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Modeling Analysis of Modeling Results Modern Situation and Perspective Development in Teaching Communication Technologies

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ABSTRACT
A model is a cognitive tool and an object that can be represented materially or imaginary, and in the process of research, the object replaces the original, and its direct study provides new knowledge about the original object. The study discusses the main issues, the methodology for using a computer model in computer science lessons, describes the effectiveness of using computer models in the methodology of teaching computer science and learning new material using communication technologies, as well as the impact on the process of assimilation of the acquired knowledge by creating a model of the object being studied, various software applications. The study also focuses on modeling issues, information and communication in modeling issues which consists of researching the possibilities of implementation of technologies.

Keywords: Forms and methods, training, modeling, information technology

INTRODUCTION

The rapid development of information and communication technologies (ICT) in the 20th century and its impact on all areas of people's lives suggests that ICT will play an important role in all areas of human life in the third millennium. The application of ICT in health, education, transportation, financial sectors and almost all other fields has indeed revolutionized the field. ICT computer graphics, three-dimensional representation of information and penetration of the virtual world create wide opportunities for human-computer interaction.

In the modern age we live in, we face new changes every day. The IV industrial revolution has already taken place in society, the concepts of knowledge society, electronic state, and artificial intelligence have entered the socio-economic life of people. The world of new information technologies shows its influence on all structures of the economy. It is undeniable that in the near future, technological development will increase at a high speed and lead to huge innovations. This rapid development is also evident in the field of 3D technologies. Currently, 3D technologies have been effectively used in almost all areas of human activity. The origins of these technologies can be traced back to shadow theater - "pantomime lights" - used to entertain crowds since ancient times. The development of various innovative technologies and three-dimensional graphics led to the emergence of the concept of "3D" in science (Tokarev, 2016).

The peculiarity of the modeling method is that the model acts as a tool that the researcher places between himself and the real object, and with the help of which he studies the object of interest to him. It is this feature that determines the specific forms of use abstractions, analogies, hypotheses, and a number of other categories and methods of cognition.

"A model is a system of cognitive activity that exists in reality and represents it imaginatively. It is used by this subject for its compatibility with another system - the original, that is, it is a management tool for receiving information about the original.

Simulation modeling

Currently, there is no single point of view on the question of what is meant by simulation modeling. There are a large number of definitions of the term "imitation modeling" by now (Pavlova, 2003).

Simulation modeling is a method that allows you to build models that describe processes as they would have happened in fact Such a model can be "played" in time, both for one test and for a given set of them. At the same time, the results will be determined by the random nature of the processes. Based on these data, you can get fairly stable statistics.

The second definition: simulation modeling is a research method in which the studied system is replaced by a model that describes the real system with sufficient accuracy, and experiments are conducted with it in order to obtain information about this system.

There is a class of objects for which, for various reasons, analytical models have not been developed, or methods for solving the resulting model have not been developed. In this case, the mathematical model is replaced by an imitator or simulation model.

In the computer modeling method, all the important elements of developing education and cognition are present: design, description, experience, etc.

Compared to the model, the real object is complex for analysis and less informative. It is necessary to note that it is impossible to study the majority of objects and phenomena directly. Thus, experiments with the economy of the country or with the health of its population are basically impossible.

Among the goals of modeling, the following can be distinguished (Beshenkov, 2002).:

· understand how a concrete object is arranged: what is its structure, internal connections, main properties, laws of development, self-development and interaction with others peace;

· learn to manage an object or a process, determine the best ways of management with set goals and criteria;

· to forecast direct and indirect consequences of implementation of given methods and forms of impact on the object.

The model can be presented in different ways.

In a broad sense, the model is defined as the reflection of less essential properties of the object.

As a result, knowledge about the investigated object-original is obtained.

Thus, it is important not to confuse the computer model (modeling program) with the event itself. A model is useful when it matches reality well. However, models can predict events that will not happen, but they may not predict some real characteristics. Nevertheless, the usefulness of the model is obvious, especially in helping to understand why certain events occur.

Modern computer modeling appears as a connection between people (exchange of computer models, information and programs), understanding and recognition of the phenomena of the surrounding world (computer models of the solar system, atom, etc.), training and exercises. (trainers), optimization (choice of parameters).

The tasks of building and researching models are performed during the study of both decorative plastic objects and objects in the field of objects aimed at the development of students' spatial thinking. The task of using the model is performed more normally when building models of objects from the specified object field. The reason can be explained by the fact that these models are intended in the aspect of learning interdisciplinary relations with the help of an informatics course. At this time, the teacher working on the subject of informatics conducts an integrated lesson and uses the following types of interdisciplinary communication: previous (when studying any material, previous materials from other subjects are used), alongside (this means that a number of issues and concepts are studied in several subjects) or it can be: the material studied in one subject precedes its application compared to other subjects (Lodatko, 2010). Let us give such an example.

