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# METHODS OF USING MODELING TECHNOLOGIES FOR STUDENTS OF THE SPECIALTY USE OF HYDROTECHNIC INSTALLATIONS AND PUMPING STATIONS

Shaynazarov Ravshan Mamayusubovich
Karshi Engineering-Economics Institute
Email: finaledition2@mail.ru; Tel: +998 972916985

**A B S T R A C T**

The article presents the importance of modeling programs in teaching specialist subjects to students of the specialty “the use of hydraulic structures and pumping stations”. Also, in the conditions of an informed society, the development of Information Communication is based on the important stages of the development of the education of our country, the need to equip educational institutions with digital and modern educational technologies, as well as the need to learn how to develop techniques and at the same time use modeling programs.

In addition, some of the best options for learning how to prepare modeling for students of the specialty” the use of hydraulic structures and pumping stations for both video games and professional projects " are mentioned, as well as a look at the activities of scientists who conducted research on these problems.

**K E Y W O R D S**

Hydraulic structures and pumping stations, specialist science, modeling programs, visualization, technical and information, internal mental content, visual image, engineering graphics, 3D technologies, etc.

## Introduction

In today's developing era, the demand for digitization of any system is increasing day by day. In the process of designing a dam, one of the hydraulic structures, on a topographic surface, one of the urgent problems is to develop algorithms for selecting the most optimal design option from the projects created using geometric modeling, mathematical modeling methods, and applying these algorithms in automated graphic programs to optimize the design process [1].

Technology is developing, and at the same time we need to be able to do many things ourselves, one of which is to learn how to use modeling programs. Therefore, now we will talk about the easiest programs to use for this purpose. In this way, you can get an idea of the ideals of where to start in this world of design. It is worth noting that all programs for creating modeling for students of the specialty "Operation of Hydraulic Structures and Pumping Stations" have a level of complexity, but, of course, everything depends on your level of interest in it.

We will tell you through a list of some of the best options for learning to prepare modeling for students of the specialty "Hydraulic structures and pumping stations", both for video games and for professional projects, according to several experts on the subject. We already know that this resource is very versatile. For this reason, it is important to know at least the basic aspects of each of the

programs that we will talk about in this post.
To make everything clear and simple, we will do it according to the price and difficulty of each one. In each of the design software options that we leave you, we will specify whether they are free or paid. This is because we consider it important to be transparent when talking about any digital resource that may interest you[2,231].

**Research Methodology**

The diversity of information and communication technologies, their innovations, interactivity, high-tech world mobility create the reality of the modern world Hi-tech world. As a result of equipping educational institutions with digital and modern educational technologies, it became possible to implement new educational projects, which implies a significant modernization of the educational process in accordance with the requirements of the time.
One of the important benefits provided by technology in the educational process in the conditions of an information society is the visualization of objects being studied. In various fields of science, the concept of visualization has various meanings, such as: epistemological, semiotic, cultural aesthetic, psychological, technical information.

**Literature Analysis**

Understanding visualization as a technical and informational concept is carried out in the context of the concept of "technological visual perception". Y.M. Plotinsky in his research notes that the visualization of educational materials can be presented as a kind of graphic visual project developed using computer technology, both digital and textual information.
Different researchers interpret the concept of visualization in a slightly different way in a semantic context. D. Bern defines visualization as a complex process of developing graphic images using various, including computer technologies.
In turn, Z. Krakauer understands visualization as a qualitative result of the analytical development of reality, which is justified by the need to correct the stable interrelation of space and time as a transformation of various fantastic forms.
K.E. Razlogov believes that visualization is reflected in the screen culture, which implies a stable and effective integration of the computer with a specific means of communication and an appropriate channel for transmitting information for various purposes.
B.G. Ananyev argues that visualization should be understood as the ability of certain visual systems to transform various invisible sensory signals into visible signals.
A.A. Verbitsky defines visualization as a method. The researcher defines it as the process of transforming the internal mental content into one or another visual image. In turn, the image received in an expanded form is the basis for the main adequate mental and practical actions[3,121].

**Analysis and Results**

The rapidly developing capabilities of information and communication technologies and the regularity of the development of “clip thinking” among students have been noted by psychologists and teachers of local and developed countries. “Clip thinking” is thinking presented in the form of concise and clear graphic images with a textual explanation. In our research work, it is necessary to find a positive

solution to overcome this negative phenomenon. In this regard, the use of graphic images of visualized text, called visual literacy, can be a constructive alternative.

