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Spatial Imagination and Logical Thinking as a Pedagogical Basis for Teaching Students to Design

I. U. Izbasarov, I. Sh. Suvonkulov, D. E. Omonov
Department of "Fine Art and Engineering Graphics", Uzbek-Finnish Pedagogical Institute

Annotation: This scientific article deals with the problem of studying spatial imagination and logical thinking as a pedagogical basis in the process of teaching students to design. It is extremely important to what extent the spatial imagination and logical thinking of students is formed during the development of the project. Since each creative work arises on the basis of certain knowledge and skills. That is why with the help of the acquired knowledge, imagination and logical thinking appear. The article is based on the goals - the development of imagination, observation in children starting creative activity from the earliest period, and in terms of fine arts - the study of the tasks set for the formation of skills to feel the beauty of the world around us and distinguish between a variety of colors.

An approach has been applied from the point of view of developing and applying in practice educational methods aimed at teaching independent thinking, creative imagination, creation, design and ingenuity. It is assumed that the experience and creative ideas of our ancestors should be studied as a basis for their use in the practice of design, and at the same time it was clarified that spatial imagination and logical thinking are a necessary element of design.

Key words: scientific and technical, graphic, engineer, architect, induction, deduction, spatial imagination, architect, constructor, perpendicular, design, still life, design, philosophical category, designer, category.

Our rapidly developing time is aimed at progress and aimed at achieving socio-economic growth. For this, one of the urgent problems of our time has become the development of a personality that meets the modern requirements of scientific and technological progress, as well as the education and development of graphic literacy and creativity in them.

Education of future creators, inventors, engineers and builders, skilled architects should be the main responsibility of educational institutions.

Today, a student, along with obtaining modern knowledge, can also get acquainted with the latest technologies and, if necessary, master graphic literacy through exercises on a drawing project. With the help of their independent exercises, it is also important to develop spatial imagination and logical thinking.

An analysis of the pedagogical and psychological literature shows that the concept of the revival of cognitive activity literally means the activity of thinking.

The activity of thinking is manifested in cognitive activity, expedient analysis and synthesis, concretization and systematization of educational material, the use of induction and deduction, mastery of the knowledge system, the development of a worldview, as well as ideas and concepts.

The development of the creative activity of students is characterized by the desire to gain a deeper knowledge of the essence of objects and phenomena cognized by the individual, as well as the introduction of elements of novelty and creativity into cognitive activity.

The activity of students is inextricably linked with their independence. These concepts complement each other. Since it is in independent movements that the activity of the individual is manifested, and vice versa, activity often requires independent actions.

Mental activity goes back to the highest degree of generalization and abstraction, increases the direction of the causal connection of phenomena, it develops the skill to substantiate and prove the state, and criticality develops in thinking. The development of mental activity becomes an incentive for the formation of theoretical thinking, the knowledge of the general laws of nature and society, the formation of the ability to master philosophical categories.

Philosophical and geometric studies of prominent thinkers of Central Asia - Ahmad Fergani, Muhammad Al-Khwarizmi (783-850), Abu Nasr Al-Farabi (873-950), Abul Wafa Muhammad ibn Yahyi ibn Abbas Al-Buzjani (940-998), Abu Reyhan Beruni (973-1048), Abu Ali ibn Sina (980-1037), Mirzo Ulugbek (1394-1449) are also based on the imagination of space.

Many scientists worked on the image of spatial figures on a plane, the development of the theory of their application in practice. Among them are the ancient Greek scientists Aeschylus, Anaxagoras, Democritus and others.

Such scientists of Central Asia as Al-Khwarizmi, Al-Farabi, Abu Reykhan Beruni introduced the projection method in their scientific works and created their drawings. The further development of such graphic images falls on the Renaissance.

The Italian scientist and painter Leonardo da Vinci made a great contribution to the perspective theory related to descriptive geometry.