The teacher instructs his students to build a model of a balloon inside a cube. Informatics teacher knows that geometry students know the definition of a sphere drawn inside and outside a cube. So, the teacher has a point of reference to fulfill the teaching task. In this case, the educational task is carried out through the subject of informatics.

The problem can be approached in another way. Students can discuss that task until they learn information randomly. In this case, the informatics teacher can achieve students' understanding of new material in his class. With this, it can facilitate the understanding of the appropriate subject by the subject teacher to the students. During interdisciplinary communication, the same concept can be considered in different lessons, using different tools. These works are especially important when there is a need for students to study the presented material more deeply or to strengthen the learned material.

When building a model by the students, the knowledge about the descriptive principles of geometric figures and their combination will be transferred to informatics. The reason for this is explained by the fact that the results of building objects in a three-dimensional computer graphics environment are the description of the imaginary images of those objects and their description on paper (it should be taken into account that the images comply with the rules of the description of spatial figures) is carried out) coincides with As a result, it matches the appearance of real objects.

It is often not possible to conduct practical experiments on real objects, because it is environmentally dangerous and not economically feasible. It is possible to conduct verification experiments on these objects by applying models. This application of models creates a dichotomy. In other words, the model serves as a means to achieve one of two goals: if the model fulfills the function of explaining, it is descriptive, and if it is to better understand the object, to determine in advance how it will behave, first of all, it is descriptive in nature. This means that a pre-descriptive model in relation to the object being modeled is not always useful for planning and designing (Sunzuma, 2019). Models developed for operations research can be considered as such.

Visually is related to human cognitive activity. Cognitive activity is based on live observation. Feelings reflect the elementary signs of things and events that surround us. This reflection occurs as a result of the direct effect of those objects on the human senses. Sensation in isolation does not exist in real life. However, it is through

sensation that complex mental processes are initiated. It is for this reason that psychologists consider emotion outside of human mental activity and study it as a relatively independent simple mental process.
Speech and modeling play a very important role in the formation of mental images. Let us consider this matter.
For now, a few conclusions can be drawn:
1. Visually is not any sign or quality of real objects and events. On the contrary, visuality is a sign or characteristic of the mental image of these objects and events. When talking about the visibility of this or that object, in fact, they talk about the visibility of the image of these objects.
2. Visuality is the understanding of mental images by a person as a result of the processes of imagination, memory, thinking and imagination. Therefore, real objects may not be visible or, on the contrary, non-real objects, fantastic objects may be visible.
3. Visibility or non-visibility of an image depends on the characteristics of the latter, its perception, interest and orientation, seeing, hearing, feeling that object, creating its bright image. An involuntary visual image does not arise by itself. It can be created only as a result of active action.
We have already come close to clarifying the relationship between visualization and modeling. To clarify how modeling is used in the learning process, what is modeling and what are its forms. Which form of modeling is more effective in the training process? First of all, let's consider the role of modeling in scientific understanding. Modeling as a teaching method was born in scientific understanding.
In science, a model is used to study any object, event or process. It is used to solve various scientific tasks or obtain any information through it. Therefore, the model is defined as any object or system. His research serves as a means to study another object.
Let's say that a geography map is used to study any region (in the geographical sense). By studying the map, we get certain information about this region. Here, appropriate roads and other information are perceived through the map. To study uniform velocity motion, we use its sign model - the equation of uniform velocity motion. The study of this equation allows to determine the basic regularities of the given movement (Normurodov, Babakhodzhaeva, 2018).
The effectiveness of training methods depends on various factors. Let's say the teacher uses the question-and-answer method. In the first case, he asks his students certain questions, and the students answer the teacher's questions based on the materials they have mastered. In the second case, students not only answer the teacher's questions, but also demonstrate new knowledge by creating new connections based on these answers. So, in the first case, we witness the reproductive, and in the second case, the heuristic interview method. We can see how to use training methods skillfully and creatively when using other methods. It all depends on the teacher's ability and how he organizes and equips the training.
In the Soviet education system, the supply of training was very important, but it remained a problem, because it seemed pointless to talk about a normal solution to this problem in a situation where information technologies were not developed. However, the famous politician said, "everything needs time." Now time has spoken and the technologies that update each other year after year in the training process have created incredible opportunities for training activities.
The use of demonstrative materials created by the three-dimensional computer graphics environment in classes creates a visual image of the educational material due to them:
- volume of models;
- the color of the models that ensure the multiplicity of information received by students within a single time frame. Through this, materials are remembered and understood;
- an animation that visually presents the laws of the dynamics of any event and the idea of its occurrence.
Animations created on the basis of a three-dimensional computer environment enrich the learning process, help to make it more effective, move the students' senses to understand the learning information.
At this time, training visibility changes from a statistical form to a dynamic form, that is, it allows to monitor the studied processes within a time frame. If we take into account that it is not possible to demonstrate many of the learned phenomena in a training audience, then it is not difficult to understand how important the above is. For example, children get the opportunity to "see" the atom and the nucleus inside it. Other examples can be cited.
When using three-dimensional computer models, students show not only external, but also internal activity based on feelings of interest and wonder. This type of presentation of the material has a certain advantage in comparison with traditional methods. Thus, the students' attention increases, and the educational material is not erased from the student's memory for a long time, as it is included in the system of figurative and emotional memory (Kenney & Kouba, 1997).
Modeling is a creative process, it is very difficult to put it in a formal framework. Each time, a scheme is drawn up for the solution of a specific issue, these schemes are subject to change as necessary at different times. Some of the blocks are removed or improved, and some are added. All stages are determined by the tasks and goals of modeling.
Now let's get acquainted with the main stages of modeling in detail:

