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METHODEN ZUR ENTWICKLUNG DER GRAFISCHEN KOMPETENZ ZUKÜNFTIGER IT-LEHRER

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Abstrakt. Dieser Artikel präsentiert Vorschläge und Empfehlungen bezüglich der Probleme bei der Entwicklung der grafischen Kompetenz zukünftiger Informatiklehrer, sowie Möglichkeiten, diese zu überwinden. Es werden auch Möglichkeiten vorgeschlagen, die interdisziplinäre Integration in der Entwicklung der grafischen Kompetenz zukünftiger Informatiklehrer zu nutzen.
Schlüsselwörter: Computergrafik, Integration, Modell, Struktur, Grafikkompetenz, Modellierung.

Methods of developing the graphic competence of future “IT” teachers

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Abstract. This article presents the problems of developing graphic competence of future informatics teachers, suggestions and recommendations on how to overcome them. Ways to use interdisciplinary integration in the development of graphic competence of future informatics teachers are also suggested.
Keywords: computer graphics, integration, model, structure, graphic competence, modeling.

Today, due to the improvement of computer technologies and its graphic programs, there is a need to develop new approaches to the development of graphic competence of future informatics teachers. One of the ways to develop the graphic competence of future informatics teachers is to use the integration of mathematics, geometry, physics, color image, drawing and mathematical modeling subjects in the organization of classes on "Computer graphics" and "Computer graphics and web design". Because the emergence of computer graphics as a science, these disciplines serve as a basis. That is, the formation of informatics as an independent science appeared on the basis of the intersection of mathematics and cybernetics, and computer graphics developed as a component of informatics, that is, due to the emergence of modern computers and the development of their corresponding software. The creation and development of computer technologies is based on mathematical rules. Therefore, one cannot become a mature expert in the field of informatics and information technologies without good knowledge of mathematics. Therefore, it is possible to come to the following opinion, that is, one cannot be a competent specialist in computer graphics without knowing mathematics [1]. In this regard, the question arises: what do you need to know from a mathematics course in order to successfully develop the fundamentals of computer graphics and to become an expert in this field?

Analyzing the content of the science of computer graphics, we will study the tasks related to making simple graphics, i.e. modeling lines, circles, rectangles,

squares and various objects and structures to graphic primitives, coloring objects, and studying the design of various graphic projects. Therefore, in increasing the effectiveness of teaching "Computer graphics" and "Computer graphics and web design" and developing the graphic competence of students, by integrating the sciences, including physics, color image, higher mathematics, geometry, drawing, programming and mathematical modeling, training and future informatics. it is necessary to organize independent education of teachers.

In today's education system, interdisciplinary integration is becoming more and more popular. This is natural, because the integration of disciplines aimed at the development of independent scientific research, the ability to pose a problem, collect and process data, conduct experiments, and analyze the obtained data is one of the methods of active training used by specialists. Teaching with the help of integration of subjects helps to develop analytical thinking of future informatics teachers, creative approach to reality phenomena, formation of skills of objective assessment of these phenomena and formation of ability to use additional sources of knowledge and resources. Let's take geometry as an example.

A point in geometry, like a pixel in computer graphics, has no dimension and is an elementary concept. Later, this concept is extended to a straight line or a curve, then a circle, a rectangle, and so on.

For the construction of geometric shapes and drawings, equipment such as a ruler, circle, and protractors are used. In geometry, special attention is paid to constructions using only a compass and a ruler. Construction of geometric shapes in computer graphics is carried out in several ways depending on the software of the task: using the built-in functions of the graphics module or the library of programming languages (for example, rectangle, line, circle, ellipse), etc., using graphic editors using the appropriate tools of the graphic interface [1].

The content of the tasks of graphic topics is closely related to solving problems from the geometry course. Almost any construction problem can be solved using computer applications, packages, and programming environments that require knowledge of the solution to that problem. Geometric constructions and their solutions, among the many mathematical works of one of the greatest thinkers and encyclopedists of the early Middle Ages, Al-Farabi was known to al-Farabi, who had a special place in "Book of Natural Secrets of Spiritual Techniques and Subtleties".

Geometric numbers is the only manuscript kept in the library of Uppsala University in Sweden (V.V. Grinshkun, E.Y. Bidaybekov [2]). It offers unique algorithms for solving many geometric construction problems that are important in human practical activities with the help of a compass and ruler: land planning, architecture, engineering, geodesy, etc. Geometric numbers is the only manuscript kept in the library of Uppsala University in Sweden (V.V. Grinshkun, E.Y. Bidaybekov [2]). It offers unique algorithms for solving many geometric construction problems that are important in human practical activities with the help of a compass and ruler: land planning, architecture, engineering, geodesy, etc.