Abu Ali ibn Sina, in addition to medicine, in his scientific and practical activities created the theory of drawing drawings and put into practice projects of a much higher level. In geometry, the definition of a point, a straight line, a plane, or the position of bodies in space relative to a system of three-coordinate planes perpendicular to each other is accepted. This method is called the Cartesian coordinate system in honor of its inventor, the French mathematician René Descartes (1506-1550).

In teaching drawing, the concept of spatial imagination often means the ability to mentally represent the geometric shape, size and location in space of the depicted object (drawing). In general, imagination is an image of touching objects and phenomena that previously had an impact on the human senses. Imagination is divided into memory images and mental perception.

Drawing plays an important role in the formation of spatial imagination and has great potential. Without spatial imagination and its development, it is impossible to master the main topics of the drawing program.

For example, in projection drawing, let the students be given the task to complete the third view and technical drawing of a complex object. The teacher explains the problem and hands out drawing cards. With the help of drawings, you can imagine the shape of bodies in space and determine the dimensions. One of the characteristic aspects of descriptive geometry is that it expands the spatial imagination of future engineers, architects, constructors and designers, calls for creative thinking, the creation of new models, projects, designs; they, in turn, express their creative ideas with the help of drawings. Thus, on the basis of the laws of descriptive geometry, it is possible to depict not only existing objects, but also imaginable future projects, and this presents an opportunity for discoveries of world significance.

Speaking of dynamic spatial imagination, we understand the ability to represent forms and change the spatial positions of imaginary objects and their parts as a result of other graphic alterations, structures, etc.

For the formation and development of the spatial imagination of students at school, not separate types of tasks and exercises are used, but their whole system.

A person, relying on his observations and knowledge, generalizes ideas about certain phenomena and events, types, aims to depict them by some means. If we consider this on the example of visual activity, a pictorial composition on a certain topic is carried out using a suitable version of a collection of sketches, sketches and sketches.

In fact, a spatial image is shown by an attempt to correctly apply the perspective of a drawing in describing the volume of bodies on a plane. If bodies and terrain in a spatial environment (for example, in a landscape) are depicted without observing the rules of perspective, then the elements of color and shade in aerial perspective cannot show the space perfectly. The construction of bodies, the terrain near and far (both in still life and landscape) should be depicted strictly following the rules of observational perspective.

In showing the space in the picture, distant objects should be depicted to a certain extent following the laws of changing colors and shades (aerial perspective). As the perspective value of products changes at a distance, so does the color change as it moves away. The farther the distance, the lower and fades, first of all, the brightness of the color.

The colors of the trees in the distance become dull in contrast to those close by. Depending on the distance, both the shade and the brightness of the light change. Light objects in the distance darken, and dark objects brighten, become faded. These changes occur as a result of a certain density of air, which hinders the passage of color rays into the body. In addition, the dim or transparent air between our gaze and a distant object appears sky blue. It connects with the colors of distant bodies, gives them a bluish tint and sets them off.

Thus, in the distance, all colors lose their brightness, take on a blue or bluish tint, as their shadows lighten and light places darken, differences in color and shade decrease, contrasting colors weaken, lines of the body and its volume lose their accuracy.

Extremely subtle changes in the bright green color of trees, depending on the distance and lighting, we can see in the work of the Russian painter I. I. Shishkin “Forest Dali”. You can see how near the bright warm green color of trees and grasses, as it moves away, it turns into a cold gray or blue tint. The space in the artist's painting is very smooth, it seems that it goes far into the depths. From this we can conclude that the painter masterfully used spatial perspective in his work.

It will be expedient if a young artist in his practical activity in depicting a landscape will effectively apply the above ideas.

Another way to show the properties of space in an image is shading or smearing with paint. Linear processing of foreground objects is more accurate and denser, and colors are thicker and brighter. The background image is hatched softer and lighter, and the colors are taken liquid and duller.