Stage I: Setting the issue. Solving the problem in the most general form is understood as a problem. In the case formulation phase, it is important to reflect three main points: describing the case, defining the objectives of the modeling, and analyzing the object and process.
When describing the issue, the problem is formalized in ordinary language. Here the description should be clear, the main goal is to define the object of modeling and know what kind of result to imagine. The final acceptance of the modeling result depends on how the problem is understood.
According to their composition, all issues can be divided into two main groups:
The first group includes issues that require the study of how the characteristics of the object change during some impact. It is accepted to name such a problem setting as "what if it happens...". For example, if a car is moving at a speed of 3 m/s with an acceleration of 0.5 m/s 2 along a straight line and increasing the speed regularly, how will its speed change after 6 seconds?
To put the question another way, if we double the rent, how much will it cost?
Sometimes the issues are formalized somewhat broadly. What happens if we change the characteristic of a given object in a given range in a few steps? such a search helps to learn the dependence of object parameters on initial data. For example; information explosion model: "A person sees an Unidentified Flying Object (UNO) and tells three acquaintances about it within 15 minutes. After another 15 minutes have passed, each of them informs three more acquaintances about it. The process continues with this rule. 15, 30, 45, etc. of informed persons. should find out how much it will be after a minute."
The second group of issues has the following generalized formula: How to influence the object so that its parameters satisfy some given condition? Such a question is "how to do it so that ... it happens?". For example, what should be the volume of a balloon filled with helium gas so that it can rise up with a load of one hundred kilograms?
More modeling issues tend to be complex. For example, the problem of changing the concentration of a solution: "5 parts volume of a chemical solution has an initial concentration of 70%. How many parts of water should be added to get a solution of the required thickness?". First, the density is calculated by adding 1 part of water. Then a table for calculating the density obtained during the addition of 2,3,4... parts of water is established. The resulting calculation model allows quick expression with various initial data. The question can be answered using the calculation table: how many parts of water should be added to get the required consistency.
What is the purpose of modeling and why do people make models?
To answer this question, it is necessary to look into the distant past. Millions of years ago, in the early ages of mankind, primitive people learned to resist natural disasters, use natural resources, and simply survive in the environment.
The accumulated knowledge was transmitted from generation to generation orally, then in writing, and finally with the help of object models. This is how the globe, which is the model of the Earth, appeared. The globe refines our ideas about the shape of our planet, its rotation on its axis and the location of the continents. Such models make it possible to understand how a specific object is built, to study its main features, the laws of its development and interaction with the surrounding world. In this case, the purpose of building models is to study the surrounding world.
Having collected enough information, a person asks himself the question: "Would it not be possible to create an object with the desired characteristics and capabilities to take measures against disasters or take advantage of natural trends?". Man began to build models of objects that did not yet exist. This is how ideas for creating windmills, various mechanisms, and even an ordinary umbrella were born. Many of these models have become reality nowadays. These are objects created by human hands .
Thus, another important goal of modeling is the creation of objects with given properties. This goal is "how to make it ...?" is determined by setting the issue.
The second stage of modeling is called development of models. This stage itself goes through three stages:
Informative or informative model:
At this stage, the elementary characteristics of the objects are clarified verbally, in the form of a scheme, in the form of a table. An idea is created about elementary objects that make up the primary object, or rather, the informative model. Models should reflect the more important characteristics, states, and relationships of object objects. It is they who provide complete information about the object (Kenney, Kouba, 1997). They should be comprehensive and comprehensive. Imagine you are solving a puzzle. You are presented with a list of characteristics of a real object: it is round, green, striped, fragrant, sweet, heavy, large, has a dry cap...
The list can be increased, but it can already be confirmed that we are talking about watermelon. Information about it is varied: color, smell, taste, etc. as you can see, the information given is more than enough to find a solution to this problem. It is necessary to try to identify the object without error by taking the minimum number of listed signs and characteristics.
If the information was intended to be drawn by the artist, then it would be enough to be satisfied with these features of the object: round, large, green, striped. A person who picks watermelons in the garden can be offered such a model: large. Crackling when pressed, dry stem.

