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Students' Graphical Culture Development in the University Virtual Learning Space

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Abstract
The article analyzes the problems related to the development of students' graphical culture in modern virtual environment of an engineering university. Graphical culture is defined as a matureness of productive professional competencies shaped within the virtual learning space of a university. They include broad-based graphical knowledge and graphic design thesaurus.

Key words: virtual learning space of engineering university, students' graphical culture, virtual reality, social reality.

New social virtual environment stipulated by the development of communication technologies has significantly changed the present society and engineering education. The educational environment of engineering university is becoming more and more virtual. This fact is of particular urgency in the case of continuous growth of the Internet user number and its expansion and impact on education. Initially, "cyberspace" was regarded as a virtual environment [1, p .3]. Development of computational engineering furthered the spread of this term. Processes and phenomena specific to the computer networks were termed as virtual environment in contrast to the real one. As noted by T.A. Rubantsova and N.V. Koltunova, "Being a part of a real world, social reality demonstrates the features of the objective reality, therefore, its learning should be based not on our sensitive perceptions and illusions, but on understanding of its characteristics peculiar to the reality itself which exist beyond human consciousness" [2, p.106]. Being a part of a virtual environment, simulacra, however, created by computers allow designing ideal objects that resemble real ones.

Virtual environment, although reflexive, is social as it is modeled by the educational actors. The virtual environment makes it possible to model various objects of social reality, for example, buildings, units of technical infrastructure, etc. However, it is necessary to remember while enhancing the model of virtual environment, we actually simplify the copy of social reality. It is worth noting that a full convergence of virtual environment and reality is impossible. Thus, new types of reality occur within the social reality. They are of virtual character and created within the Internet that serves as a technological basis. One of the essential spheres of virtual environment is educational environment of a university, which has recently become an important component of higher education in the Russian Federation.

In modern engineering university, a new pedagogical environment, i.e. virtual learning space, is currently being developed. It is operated on the basis of up-to-date computer technological and the Internet. Today, professional activity of an engineer, as well as high technologies implemented into manufacturing process, is becoming more and more complicated.

Therefore, there is a need to rapidly acquire knowledge in a short time period. It concerns both educators and students. Despite a great number of studies devoted to virtual environment issues, the notion of "virtual environment" is ambiguous and disputable. The pedagogical literature often defines the term "educational environment" through the prism of analysis and description of technical tools which help create new learning space. S.R. Tumkovsky, G.P. Putilova, and L.N. Kechieva believe that a set of computer tools and the way they are applied form the information and education environment [3, p. 22]. Definitely, this aspect of analysis is essential for the study of virtual learning space, however, it is worth noting that virtual learning space and virtual educational environment are different notions. The former is focused on the analysis of methods and tools to provide technical support of the training process. The latter involves new methods and techniques used by an educator and students to master competencies required for the job.

One of the main tasks of modern education philosophy and pedagogy is the development of new modes and formats of education, i.e. virtual learning space of a university. Education is the process of search and mastering of certain set of knowledge, skills and competencies required for the job. The basic learning outcomes are formulated as a required level of graduates' theoretical and practical knowledge.

In this article, the term "virtual learning space" should be understood as a new pedagogical and technological educational environment which is based on the use of computers and telecommunication systems in engineering education.

Graphic design disciplines are considered a theoretical basis for special engineering education. They are an integral part of professional engineering training which is basically provided in the virtual learning space. As a result, the methodology of these disciplines is subject to increasingly severe requirements.

Being one of the actors of the training process, an educator defines the way graphical information is presented in the virtual learning space, which helps students independently model and visualize various things while mastering teaching materials. Graphics plays a key role in developing communication-information environment in engineering education. As noted by M.V. Samardak, "Being an integral component of engineering education, graphic design training should perform the following interconnected functions: educational, cross-technical, professional, and cross-cultural" [4, p. 363].

Due to educational and cross-cultural functions, a student develops himself or herself as a personality and starts applying one of the ways of conceiving the world – graphical one. As noted by M.V. Samardak, "cultural focus of graphic training is rooted in its role to preserve, generate and transmit spiritual values, mainly perceptions of graphic language as a synthetic language that has various systems of information presentation (graphical, symbolic), its inception, development and role among other languages of the world culture" [4, p.364]. Graphic activity plays a crucial role in shaping students' cognitive abilities in learning space of a university. While mastering graphic design disciplines, a student develops spatial thinking which is connected with the productive forms of human activity.