To form the spatial imagination of students, more classes should be conducted on the analysis of works of fine art. For in the process of contemplating a picture, the student is attracted by its composition, color, method of work, appearance, structure, thoughts arise regarding the work.

Especially when working with thematic drawings, there is a need to rely on imagination and logical thinking. Because the picture drawn is not entirely fictional: the structure and color of each element of the composition is based on perceived knowledge. If the child does not have such skills, the work performed will consist of passages.

When working on a composition in any image, you must follow the rules of linear and aerial perspective. Aerial perspective is a modified (reduced) view of objects under the influence of

space (emptiness). Space is a transparent environment. However, its transparency can change under the influence of various phenomena. For example, air humidity, changes in atmospheric pressure, cloudy weather due to dust in the air, etc. Therefore, depending on how deep in space the imaged object is located, its color, ratio, hue and individual its parts. Aerial perspective can also change depending on the time of day (morning, afternoon, evening), when the object is depicted, on the season (winter, spring, summer, autumn), atmospheric changes (sunny or cloudy), etc.

Linear constructive construction. Regardless of whether an object is simple or difficult to depict, it has a constructive structure. The word construction means building (building), and the artist must follow this pattern when depicting an object. In order to truly depict an object, it is advisable to pay attention to its linear-constructive construction.

Linear-constructive vision is performed when depicting any task. Below we can see how, when depicting a cone, using a linear-constructive method in practice, in what integrity nature is performed. The constructive construction of an object is carried out by drawing auxiliary lines through its main parts.

For the correct image of an object by means of a linear constructive construction, it is necessary to fully follow the rules of perspective. Consequently, a linear-constructive structure, slightly depicting the extreme sides of an object with contour lines, requires thoroughly showing the sides that are invisible to us.

Objects, in addition to volume and in proportion, have height and width. And this is called the ratio of objects. Assembled from several objects of nature, in addition to its ratios, it also has ratios among themselves depending on the size. The correct determination of the ratios of objects is of great importance in their realistic image. Consider, for example, a plaster painted rosette. To determine the size of the outlet in the ratio of height and width, holding a pencil in outstretched hand, marking the smaller side with your thumb, compare with the height of the outlet. Next, we mark the found ratio on paper. In this way, a still life assembled from a group of objects or ...

Describing the project, we can say that it is the individual or group work of students during the assigned time on the assigned topic to collect information, research and perform. The task of students with this method is planning, decision-making and its implementation.

Any device related to design is associated with creative thinking and innovation. The concept of creativity is understood as the creation of a necessary and useful novelty at a certain time and in a certain situation. In general, a certain thing can be called a product of creativity, and novelty, in turn, not previously in this form, is the fruit of technical thinking, which currently includes previously unknown elements.

According to psychologists, the fruit of imagination and creative imagination is described as follows. The fruit of the imagination are called objects and phenomena that exist in reality or were in the past, but not encountered in our practice and not perceived by us, imaginary representations and images. These images are created from the words of other people, as well as on the basis of written and other documents.

In all these examples, the objects of the imagination, although they are now or were in the past, were not directly perceived by us.

In the process of imagination, a person understands that the image of the object that he represents was really at a certain time or in a certain place. This is the characteristic feature of the fruit of the imagination. Also, the images that were introduced into a certain system, and the images created on the basis of the finished material, are also a figment of the imagination.

For example, when reading a work of art, viewing a painting, technical drawings and diagrams, listening to stories, images of people, paintings, landscapes and events appear in our minds. It can be argued that ready-made images that have already been created by other people are perceived here.

Creative imagination refers to objects and phenomena that have not been encountered in our practice and in reality, but are a type of imagination created on the basis of ideas and images. A person in his creative imagination creates something new, original.

For example, the imagination of a writer who creates living images of characters for his work is a creative imagination. Or the imagination of an inventor who designs a new instrument is also a creative imagination. The imagination of a researcher working on a hypothesis or design of an experiment can also serve as an example of creative imagination.