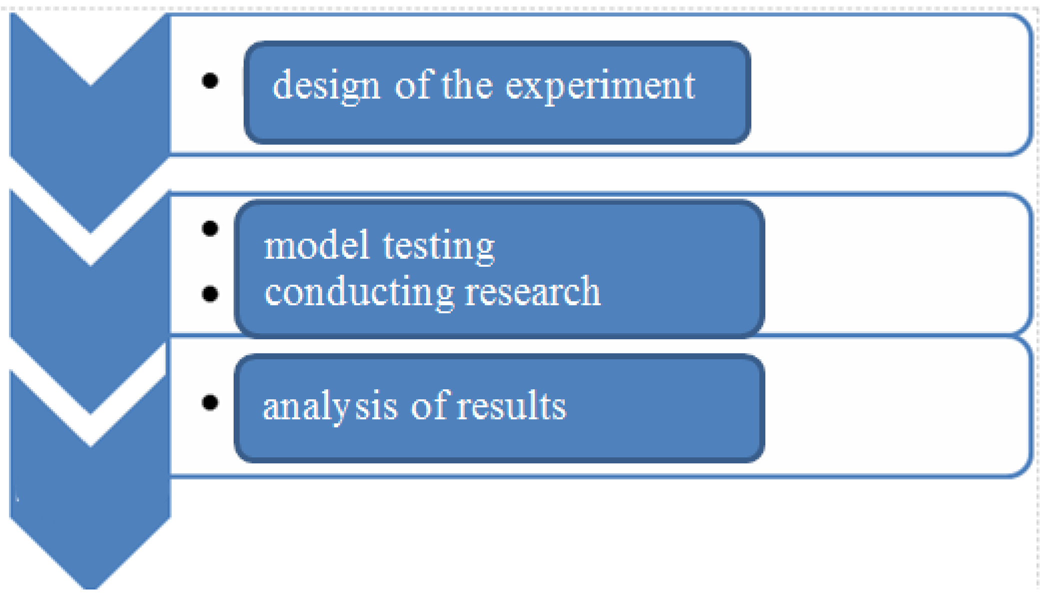
This example shows that there must be a lot of information. The important thing is that you get to the heart of the question, that is, that it fits the intended purpose. For example, at school, students are introduced to an informative model of blood circulation. This information is enough for students, but not enough for doctors who perform vein surgery in hospitals.
A person collects information about an object in order to learn about it. Some properties of the object become clear with their full meaning. For example, a flower is yellow, lightning gives a shine. But when the question is asked why the object acquires these or other properties, the study of it as a whole begins. Depending on the purpose for which it is studied, and what knowledge and tools a person has mastered, different information will be received in terms of volume.
What information can a biologist, a chemist, or a diligent student learn about a flower growing in a meadow?
The biologist compares it with the already known flowers, will study its root system, the lattice structure of its stem, and the characteristics of the earth.
And the chemist is interested in the chemical composition of the plant in order to detect the harmful and useful parts in it. The possibility of using this plant in medicine is being studied in the future.
The student draws the appearance of the rose, remembers its smell, checks how long the plucked rose stays in water, and notes the date of flowering.
Or, for example, what can be concluded by observing a natural process such as a rainbow?
The artist pays attention to smooth transitions to color, separates the seven primary colors and learns the law of their mixing.
Applying the law of propagation of physical light, he explains that the rainbow is the image of the sun's rays in raindrops. Knowing the essence of the process, he is able to create a realistic model of a rainbow in laboratory conditions. A child who sees a rainbow for the first time remembers its mysterious beauty and shares his impressions with other children who have not yet witnessed this miracle of nature. Other teachers also get an idea of his talks.
So, the same object can be seen from different points of view and accordingly it can be described in different ways. It is possible to write some properties of the object in the form of a formula that combines various parameters. For example, the law of conservation of mass during chemical reactions or the law of refraction of light, etc.
Different schemes, pictures, sign systems, and numerical characteristics can be used to describe objects, their properties, and relationships. Although information cannot replace a real object, each such description will characterize it to a different degree.
In the informative model, the parameters of the object and its constituent parts are given in numerical, textual or other form, in the form of research activities and information processing.
Informative models play a very important role in human life.
The knowledge we acquire at school has the form of an informative model designed for the purpose of studying object processes. History lessons allow you to build a model of society's development, but studying it allows you to build your personal life either by repeating previous mistakes or by learning from them (Dunleavy, Dede, Mitchell, 2009).
During the construction of an informative model, the selection of more important information and its complexity is conditioned by the purpose of modeling.
Building an informative model is the starting point of the model development phase.

