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Scientific article

Nodir Yadgarov

Bukhara State Pedagogical Institute, Bukhara, Uzbekistan

E-mail: nodirbekyadgarov@gmail.com

Methodology for the formation of professional knowledge of future teachers of fine arts through spatial learning - visual 3D images

Abstract. The article considers the professional skill of the future drawing teacher - this is an integrative feature that describes his readiness to work with visual images in the space of his work. Drawing describes the teacher's practical readiness to perform his work with spatial-visual representations of details and structures based on his knowledge and compensation. In the process of forming the professional skills of the future drawing teacher in higher educational institutions, their qualitative components, that is, spatial-visual 3D images, are interconnected with each other and with the engineering elements of the structural system. In determining the meaning of the concept of "spatial-visual 3D images" an important role is played by the assessment of the indicators of the development of spatial imagination. It determines the following indicators of spatial imagination development: stability, width, flexibility, depth, completeness, dynamic state of geometric images, appropriateness, as well as types of work with spatial imagination in solving problems. The set of these indicators, in our opinion, describes the formation of spatial images in students as fully and comprehensively as possible. The study allowed us to determine the spatial-visual 3D image competence, which describes the level of preparation of teachers for professional activities, as a necessary part of professional skills.

Keywords: spatial education, visual 3D images, drawing subject, development of spatial imagination, spatial-video 3D image.

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Introduction

The study of human mental activity and character has been known since ancient times. In the works of medieval thinkers who lived and served in the Middle East, much attention was paid to the connection of scientific knowledge with the type, principle, structure and criteria of human mental development and maturity. The medieval scientist and philosopher Al-Khwarizmi clearly distinguished between cognition through feelings and cognition through "logical reasoning": he considered feelings to be "subtle" properties, and "logical" to be the study of the essence and their interaction. In the scientific heritage of Al-Beruni, special attention is paid to the scientific method in the study and cognition of nature. In his work "Kitob al-Taffim" Al-Beruni describes the body as an entity cognizable through the senses and existing according to its own laws. He claims that the boundary of the body is the surface, and the edges of the surface are lines at the end of which are points. The section on stereometry of his work provides rules for determining a cube, prism, cylinder, sphere and other geometric bodies. Also considered are various methods of constructing second-order curves at intersection with planes. In modern education, the development of students' mental activity is one of the most important pedagogical problems, the solution of which is aimed at increasing the effectiveness of training. Modern research in the field of didactic and educational psychology emphasizes the importance of graphic information for the formation of mental actions, such as analysis, synthesis, comparison, abstraction and generalization. At the initial stages of training in engineering graphics, students develop the ability to abstract through the implementation of graphic tasks. This ability gradually moves from emotional perception to more reasonable, logical thinking. In the process of training, abstraction is carried out through visual aids, such as computer animations, real objects and images.

The development of spatial thinking and components of the educational process has been the subject of research by many scientists, such as A.D. Botvinnikov, A.B. Vasilevsky, G.D. Glatzer, V.A. Gusev, N.S. Podkhodova, A.Ya. Zukar, Z.R. Fedoseeva and I.S. Yakimanskaya. The works of these methodologists consider the problems that arise in the process of teaching drawing, including underdeveloped imagination in a modified form. As a solution, the use of

theoretical material in the form of tasks that require the image of spatial bodies and design tools is proposed. This contributes to the formation and development of spatial images, as well as the skills of their mental construction. By 3D images are understood general territorial-visual 3D images of geometric objects used for information processing (analysis). In modern practice, there are several types of visualization: natural material models (real structures, mechanisms, geometric bodies), traditional graphic images (drawings, sections, sketches) and symbolic models (graphs, maps, diagrams and mathematical symbols). These methods are used to form the professional skills of future fine arts teachers, activating their ability to work with spatial images.

Materials and methods

To study and develop spatial thinking of future teachers in the process of teaching engineering graphics, methods of modeling, visualization and spatial visualization of 3D images are used. Modeling is the process of creating an image that includes logical and emotional elements, abstract and concrete components. The process of creating a model contributes to a better understanding of the geometric shape and methods of its representation, which is an important step in the development of abstract-logical thinking. Visualization is a way of presenting abstract information in such a way that it is convenient for visual perception and analysis. This method is actively used in the educational process so that students can work with abstract objects and present them in an accessible and understandable form. The creation of spatial 3D images in the learning process helps to activate the cognitive abilities of students and contributes to the development of their creative and analytical thinking. Thus, the research methodology includes a combination of theoretical knowledge, practical tasks, modeling and visualization for the effective formation of spatial thinking and the development of skills in working with geometric objects in students.