1. Infographics have been successfully implemented in education. Infographics are illustrations that combine design and information. This image of information and concepts helps to convey educational material to students, facilitate its perception and understanding in our research work. The human brain has the ability to recognize various structural formations, combining elements that are missing in them. Thus, a person has the opportunity to fill in the missing components, understanding the holistic image of an object that he does not see, but is generally visible. “People remember better what they think about than what is understandable to them.”

2. Infographics, in general, are very effectively used in such areas of human activity as science, statistics, education, etc. In the educational process, students: work with graphics and figures located in a visually balanced row, images and text. This creates conditions for quick analysis and memorization of educational materials, drawing meaningful conclusions. Visualization of educational materials using infographics helps to successfully implement pedagogical tasks such as: conveying the necessary knowledge to students, identifying the scene, visual and critical thinking.

3. Methods of activating students' cognitive activity are widely used in the preparation of students in higher education practice. 3D technologies that are relevant for our research work are: mandatory for making education interactive and mobile. In this research work, 3D technologies were developed for the courses “Machine Parts”, “Automotive Repair”, “Engineering Graphics”. Currently, 3D photo and 3D video materials are not fully implemented in the educational process. Their use is based on the use of informational properties of three-dimensional objects, rather than their attractiveness. From a complex pedagogical point of view, where the presentation of visual educational materials is mandatory, it is necessary to more actively use 3D technologies in the study of educational materials.

4. Implementation of professional training of service providers using 3D technologies should involve effective business relations between the developers of such technologies and certain services and departments of higher educational institutions. One of the promising information technologies of the information society is virtual 3D simulator technology. This technology is of great importance in the study of technical sciences and engineering graphics, since the capabilities of animation and other modules included in this technology help in our research work to comprehensively reflect both the technological process and the operation of the entire mechanism[3,86].

During this research work, the three-dimensional design system Compass 3D was used to perform laboratory work in technical sciences, as well as to create graphic images - complex drawings and modeling for students of the specialty "Operation of Hydraulic Structures and Pumping Stations". Each part of the presented educational material provides for the study of any important specific features of the object under consideration, abstracts its other features in the mind, which contributes to the success of logical thinking operations such as analysis, comparison, abstraction. The educational material is projected on a large screen using a computer.

Thus, visualization technology helps to present educational materials more clearly. Visualization is understood as a specific presentation of various types of educational materials by students in the world of science and education, as well as the development of students' visual spatial thinking.

In this research work, the specific features of visual methods for graphical presentation of educational material are studied.

Graphical Clustering is a method of presenting a large amount of educational material in a structured form. A cluster is a scheme consisting of special oval structures in a certain graphic form, in which the main problem or idea is visually implemented. The oval structure of the second level is designed to functionally systematize educational material, and the third level is designed to more fully describe the current problem. The cluster method is also used to systematize existing educational material and identify missing educational materials, or in independent work of students with various texts. We consider the development of lessons as a creative process that allows students to realize their own ideas, express their own thoughts in solving educational problems, and ultimately express themselves as individuals.

A very effective method of structural processing of information is the mental maps (“mind map”, “mind maps”, “mind maps”, “cognitive network”) developed by Tony Buzan (1993).

The specified educational method is based on the visual recording of any thoughts, ideas, associations. In the main part of the sheet, one or another visualized topic or concept is actualized; at the next stage, after a careful study of the educational material, the visual project is transformed into a new qualitative level of map, expanded and supplemented with drawings that clarify and reveal the idea and the main thematic rules. Educational discussions or thematic discussions are held on the specified map in the context of visual and textual information. This method creates favorable conditions for the development of associative thinking in students, as well as conditions for revealing the creative potential of their personality[5,68].

Denotational graphics are a method of isolating important specific features of basic concepts from the semantic field of the text.

Denotational graphics are understood as the process of transformation of verbs and nouns. Verbs denote meaningful actions, and nouns denote the main conceptual formations of the next level. At the first stage, an explanation is selected for the verb using nouns and adjectives, after which the basic concept is divided into independent, but interconnected, informational and semantic "networks", which helps to perceive and understand it from the point of view of various semantic aspects[6,211].

Denotational graphics reflect the “antipodes” that are a significant obstacle to the discovery and identification of positive reference signs and information signs of educational materials and have a clearly negative value. The indicated method is widely used in the organization and implementation of distance learning for students.

The syncwine (five-line) method was introduced from American education by Adelaide Crepsi. In the educational process, this method is used to organize thoughts and opinions in information communication processes. The student, getting acquainted with new educational materials, develops a five-line scheme. The first line contains a word that is considered a key concept; the second line contains two terms that reflect the topic being studied and its main characteristics; the third line contains three terms that indicate important actions related to the word in the first line; the fourth line is again the main concept; the fifth line is also expressed as a conclusion expressed in words.

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