Symbolic model
An informative model is usually presented in one form of notation (computer or non-computer notation).
Before starting computer modeling, preliminary sketches of the drawing or scheme are given on the sheet, calculation formulas are derived. The creative or research process is always remembered by the tedious searches and drafts. Non-computer sign models are not necessary for familiar problems that are simple in content alone. At the time when computers have become the main tool of the researcher, many people think that it is necessary to draw up the initial sketches and formulas immediately.

Computer model
After the formation of the informative and sign model, it is necessary to build a computer model. It is necessary to choose the means to be used for this. The myriad of software tools to accomplish these tasks require the modeler to make a choice. The programmer should choose the most efficient program for computer modeling of the object. The person already knows what the model will look like and uses the computer to give it a symbolic shape. For example, it uses graphic editors for constructing geometric models, schemes, and text editors for verbal and tabular descriptions.
Other software environments are used in the processing of primary information, obtaining and analyzing results. Here the computer acts as an intellectual assistant. Examples of this are Access, Excel, Dbase, etc. programs can be shown.

Descriptive algorithms include block diagrams, circuit diagrams, diagrams, etc. there are various programs that allow you to build Informative models that not only reflect information about objects, but also show their interrelationships are implemented in database management systems (Guzel, Sener, 2010).
If you need to build a mathematical model, then neither the graphical editor environment, nor the database environment, nor the word processor environment will be suitable. An effective means of searching for mathematical models is a programming environment in which the computer model is presented in the form of a program. Here, the primary information-sign model is presented in the form of tables connecting elementary objects according to the rules of establishing relationships in this environment.
A computer model is a model realized by means of software.

METHODS
You have often come across experiments in biology, chemistry, physics, and geography classes held at school.
Later, tests are used when recruiting new enterprises. Usually, for this purpose, a specially created device allows you to conduct a test. This is done either in laboratory conditions or by conducting a natural experiment on the real product itself.
Experiments in the laboratory and in nature require large financial costs and time.
The development of computer technology gave rise to a new unique research method - the term computer experiment. Aided by empirical examples and sometimes substitute testing, computer research models have been developed. Conducting a computer experiment is carried out in two stages: design, experiment and research.
Plan experiment.
In the plan experiment, the model of the work, this is clearly performed and given the sequence of execution, is shown. An example of such a plan experiment is a test model. It should be a plan experiment that properly sets up this verification process.
To be sure of correctness, it is necessary to model the obtained results: For this, it is important to build an algorithmic model of the material to be tested, which correctly reflects the built model, taking into account the properties and time.
Conducting research;
After this stage, there is confidence in the correctness of the test, and then there is a need to conduct research on the established model.
The computer experiment preparation scheme is described as follows:
Experimentation is needed to give life to new installations, to penetrate technical issues in production, or to test the efficiency of new ideas. In the recent past, such an experiment was carried out in various forms.
For this, small groups were taken in the laboratories and experiments were conducted on them. In another way, the experiment is carried out in kind, that is, it was possible to test this model in the true form of the product by testing it every time. For example, in order to study the operating properties of some unit or node, it is placed in a thermostat, frozen in special chambers, shaken in special containers, etc. they go through processes.



If a research experiment is conducted on a new watch or a vacuum cleaner, the losses are not so great when they fail. But what if we choose a plane or a rocket as an object? Of course, it will be different here. Laboratory and natural experiments require a lot of money and time, but their importance is nevertheless very great.

We have already discussed in the first stage that many features were discovered during the initial analysis of elementary objects that underwent various experiments in the process of modeling. If we return to the issue of the aircraft, then all the tools for experiments on patterns and systems are convenient. Aerodynamic tubes and wings, etc., to check the slipperiness of the body. natural models are required. There are various simulation models for testing the accident-free power supply and fire safety system, it is impossible to do without a special stand for the development of the chassis release system.

With the development of computing technology, a new unique research method - computer experiment - appeared. Computer studies of models were created in many cases with the help of experimental samples and test stands, and sometimes by replacing them. The stage of conducting a computer experiment consists of two steps: designing a modeling plan and modeling technology.

The modeling plan should accurately reflect the sequence of work with the model.

A plan is often expressed as a sequence of numbered paragraphs that describe the important tasks the user will perform with the computer model. It is not possible to specify which software tools to use here. A matching plan is in its style the opposite of a computer experiment strategy and algorithm.

The first step in such a plan is always text processing, followed by model testing.

Testing is the process of checking the correctness of the model.

A test is the collection of preliminary data with a prior knowledge of the result.

In order to be sure of the accuracy of the results of the modeling, it is necessary to conduct a computer experiment on the model for the compiled text. At this time, it is necessary to remember the following:

First, the test should always be oriented to verify the developed algorithm of the computer model's operation. The test does not reflect its meaning content. However, the results obtained in the testing process may lead you to change the original informative or symbolic model in which the meaning and content of the question is located.