Spatial learning method - 3D visual images

The drawing uses the achievements of modern didactic and educational psychology to study the schedule and mental activity of future teachers in the learning process. In the process of acquiring graphic information by students, they

play an important role in analytical and synthetic actions, as well as in thinking operations such as comparison, abstraction, generalization and clarification. By 3D images, we mean the general territorial-visual 3D image of a geometric object for information processing (analysis) monitoring. In this regard, we consider the most used types of visualization, which can be divided into three main groups.

- natural material models (real construction, mechanisms, geometric bodies, etc.), their perspective images (photographs, artistic reproductions may also be included here);

- traditional graphic images (drawings, sections, sections, sketches, etc.) that differ in different forms and content;

- symbolic models (graphs, geographical maps, topographic plans, diagrams, semi-formulas and equations, mathematical symbols).

Creating a subject of drawing using spatial images leads to the formation of professional skills of the future art teacher by activating the ability to work with spatial images. Spatial images are understood as a whole visual image of the spatial element and the structure formed by them. It is understood as a mental activity aimed at working with spatial images, activating elementary images in the right direction, reconstructing them, changing their forms, transforming and creating new images on this basis. pictures are drawn. Therefore, by knowing the methods of representing spatial objects on a plane, by perceiving spatial images and performing mental actions on them, necessary conditions are created to create new images. Modeling in the formation of spatial images serves as a component of spatial thinking. It consists of:

1. The process of creating a model combines logical and emotional, abstract and concrete, general and specific, demonstrative and abstract elements. Logis takes subject to subject and vice versa, providing information that allows for experimental investigation, measurement, and inference. There is a connection between this subject and life.

2. Making a model is the highest form of generalization of theoretical and practical knowledge about geometric form and methods of its material representation, including preliminary calculations, constructions, integral development, etc.

3. Reflection on the created model - awakens the cognitive interest of the future art teacher. The process of cognitive interest is not only thinking about the

individual details of the figures, even the figure itself, but also thinking about the ideas and methods of its creation.

4. A model is a means of verifying the originality of an imaginary product.

5. Development of models synthesizes almost all types of learning activities.

So, by modeling we mean any attempt to create realistic and perfect models of objects in the world. Geometric concepts (point, line, plane, etc.) are abstract, and in the process of modeling you can see their concrete image. In conclusion, we can say that modeling is used as a means of developing figurative (abstract-logical) thinking. Engineering graphics are taught in a three-dimensional euslide space, where subjects are composed of sets of points. For this reason, 3D technology is used to simulate the virtual space of spatial images. By transforming objects in this virtual space model, their spatial-visual 3D images are visualized. The visualization we are talking about is spatial visualization. Spatial visualization promotes visual perception of objects by transforming abstract information and phenomena. In conclusion, it can be said that modeling is used as a means of developing figurative (abstract) thinking.

Creation of spatial-visual 3D images consists of 3 stages: modeling, visualization, spatial-visual 3D images. Visualization - what is it and how does it work? Visualization is a way of presenting abstract information in a way that is convenient for visual perception and analysis of the phenomenon. This term is multifaceted, its meaning is based on the field of activity. The goal of this method is to fully master the information. Information must arise from an abstract phenomenon that requires prolonged reasoning, and as a result of this process, it becomes an invisible phenomenon. Visualization helps to transform (transform) abstract (abstract) information and phenomena, objects in a way that is convenient for visual perception. This term does not apply to all methods of data visualization, such as statistics, animation, and interactive visualization. In addition to the difference between interactive visualization and animation, Scientific Visualization, which is used using special programs, gives good results. Because information visualization has a special place in education. This method is very convenient if the research object is abstract or invisible objects, for example, molecules. Without special scientific equipment, they are invisible to the human eye. It helps to learn the value of visualizing such objects and to create more complex logical sequences associated with the object in the future.

Method of application in science

Today, visualization is actively used in science, technological production process, medicine and many other areas of life. In addition to the fact that this method occupies an important place in the field of computer graphics, it is an integral part of the computer world. Visualization also plays a special role in the development of animation. Digital animation is used, for example, in broadcasting meteorological information during a wide range of weather forecasts. In TV channels, you can see many examples of scientific visualization, for example, when roads or various equipment are converted into animation form. In the field of education, the demand for animated videos is very high, so all the necessary information can be easily conveyed to the students through this method.