Novelty can be objective and subjective. Objective novelty is something new that has not yet had its own equal. Subjective novelty is something new that actually exists, but at the moment is a novelty only for the creator himself.

In the creation of novelty in matters of design, one should understand the change in the form and content of machines and structures. These changes require the introduction of new, constructive additional elements in the composition of parts, mechanisms, devices and machines, the reconstruction of parts, the creation of a more efficient, accessible and convenient look relative to the previous one.

To redesign a device, you need to know what the main problem is, then optimize it for the best result.

The new idea is based on the working function of this device. Depending on the principle of operation, positive and negative sides, an improved version of the device is created, supplemented with new ideas. Of course, the result may not be identical, but, on the contrary, different. A new project is first mentally thought out, its scheme serves as a means of expressing the designer's creative idea. This is a method of mentally thinking about the image of a new product and its graphic image through consciousness. In the design process, this is the successful side of the design activity.

In the creative activity of a person, a graphic image performs two interrelated functions. Firstly, graphics are a kind of weapon of thought, and secondly, it is a means of conveying thoughts (ideas). That is why in the design activity we separately study graphic features.

In the implementation of this process, it is natural to change the shape, weight and dimensions of machine parts. The design process consists of the following steps:

The first stage is preparatory, here the technical needs are determined;

The second stage is the stage of comprehension, where scientific information in this area is analyzed, means and options are selected at the stages of solving the problem;

At the third stage - the stage of research - all the ideas that have appeared are compared, and the most worthy ones are selected;

The fourth stage is the implementation stage, in which the project is formalized by graphical media, and the solution is also verified.

The main, different from others, feature of solving design problems is that it (the solution), despite the variability of the solution, is characterized by the fulfillment of certain technical, technological, economic requirements given in the condition of the problem.

Below we will highlight the implementation of the method "Genealogy of breadth of thinking". This method is considered to be the collection of available information on a specific topic, and is also an incentive for a broad and versatile understanding, obtaining certain skills and abilities for the creative use of one's ideas and mental abilities.

This method can be done in groups or individually. This method contributes to the consolidation of the acquired knowledge by the student and makes it possible to increase the level of knowledge. This is the best way to identify types, differences, tasks, as well as the ability to recognize and comprehend useful things. In the classroom, when using the Genealogy of Breadth of Thinking method, you need to follow several rules:

1. The teacher explains to the students the need to fulfill the conditions of the applied method in the allotted time (20 minutes).
2. The teacher places the given topics in envelopes or lays out the leaflets with the written topics on the table face down.
3. The teacher divides the students into groups of two.
4. Gives each group one white sheet, then a student from each group comes out and chooses one option among those laid out. Then each student writes a given topic in the center of the sheet and continues according to the condition. The use of this method was shown in the table on the example of the topic "Types of lines" in geometric drawing (Table 1). Questions given in the conditions of the method on the example of the topic "Types of lines":

1. types are recorded;
2. the thickness of the selected types is written;
3. the task of the species is written;
4. terms are written on the selected types and topics, often used in the lessons. In this method, the teacher makes conditions on the topic;
5. after the time has elapsed, the teacher checks the correctness of the tables, and, judging by how much information is collected, the knowledge and thinking ability of students are evaluated.

The purpose of applying this method is not only to instill in students a broad and deep understanding of the problem, but also to expediently reject any method of evaluating their activities.

The positive aspects of the application of this method in the educational system, along with an increase in interest in the subject, the exchange of ideas among students, the formation of the ability to make the right decisions, are also an increase in the consciousness of students, a deep understanding of the problem, a call to collect more information on a given topic. Also, with the help of this method, students who are lagging behind in academic performance adopt knowledge and relevant information from successful students.

Another advantage of this method is that the teacher can apply it both during the lesson and at the end of a certain section to summarize the knowledge gained. If considered separately, the design process is usually the design of an existing item (move, build, install, provide strength and use for other purposes), then it includes the redesign of a new product, cooperation with design organizations, analysis of the inconvenience of new parts, drawing new schemes , creating new details by engraving.

