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Using an integrative approach in developing students' competence in fractal graphics

B.I. Esanbayev,
basic doctoral student, of the Navoi State Pedagogical Institute

Today, due to the improvement of computer graphic programs, there is a need to develop new approaches to developing students' competence in fractal graphics [1, 2]. It is considered appropriate to use the integration of mathematics, geometry, physics, color image, drawing and mathematical modeling, programming disciplines in the development of students' competence in fractal graphics. Because the emergence of computer graphics as a science, these sciences 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 appropriate software for them. The creation and development of computer technologies is based on mathematical rules. Therefore, one cannot become a competent expert in the field of informatics and information technologies without good knowledge of mathematics. Therefore, it is possible to come to the following conclusion, that is, one cannot be a competent expert in computer graphics without knowing mathematics. Here the question arises: what do you need to know from a mathematics course in order to successfully develop the fundamentals of computer graphics and become a modern expert in this field?

Analyzing the content of computer graphics science, it consists of studying the tasks related to making simple graphics, i.e. modeling lines, circles, rectangles, squares and various objects and structures to graphic primitives, coloring objects, designing various graphic projects. Therefore, it is necessary to use the integration of mathematics, geometry, physics, color image, drawing and mathematical modeling, programming sciences in the development of students' competence in fractal graphics. 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 problems, collect and process data, conduct experiments, and analyze the obtained data are among the active teaching methods used by specialists. is one. Teaching with the help of integration of sciences helps to develop analytical thinking of students, creative approach to reality events, formation of skills of objective evaluation of these events and formation of ability to use additional sources of knowledge and resources. Let's consider 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.

To create 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 done 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 the appropriate tools of the graphic interface graphic editors are used.

Also, computational mathematics is of great importance for a deeper understanding of algorithms and methods of fractal graphics [3]. The topic of its study is the definition of computational algorithms and criteria, their quality assessment, the theoretical foundations of digital algorithms, as well as the issues of their computer implementation, including the problems of digital simulation, play a major role in the process of understanding the modern scientific understanding of the rules of fractal graphics. plays The direction of the importance

of computational informatics is the main core of the content of teaching computer graphics [2]. In this case, most of the mathematical models simplify the problem solving methods. Regardless of the types of problems and the methods used, there are three main principles: discretization, approximation and algebraization [3]. 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 discretization that allows you to display graphic objects point by point on a plane. Mathematical modeling and numerical methods, their knowledge and understanding allow a deep understanding of the methods and algorithms of the mathematical foundations of computer graphics [4].

In conclusion, it is necessary to use an integrative approach in teaching fractal graphics to students. In this, students are directed to write code in modern programming languages by developing mathematical models and algorithms for generating given images. As a result, students' creative thinking and competence in fractal graphics will be developed.

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