As part of the publication standardization, a drawing is considered as an element of a publication: a drawing is a conventional graphic image of an object with the exact ratio of its dimensions obtained by projection:

- graph - a drawing graphically depicting the numerical relationship and development of interconnected processes or phenomena in the form of a graph, a straight line or a polyline built in a partial system;

- nomogram is a drawing that allows you to replace calculation with formulas by performing the simplest geometric constructions related to reading the answers with the help of a key;

- plan — a horizontal or vertical projection of the object(s) and its (their) dimensions, represented by conventional signs (ssale) on the plane.

As a means to an end. Visualization is also the most important tool to achieve the goal. This can help, as can affirmations, which aim to improve motivation by visualizing or projecting mental images. This method was used in various fields from the late 70s to the early 80s.

A tool for creativity. Visualization is primarily aimed at forming mental images of our primary goals, stimulating the imagination, and is the most valuable tool for dreaming.

How does this work? Visualization at the level of physiology shows results. Neural connections contribute to the stimulation of the nervous system as specific events. Complex signals are oscillations of neurons that affect the activity of the muscular system.

This can be observed in sports games, because in order to achieve a successful result, it is important to clearly understand the rules of the game and adapt accordingly to the upcoming activity. Imagination, like any other mental activity, requires regular exercise.

When is visualization done? Visualization helps you achieve your goals in the process of monitoring positive results of work. Often, suspicious people first think and imagine the path of suspicion in their imagination, and only then rush to implement it. It helps to create a specification plan and is considered a "rehearsal" of the upcoming event. Any goal, no matter what it is (lose weight, improve your career, etc.) requires advance planning. Seeing = believing. Before reaching the goal, you need to create a way to achieve it with the help of visualization. This method allows you to plan your behavior in the future and achieve the desired result, so this method is very popular among skeptics. The brevity of the method. Research has shown that when a person's brain is photographed during this exercise, important information transmitted by neurons in the brain changes everyday life in a way that resembles reality. The brain creates neural pathways to create a sequence of actions. This process can also be called self-programming.

Mind and Body: The Connection. Visualization helps to improve the process of thinking and imagination. It is important to remember that thoughts directly affect reality (Fig. 1).

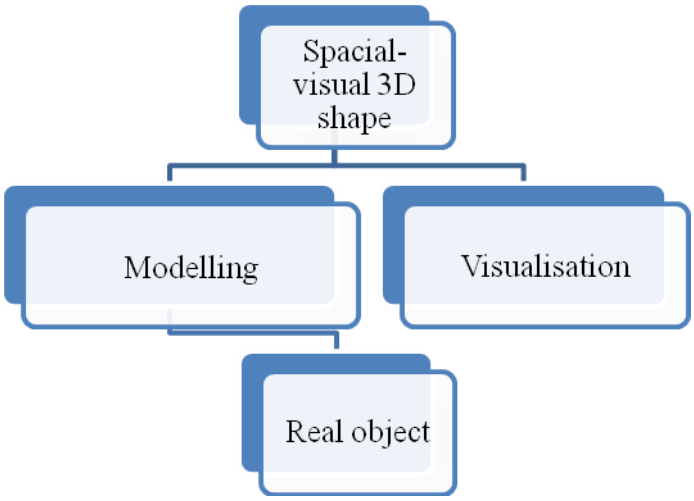

Figure 1 - The scheme of creating a spatial-visual 3D image of a real object

It is important to use the resources of the human brain as much as possible to improve the quality of life and plan your future activities. In the process of studying the science of drawing, the formation of a spatial-visual 3D image can start from any structural elements and move in any direction. But according to the laws of ontogenesis, its development follows the following pattern: Real object - image - geometric body. This approach allows perfect mastery of academic subjects:
- formation of spatial thinking necessary for acquiring knowledge from academic subjects, - visual, convenient and interesting study of academic subjects, - systematization of knowledge, educational methods of education.

Discussion

Based on the analyzes, conclusions and opinions described above, the concept of "Spatial - visual 3D image" was defined as follows - this is a real object, abstract information and a visualization model, their version, obtaining objective information about the object, understanding the information represented in them. The first step in any cognitive process that involves generating ideas is perception. For example, drawing, diagram, model, etc. To make it effective, it is necessary not only to watch or observe visual images, but also to understand the information in them, that is, to analyze the visual information. Analysis of visual information begins with creating a general structure of information placed in a visual image (model, picture, diagram, etc.) and highlighting its elements. Visually presented educational materials are divided into certain elements. For example, when describing spatial or planar geometric figures, in some cases the figure itself refers to a structural element (heights, angles, sides, vertices, etc.).

Conclusion

Working on the basis of spatial-visual 3D images and performing various educational production tasks on this basis is an important feature of human mental activity. Formation of spatial-visual 3D images of students and improvement of related skills is the most important component of graphic activity. The use of spatial-visual 3D images in the process of formation of professional skills of future drawing teachers has a great pedagogical value and it consists in education of the most necessary skills and abilities of modern production.