For many centuries, the interest in such problems is not only due to the uniqueness of their solution methods, but also, most importantly, to their great

practical importance. Currently, geometric construction issues are also of great interest, because the design of construction objects, architecture, the design of various equipment and many other practical issues are based on geometric constructions. Such issues are of great importance in the mathematical development of the future informatics teacher.

Therefore, they are an important element, one of its components, in the teaching of "Computer graphics" and "Computer graphics and web-design" subjects, forming one of the content directions of the geometry course in higher educational institutions. These include various levels of regular polygon construction problems, including problems that cannot be solved using circles and straight lines.

According to these arguments, the coordinate system considered in computer graphics is different from the one we use in math and geometry classes. In mathematics, different coordinate systems are represented by only one coordinate system in computer graphics, so it is important to understand the conversion between coordinate systems: from Cartesian to graph, from polar to graph, from parametric to graph and vice versa. needed [3].

Computational mathematics is of great importance for a deeper understanding of computer graphics algorithms and methods [4]. The topic of its study is the determination of calculation algorithms and criteria, their quality assessment, the theoretical foundations of digital algorithms, as well as the issues of their implementation on a computer, including the problems of digital simulation, play a major role in the process of understanding the modern scientific understanding, that is, the rules of fractal graphics.

Computational informatics is the core of the computer graphics curriculum. In addition to studying the rigorous mathematical theory of computational methods, it is designed to show prospective teachers the broad use of mathematical apparatus in the study of processes. These include real-life phenomena, which explores the wealth of possibilities of modern computer technology and, at the same time, its main limitations [5].

An appropriate approach can become an important link in the training of computer science teachers in the field of professional subjects, including computer graphics, and perform the following functions:

- interdisciplinary, integrative, related to mathematics, natural sciences and special training in informatics and computer graphics;

- modeling and graphic modeling methodology, in general, raising awareness as one of the leaders in the knowledge of the surrounding world;

- development of information modeling, algorithmic, programming, computer use and visualization skills to solve various problems [5];

- the history of the appearance of colors, their physical properties, the effect of colors on the human body, the combination of colors, the creation of new colors using several colors.

With mathematization and informatization of fields of knowledge, mathematical modeling is spreading widely. This allows you to design a new model or simulate a process. Today, it is difficult to imagine the results of mathematical

modeling without a graphical interface of the environment, a visual representation of graphic objects using application programs [1].

Most mathematical models simplify problem solving methods. Regardless of the types of problems and the methods used, there are three main principles: discretization, approximation and algebraization [4]. Among these principles, discretization is one of the important features of the algorithm.

Any algorithm cannot be described without dividing it into steps. It is the discretization that allows you to represent graphic objects point by point on the plane. Mathematical modeling and numerical methods, their knowledge and understanding provide a deep understanding of the methods and algorithms of the mathematical foundations of computer graphics. Any algorithm cannot be described without dividing it into steps. It is the discretization that allows you to represent graphic objects point by point on the plane. Mathematical modeling and numerical methods, their knowledge and understanding provide a deep understanding of the methods and algorithms of the mathematical foundations of computer graphics.

Thus, it can be seen that computer graphics is closely related to physics, higher mathematics, geometry, color image and programming. Like the sciences, computer graphics makes it possible to do it in the early stages of studying computer science and computer graphics. In addition, with the advent of computer technology and high-level languages, the way to solve the problem is to program algorithms and implement their software in an image programming language environment [6-7].

The development of the graphic interface and the appearance of the visual environment made it possible to bring the stage of solving computer graphics and mathematics problems to the level of visualization, interactive interaction with the parameters of the problem. Thus, it becomes possible to model information processes and events, to graphically represent them using object-oriented programming languages. Visualization methods for solving computer graphics problems are becoming a crucial level of special knowledge [1].

At the same time, it is considered appropriate to implement color in the teaching of computer graphics by ensuring its connection with the subjects of drawing and design. Because it requires knowing the laws of color and following the rules of drawing when working with computer graphic programs. At the same time, the field of activity in which computers are used as a tool for creating images and processing visual data from the real world, these are the ways in which the computer transforms data into graphic (visible) images and vice versa - images are transferred into numbers. In general, Computer graphics have been the entire visual sphere of modern man for a long time. This essence is easier to understand if we remember its practical application. At the same time, the field of activity in which computers are used as a tool for creating images and processing visual data from the real world, these are the ways in which the computer transforms data into graphic (visible) images and vice versa - images are transferred into numbers. In general, Computer graphics have been the entire visual sphere of modern man for a long time. This essence is easier to understand if we remember its practical application. With its help, fabrics, clothes, shoes, household items are modeled. Architects cannot achieve their

goal without it, otherwise they will create projects for years. All printed products have long been created using computer graphics. Any visible advertising, films, animation, landscapes, public scenes, many characters in films cannot be imagined without them. The entire field of photography is now based on computer graphics.