Second, the initial data in the test may not completely reflect the real situation. This can be a regular number or any combination of characters. What is important is that you can foresee the expected result in a particular version of the initial data.

For example, the model is presented in the form of complex mathematical ratios. It is necessary to protest (deny). You take several variations of simple quantities of initial data and calculate the final answer in advance, that is, the expected result. Then you run a computer experiment on this initial data and compare the obtained result with the expected result. They should overlap. if they do not coincide, then the reason must be sought and eliminated.

After testing, when you are sure that the model works correctly, you go directly to the technology of modeling.

The technology of modeling is a set of purposeful activities of the user on the computer model.

Each experiment should be conducted in a form that can be the basis of analysis of modeling results.

Method, form and means of training.

Y.K.Babansky's completed structural classification was completed by (S.A.Smirnov, Kotova, Shiyanov, 1999).

Considering these classifications, we justify the use of three-dimensional computer modeling in the methodology.

In the structure of Y.K.Babansky, the following groups of training methods are defined:

1) methods of organizing students' learning and understanding activities;
2) methods that organize students' mutual relations and the collection of their social experience;
3) methods of monitoring and diagnosing the effectiveness of training and understanding activities;
4) methods of developing students' creativity;
5) methods that stimulate learning and understanding.

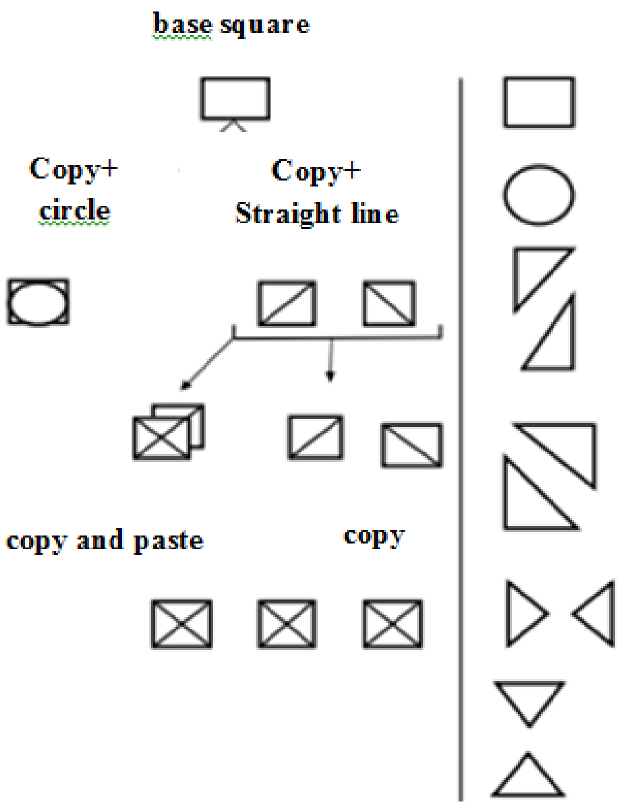
Two of the above-mentioned methods (methods of monitoring and diagnosing the effectiveness of teaching-learning activity and methods of stimulating teaching-learning activity) are aimed at the teacher's activity. We will provide more detailed information about this in the next paragraph. Here we will talk about the methods that interpret the students' activities in a broad way.

In many cases, it is possible to break down the object of modeling into smaller details. The house is made of bricks or building blocks, and the mechanisms are of individual patterns. Therefore, it is necessary to process the details in such a way that it is possible to collect various objects from them. Such a process is otherwise called construction work .

Before executing the model with the material, it must first be given in certain forms on the computer. Many geometric objects can be built in such a graphical editor environment.

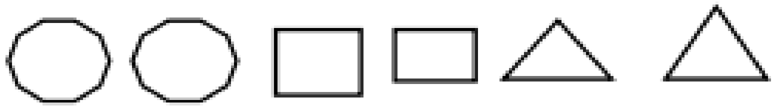
Let's think about where the modeling (construction) works, which are superficial details. Another example is that you've probably seen cardboard dolls whose clothes, pants, and hats can be changed. It can be seen as a special "set of young fashion designers". Not only children, but also adults are engaged in similar modeling work. We know that policemen make photo robots of criminals with images of eyes, mustaches and noses. With the help of a computer program, the hairdresser helps the client to choose a suitable hairstyle. Modeling from superficial details helps an artist or designer to imagine modern fabric paintings, to create multi-colored stained glass.