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Нодир Ядгаров

Бұхара мемлекеттік педагогикалық институты, Бұхара, Өзбекстан

Кеңістіктік оқыту арқылы болашақ бейнелеу өнері мұғалімдерінің кәсіби білімін қалыптастыру әдістемесі – визуалды 3D кескіндері

Аңдатпа. Мақалада болашақ сызу мұғалімінің кәсіби шеберлігі қарастырылады - бұл оның жұмыс кеңістігінде көрнекі бейнелермен жұмыс істеуге дайындығын сипаттайтын интегративті қасиет. Сызба мұғалімнің өз білімі мен өтемі негізінде бөлшектер мен құрылымдардың кеңістіктік-бейнелік бейнелерімен жұмысын орындауға практикалық дайындығын сипаттайды. Жоғары оқу орындарында болашақ сызу пәні мұғалімінің кәсіби шеберлігін қалыптастыру барысында олардың сапалық құрамдас бөліктері, яғни кеңістіктік-визуалды 3D кескіндері бір-бірімен және құрылымдық жүйенің инженерлік элементтерімен өзара байланыста болады. «Кеңістік-визуалды 3D бейнелер» ұғымының мәнін анықтауда кеңістіктік қиялдың даму көрсеткіштерін бағалау маңызды рөл атқарады. Ол кеңістіктік қиялды дамытудың келесі көрсеткіштерін анықтайды: тұрақтылық,

кеңдік, икемділік, тереңдік, толықтық, геометриялық бейнелердің динамикалық күйі, орындылығы, сонымен қатар есептерді шешуде кеңістіктік елестетумен жұмыс түрлері. Бұл көрсеткіштердің жиынтығы, біздің ойымызша, оқушыларда кеңістіктік бейнелердің қалыптасуын барынша толық және жан-жақты сипаттайды. Зерттеу кәсіби дағдылардың қажетті бөлігі ретінде педагогтардың кәсіби іс-әрекетке дайындық деңгейін сипаттайтын кеңістік-бейне 3D кескін құзыреттілігін анықтауға мүмкіндік берді.

Кілт сөздері: кеңістіктік білім беру, визуалды 3D суреттер, сызу пәні, кеңістіктік қиялды дамыту, кеңістіктік-видео 3D кескін.

Нодир Ядгаров

Бухарский государственный педагогический институт, Бухара, Узбекистан

Методика формирования профессиональных знаний будущих учителей изобразительного искусства посредством пространственного обучения - визуальных 3D образов

Аннотация. В статье рассматривается профессиональное мастерство будущего учителя черчения - это интегративное качество, характеризующее его готовность работать с визуальными образами на рабочем месте. Чертеж характеризует практическую готовность учителя выполнять работу с пространственно-зрительными изображениями деталей и конструкций на основе его знаний и компенсации. В процессе формирования профессионального мастерства будущего учителя черчения в вузах их качественные компоненты, то есть пространственно-зрительные объемные изображения, взаимосвязаны друг с другом и с инженерными элементами конструктивной системы. В определении значения понятия «пространственно-зрительное 3D-изображение» важную роль играет оценка показателей развития пространственного воображения. Он определяет следующие показатели развития пространственного воображения: устойчивость, широту, гибкость, глубину, законченность, динамическое состояние геометрических образов, целесообразность, а также виды работы с пространственным воображением при решении задач. Совокупность этих показателей, на наш взгляд, наиболее полно и всесторонне описывает формирование пространственных образов у студентов. Исследование позволило определить пространственно-зрительную компетентность в области 3D-изображения, характеризующую уровень подготовки педагогов к

профессиональной деятельности, как необходимую часть профессиональных навыков.

Ключевые слова: пространственное образование, наглядные 3D-изображения, развитие пространственного воображения, пространственно-видео 3D-изображение.

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Авторлар туралы мәліметтер:
Ядгаров Нодир Жалалұлы – хат-хабар авторы, п.ғ.д., профессор, Бұхара мемлекеттік педагогикалық институтының, Янгиюл көш. 51, Бұхара, Өзбекстан.

Сведения об авторах:
Ядгаров Нодир Джалалович – автор для корреспонденции, д.п.н., профессор, Бухарский государственный педагогический институт, ул. Янгиюл 51, Бухара, Узбекистан.

Information on authors:
Yadgarov Nodir Zhalalovich – corresponding author, doctor of pedagogical sciences, professor, Bukhara State Pedagogical Institute, st. Yangiyul 51, Bukhara, Uzbekistan.