Therefore, in the development of graphic competence of future informatics teachers in higher education institutions, it is necessary to improve the methodology of organization of classes, including lecture classes, based on the integration of subjects, using problem-based educational technologies and digital educational tools. For this purpose, the report calls for improvement of the stages of training organization. Therefore, within the framework of research, pedagogy recommends using the following steps in teaching computer graphics subjects in higher education institutions (see Figure 1).

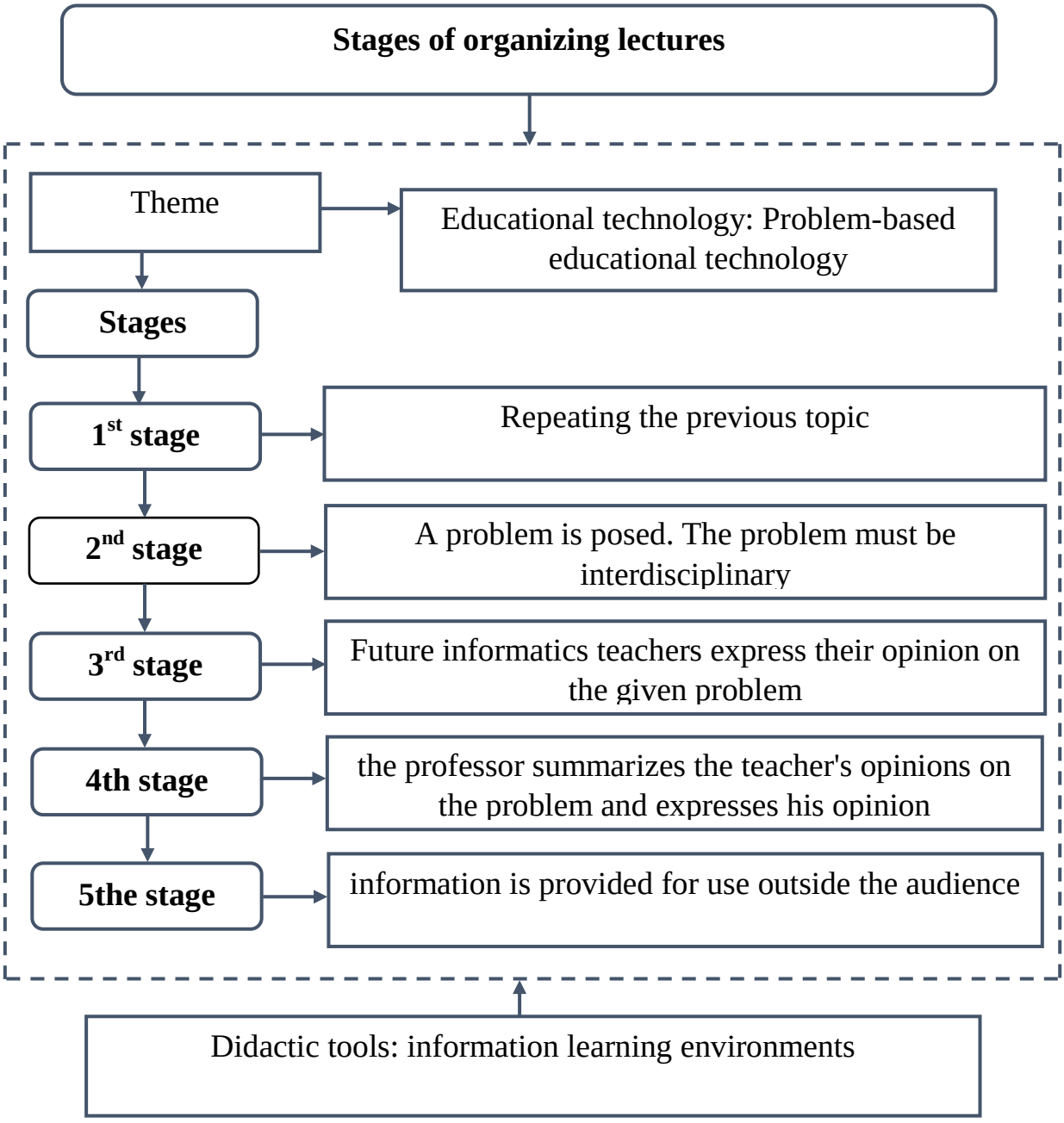

Figure 1. The structure of the organization of lecture classes.

Based on the structure shown in Figure 1, it is considered appropriate to increase the teaching effectiveness of lectures in "Computer graphics" and "Computer graphics and web design".

In conclusion, it was found out with the help of experimental work that the recommendations developed within the framework of the research, that is, the recommendations on the organization of lecture classes, are of great importance in the development of graphic competence of future informatics teachers. Therefore, it is considered appropriate to use the structure recommended above in the organization of lectures on computer graphics in higher education institutions of pedagogy.

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