Conclusion

Students participate in the implementation, verification, derivation and evaluation processes. Project development can be individual or group, but each project is an agreed result of the joint activity of the study group. Each lesson in fine arts and drawing is aimed at expanding the horizons and spatial imagination of students, and this involves ensuring the conscious performance of ongoing work in the educational process. If the student does not understand the essence of the work he is doing, it is difficult to talk about a fruitful result. Because if he carries out actions without relying on the ideas that have appeared in his imagination, the result will not live up to expectations.

References

1. Sharipov Sh. S., Musli'mov N. A. "Technical creativity and design" was published in Tashkent-2011 TDPU Rizography. 66-67 pp.
2. Hasanov R. Methodology of practical decorative art training manual. - Tashkent, 2003.72 p.
3. Methodical manual S. Rakhmetov "Fundamentals of composition in easel painting" SHARQ" Tashkent 2007
4. Rostovsev N.N. "Methodical teaching of visual representation in school" M.2000.
5. N. Isohojaeva "Colorful composition" (still life) Tashkent 2014.
6. Egamov A. "Art" magazine "Fundamentals of Composition" T. 2005.
7. Oripov B. "Fine art and its teaching methodology" Tashkent "Ilm-Ziya" 2005.
8. Omonov D.E. Integration of fine arts and computer technologies in art education of students //Middle European Scientific Bulletin. - 2021. - T. 17. - S. 225-227.
9. Omonov, D.E., et al. "Conceptual Bases of Production Of Teaching Technologies In Lectures And Practical Classes Of Engineering Graphics." International Journal of Advanced Sciences and Technologies 29.2 (2021): 84-87.
10. OMONOV D.E. Ways to introduce the science of painting to the visual arts using new pedagogical technologies //International Journal of Philosophical Studies and Social Sciences. - 2021. - T. 1. – no. 3. - S. 180-183.
11. Мамурова Д. И., Мамурова Ф. И. Соотношения навыков черчения с опытом психологического исследования //Вестник по педагогике и психологии Южной Сибири. – 2015. – №. 1.
12. Mukhiba S. The role and importance of fine arts in imparting knowledge and skills to students //International Engineering Journal For Research & Development. – 2020. – T. 5. – №. 7. – C. 3-3.
13. Olimov, S. S., & Mamurova, D. I. (2021). Graphic Information Processing Technology and its Importance. *European Journal of Life Safety and Stability (2660-9630)*, *10*, 1-4.
14. Olimov, S. S., & Mamurova, D. I. (2022). Information Technology in Education. *Pioneer: Journal of Advanced Research and Scientific Progress*, *1*(1), 17-22.
15. Shodiyeva S. B. THE OLDEST FINE AND APPLIED ART OF UZBEKISTAN //" ONLINE-CONFERENCES" PLATFORM. – 2022. – C. 292-295.
16. Mamurova, F. I., & oglu Akmalov, J. O. (2021). ORGANIZATION OF GEODESIC WORK. STATE GEODESIC NETWORKS. *Conferencious Online*, 21-23.

17. Islomovna M. F. et al. DESIGNING THE METHODICAL SYSTEM OF THE TEACHING PROCESS OF COMPUTER GRAPHICS FOR THE SPECIALTY OF ENGINEER-BUILDER //Journal of Contemporary Issues in Business & Government. – 2021. – Т. 27. – №. 4.
18. Khodjaeva N. S. METHOD OF TEACHING DIFFERENTIATED ISSUES. – 2021.
19. KHODJAEVA N. S., YUNUSOVA N. S. SPIRITUAL AND MORAL EDUCATION OF YOUTH IN MAKHALLA //THEORETICAL & APPLIED SCIENCE Учредители: Теоретическая и прикладная наука. – 2021. – №. 12. – С. 685-688.