Therefore, it can be said that computer engineering is the process of creating computer models from typical elementary objects.
Let's explain our opinion on different examples:
Problem 1: Suppose we are required to create typical mosaic form menus. Building this work as a model is done in the following way:
I stage. Setting the issue:
Description of the issue:
Among any children's toys there is a mosaic, from which it is possible to collect patterns and pictures of various shapes. Mosaic helps the child's development, and this game is the process of children modeling the world around them according to their imagination. It is possible to realize the details of such a mosaic on a computer. It is important to fulfill the single requirement - the details must be together.
To model more than once from a mosaic, you need to create this menu again each time before building. Therefore, it needs to be done once, but stored on disk, protected from pre-sanctioned writes. This means that anyone can read the file from disk, but cannot add something to it and then write those additions to the file.
Thus, it is convenient to use the ready-made forms menu for modeling from any ready-made elements. Sometimes a lot of time is spent on creating such a menu. By creating such a menu once and saving it to memory, it is possible to create new compositions based on ready-made elements. The menu of ready-made forms makes work easier and gives free time for creativity.
The purpose of modeling
From them to create a menu of mosaic details for the future work of building complex geometric objects.
Object analysis
System of mosaic details of unit size type.
II stage. Development of the model.
Computer model
Select the Paint graphics editor environment for modeling.
III stage. Computer experiment



Modeling plan
1. Execute the algorithm presented in Scheme 1 (left side).
2. Place the surface constructor details in the workspace on the right.
3. Save the build in the Mosaics menu file, protecting it from unauthorized writing.
Let's take another issue:
Issue 2: Creating geometric compositions from ready-made mosaic shapes.

I stage. Setting the issue.
Describing the issue
Creating geometric models from a base set of typical geometric objects.
Object analysis
System of mosaic details of unit size type.
II stage. Development of the model.
Computer model
Select the Paint graphics editor environment for modeling.
III stage. Computer experiment
Modeling plan
1. Execute the algorithm presented in Scheme 1 (left side).
2. Place the surface constructor details in the workspace on the right.
3. Save the build in the Mosaics menu file, protecting it from unauthorized writing.
Let's take another issue:
Issue 2: Creating geometric compositions from ready-made mosaic shapes.
I stage. Setting the issue.
Describing the issue
Creating geometric models from a base set of typical geometric objects.
The purpose of modeling
Development of spatial imagination and creative ability.
Object analysis
Two-dimensional artistic compositions made from a standard set of surface details according to the tasks and personal fantasies in Figure 1.
II stage. Development of the model
Computer model
For modeling, select the Paint graphic editor environment and use the ready-made shape menu created in problem 1. Computer models should be constructed as surface representations of the problems in figure 1. Use the SELECT (SEPARATE), COPY, PASTE (PLACE) method when copying and constructing elementary graphic objects during the construction process.
III stage. Computer experiment
Modeling plan
Open the Mosaics menu file.
Creating the figure depicted in picture 1 from elementary objects.
Modeling technology
1. Select the Open command to open the File (Edit) menu and display the files.
2. Find and open the Mosaics menu file; at this time, the pre-made geometric details for construction work appear in the workspace area (right part of the workspace)
3. Select the separation frame from the tools and move its necessary reference detail to the menu.
4. Open the Edit (Edit-Correction) menu and copy the selected detail.
5. Create the required amount of details on the screen in the given configuration list by selecting the Paste command in the Edit menu.
6. Repeat steps 3-5 until the given build job is received.
Issue 3: Parquet modeling.
I stage. Setting the issue
Describing the issue
We have already talked about computer graphics and given a reminder of their use by designers, constructors and architects. Let's be interested in their role.
You have probably noticed the beautiful parquet floors in the museum halls. Genius architects thought up patterns and drew sketches, and master-parqueters created them. The road from sketch to parquet has been long and tumultuous. After all, it is not enough to think of a beautiful painting, it should also be in harmony with the general architectural style, dimensions of the hall and its decoration.
In today's era, when the computer has become an indispensable tool for artists and designers, the process has become quite simple. It is possible to create many computer versions of the parquet and even check them on the volume model of the living space.
Parquet is made up of details. As a rule, they are regular polygons: triangle, square, hexagon...
Parquet craftsmen collect not very large blocks from these details that fit together on a special table. Real parquet is bought from these blocks on the floor of the residence.
If after the construction of the blocks there is a hole of the correct shape between them, the details from the main set are placed under them. The contour figure of the parquet menu given in figure 2 was obtained with the help of programs written in the LOGO programming language.



