combine the principles of the general theory of education and the capabilities of computer technology, students can be offered complex course and final qualification works. The technology of professional training of future specialists also includes pedagogical

practice, which allows connecting the theoretical education of future specialists with their practical activities.

The process of pedagogical practice is associated with preparing students to use information and communication technologies in their professional activities and computer-aided design activities, therefore its main tasks are: obtaining information about the level of readiness of students for the activity under study in the real conditions of the pedagogical process; consolidating and deepening knowledge, practical skills and abilities in the use of information and communication technologies in professional activities; ensuring subsequent work on diagnosing readiness for the activity under study.

Research shows that the effectiveness of preparing students for teaching is greatly influenced by the following organizational and pedagogical conditions: the structure of subject-subject interaction in the "teacher-student" system; the introduction of various educational schemes; the stage-by-stage organization of the educational process; active consultation.

As didactic prerequisites for the effective improvement of the informational-design competence of future specialists in the field of computer design60112400 - "Professional education (engineering of vehicles (auto transport transport))" and 60712500 - "Engineering of vehicles (surface transport systems and their exploitation)" were identified in the aspect of pedagogical activity in the field of educational areas: the use of educational process improvement technology, including information-communication technologies and computer design techniques; application of active methods and forms of teaching; incentive assessment [4].

Feedback and suggestions

In modern conditions, professional and pedagogical activity cannot be effectively carried out without information and communication technologies and computer-aided design. Computer-aided design of an object (process) is a design activity using information and communication technologies, taking into account the optimality criterion of the object (process) under study. The object (process) is systematically studied and systematically modified on the basis of computer-aided design, and its new qualities are identified.

In the activities of future specialists, computer-aided design can be presented through the following clusters of information issues implemented in the field of professional activity:

1. Computer design of the educational process:

– organization of individual, independent and learning activities of students using information and communication technologies;

– use of information and communication technologies to implement the educational process (use of interactive teaching technologies, case method, multimedia technologies);

– use of the system of computer simulators in the organization of training for working professions;

– use of information and communication technologies, Internet networks to implement distance education and network interaction of educational institutions;

2. Computer-aided design of technological processes and objects:

– collection, compilation of scientific, technical and other necessary information for computer-aided design and optimization of technological processes and objects;

– use of modern information and communication technologies to solve professional problems, find analytical and numerical solutions;

– use of 2D and 3D design systems to optimize technological processes;

– identification of opportunities for using ready-made algorithms and software products to solve production and technological problems.

Effective improvement of information and design competence of future specialists through computer-aided design is carried out in the following stages: mastering information (computer) literacy; mastering the value-semantic components of information; developing the ability to reflect on information; developing information competence.

This process can be effectively implemented in the interdisciplinary study of the modules of the "Computer-aided Design" course, which combines the integrative educational content and the technology of its acquisition in a system of a high level of integrity.

Within the framework of interdisciplinary study of the modules of the "Computer Design" course, the structure of which is shown in Figure 1, it is possible to carry out the following activities (content):

– mastering elementary skills in the use of information and communication technologies - information (computer) literacy;

– the use of automated design systems for the modeling of mechanical engineering constructions in the training of future specialists - the acquisition of informational value-spiritual components, the development of the ability to reflect information;

– use of information and communication technologies to implement modeling and optimization of technological processes based on solving the system of information-design tasks - development of information competence.

"Fundamentals of automation of design processes"	Modules of the training course "COMPUTER DESIGN"	"Automated vehicle design systems"
	Module 1. Hardware and software support for computer-aided design.	
	Module 2. Components of types of computer-aided design support.	
	Module 3. Technical means of computer-aided design.	
	Module 4. Operating systems in computer-aided design.	
	Module 5. Computer-aided design (AutoCAD / COMPASS).	
	Module 6. Launching the AutoCAD / COMPASS editor.	
	Module 7. Three-dimensional modeling.	
	Module 8. Automated calculation (MathCAD).	
	Module 9. Algebraic calculations in MathCAD.	
	Module 10. Differentiation in MathCAD.	
	Module 11. Integration in MathCAD	

Figure 1. Study structure of the modules of the "Computer-aided design" training course through interdisciplinary communication

CONCLUSION

In conclusion, the level of information and design competence of teachers of professional education plays an important role in the formation of professional knowledge, practical skills and abilities of students of modern professional educational institutions. He must have extensive and solid knowledge in his specialty and be able to actively and creatively apply it in the process of professional pedagogical activity using information and communication technologies. This requires them to have high information and communication training and extensive technical knowledge, thorough knowledge of modern production achievements and directions of economic development.

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