In cross-technical sphere, graphic design training encourages development of technical thinking by shaping spatial one. The road to polytechnic generalizations that reflect common regularities of the studied objects is paved by the intensive use of graphical conventions. The above-mentioned functions indirectly contribute to personality development and self-development, build the foundation for more enhanced self-identity and professional self-fulfillment.

Graphic design training of engineering students constitutes a basis for professional training of future engineers. Its specific features are due to the fact that it is mainly shaped in the virtual learning space created by an educator. Engineering languages of graphical presentation of information are referred to graphic-geometry disciplines

which most fully use the functions of professional communicant. When specifying the elective component of graphic design disciplines, it is essential to consider the peculiar features of students' further professional activity. For example, within the professional activity of designers, the objects and the results of geometric modeling are regarded as a geometric system which corresponds to the stages of engineering activity in terms of form and structure: graphical model for cognitive activity and symbolic-graphical model for transforming activity.

Thus, target-oriented graphic design training delivered in the virtual learning space of a university provides a student with a set of knowledge and skills, peculiar attributes required for professional problem solving, i.e. professionalism. The quality of multifunctional graphic design training that meets the requirements for general education, professionalism and professional culture of an engineer, comprises the education potential of a personality which can be termed as a level of graphical culture.

Therefore, graphical culture can be defined as a matureness of productive professional competencies shaped within the virtual learning space of a university. They include broad-based graphical knowledge and graphic design thesaurus. As a result, a student demonstrates high performance which is rooted in the system of graphical skills and abilities. Mastering graphic design disciplines shapes a high level of spatial thinking that secures the processes of perception, structuring, and decoding of graphical professional information. Development of graphical culture in the virtual learning space of a university is a multifaceted and complicated process of graphical thinking shaping within the university virtual environment. It involves several stages: from the basic graphical knowledge to comprehensive and creative understanding the ways of implementing this knowledge in professional activity.

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Continuous Mastering of Computer Technologies as a Mandatory Condition for Highly Qualified Specialists' Education in the Sphere of Optical Engineering and Electrooptic Instrument Engineering

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Abstract
Specialists' training in the sphere of optical engineering and electrooptic instrument engineering can be divided into three stages from the standpoint of using information and computer technologies: 1. Study of general principles of information and computer technologies; 2. Mastering these technologies in design of typed blocks of optic and electrooptic systems; 3. Instruction in computer modelling based on systematic approach to designing electrooptic complexes as a whole.

Key words: computer technologies, optical and electro-optical systems instrumentation.

Today the role of information and computer technologies, in particular, computer modelling, is well known for specialists' training. They are paid much attention in implementing education programmes in the sphere of optical engineering and electrooptic instrument engineering including laser one. The complexity of modern electrooptic tools and devices consisting of various by nature blocks and units (optical, mechanical, electronic etc.) requires applying systematic approach at all stages of design, production, and research [1], which is now impossible without computer technologies.

The goal of this article is to introduce the readers to the experience of continuous study and application of computer technologies in training specialists in the sphere of optical engineering and electrooptic instrument engineering at the Faculty of Optical Information Systems and Technologies (FOIST), Moscow State University of Geodesy and Cartography (MIIGAiK).

Future specialists' training in optical engineering and electrooptic instrument engineering can be divided into three stages from the standpoint of using information and computer technologies: 1. Study of general principles of information, computer devices, and computer technologies; 2. Acquiring skills of using these technologies in computer modelling of typed blocks of optic and optoelectronic systems (radiators, optic systems, scanners, photodetectors, electronic blocks, etc.); 3. Instruction in computer modelling based on systematic approach to designing electrooptic complexes, i.e. considering it as a whole consisting of separate blocks described by submodels.

The first stage has been secured was realized in numerous curricula and education programmes for a long time. For instance, such courses as "Informatics", "Mathematical modelling", "Engineering and computer graphics" are taught. The curricula of these courses are regularly revised and updated improving their hard- and software.

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