The purpose of modeling
Modeling standard blocks from detail sets and making parquet from them.
Object analysis
Geometric parquet made from a standard set of correct polygons according to tasks and special projects.
II stage. Development of the model
Computer model
Select the Paint graphics editor environment for modeling.
III stage. Computer experiment
Modeling plan
Open the previously created Parquet menu file.
2. Using the SELECT, COPY, PASTE method, buy an exhausted block of parquet that overlaps with other such blocks.
3. To model parquet from ready-made blocks with the help of those methods of drawing a fragment.
4. To model parquets consisting of two or three-figure details according to a personal project.
5. Remember that during modeling, cracks in the parquet and overlapping of details in order to mask these cracks should not be allowed. Because real parquet has a certain thickness.
Modeling technology.
1. Select the Open command to open the file menu and display the file list
2. Find and open the parquet menu file; at this time, a set of geometric details prepared in advance for construction work appears in the Workspace area.
3. Select the split frame from the tools and move its necessary parquet detail to the right side of the screen area.
4. Copy the selected detail using the Ctrl+C key combination.
5. Create the required amount of configuration details on the screen using the Ctrl+V key combination. It is necessary to work carefully when building and connecting the details of the project.
6. Repeat steps 3-5 until you get a solid parquet block.
7. From the ready-made blocks, form a parquet along the entire screen using the method of SELECTING, COPYING, INSERT.
8. To cover the empty spaces of the correct shape with the details of the parquet menu.
The ultimate goal of modeling is to make a decision based on a comprehensive analysis of the obtained results. This stage is crucial whether you continue the study or finish it. It is possible that the expected result is known to you, in which case it is necessary to compare the received and expected results. You can make a decision if there is an overlap. The results analysis phase cannot exist separately. The obtained results often help to conduct additional series of experiments, occasionally to change the model.
The results of testing and experiments act as the basis for improving the solution. If the results do not correspond to the goals of the problem, then mistakes were made in the previous stages. This is a very simple construction of an informative model, or a violation of technological methods during the construction of the model. If such errors are found, then it is necessary to correct the model, that is, to return to one of the previous stages. The process is repeated until the results of the experiment meet the goals of the modeling (Tokarev, 2016).
Concept of geometric model. Completion by computer
Many people think that the use of models started in recent times. But modeling is as old as the world itself. It was created at the time when humanity understood its place in the surrounding world and tried to study and change it. Rock paintings depicting domestic scenes, paintings on worship utensils, idols and depictions of gods confirm this.
Geometric models are a simple type of models. They give the external characteristics of the object (size, shape, color).
Geometric models correspond to their prototype (original). They are mainly used for the purpose of correcting various mechanisms and data, designing buildings, and for visualization purposes during training. Such simple models surround you from infancy and childhood, they are toys. It is they who help to understand the surrounding world. As you grow, you come across more complex geometric patterns.
The image created when working in the graphic editor is also a geometric model. So, the graphic is one of the editor-modeling tools, like a painter's brush, a sculptor's knife or a reporter's camera. Let's give some recommendations on performing geometric constructions in the graphic editor environment. Let's list the tools

needed for modeling in any graphic editor as follows. For this, let's use the table form of the graphic editor. Let's show this using the informative model of the graphic editor.

Turning to the role of modeling in didactics - a section of pedagogy dedicated to the theory of learning, it is necessary to emphasize that the process of presenting the material to students will be ineffective without the use of schemes, physical structures, and symbolic formulas - in a word, models. Modeling in didactics is successfully used to solve important tasks of optimizing the structure of educational material, improvement of the planning of the educational process, management of cognitive activity and the educational process, diagnostics, forecasting, design training.

Any discipline of the general education cycle needs to rely on the model. It is impossible to study mathematics and physics without formulas and schemes, it is impossible to master the grammar of Russian and foreign languages without sign constructions, it is difficult to understand a foreign culture without a model of the language environment, it is also difficult to imagine sections of biology without models of various structures.

Summing up the results of this article, we will list the stages selected by the teacher A.N. Dakhin in which it is possible to formulate the main provisions of pedagogical modeling (Dakhin, 2005).:

1) Entry into the process and selection of methodological bases for modeling, qualitative description of the subject of research;
2) Posing modeling tasks;
3) construction of a model with clarification of the dependence between the main elements of the object under study, definition of the object's parameters and criteria for evaluating changes in these parameters, selection of methodical measurements;
4) study of the validity of the model in solving the tasks;
5) Application of the model in the pedagogical experiment;
6) Meaningful interpretation of modeling results.

The application of modeling is closely related to increasingly deeper understanding of the essence of educational phenomena and processes, deepening of the theoretical foundations of research. A teacher-researcher can develop a model:

Optimization of the structure of the educational process, activation of cognitive independence of students, personality-oriented approach to students in the educational process. The modeling method is open to pedagogical science

The possibility of mathematization of pedagogical processes carries a huge potential.

CONCLUSIONS

According to the results of the study, the functions of model and modeling are distinguished from each other. As a result, students do not have difficulty in differentiating similar concepts and, therefore, they proceed from the level of critical thinking in their conceptions of spatial concepts. Teachers have a serious need for three-dimensional computer modeling in the subject areas they teach. The conducted research proved the correctness of our hypothesis, and showed the effectiveness of our research, which gives us a feeling of confidence that the results of our research will be used in the training process in the future.

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