ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 10 , October 2021

Current Status of Developing Students 'Space Imagination in the Use of Graphic Software in Teaching Architectural Drawings

Sanjar Xudoykulovich Mardov

Teacher of the department of “Engineering Graphics and Computer Design",**Tashkent Institute of Architecture and Construction**

ABSTRACT: The Higher Education Construction Drawing course focuses on shaping students ’graphic culture as well as their creative potential.

KEYWORDS: projection, graphics, computer graphics, detail, drawing, size.

I.INTRODUCTION

The development of spatial imagination depends on a number of factors. These factors include attention, memory, and imagination. While these factors may be key, they are also interrelated. It is important to note that we have already mentioned above that if attention is not well developed, the path to remembering what is in the memory will be cut off. If the attention is well developed, the memory will work better and will help to remember the necessary information. When memory is strong, imagination is also highly developed.

To date, research by psychologists around the world has shown that attention is an important and necessary condition for all types of human activity, primarily education and labor efficiency. One of the most important and fundamental factors in the perfect organization of the educational process is to attract the attention of students. Attention refers to the orientation and concentration of the mind, which increases a person's level of sensory, mental, and motor activity.

Distraction is the ability to successfully combine two or more different activities (multiple actions) at the same time. A high level of attention is one of the prerequisites for a successful learning process.

Memory is the mental process of remembering and, if necessary, retrieving perceived objects and events or past experiences. It is one of the features of the nervous system, which is manifested in the long-term storage of information about external events and reactions of the organism, as well as its ability to reproduce in the activity of the mind and in the context of behavior. The following basic processes are distinguished in memory: remembering, storing, retrieving, forgetting. These processes are formed in activity and define it.

Memory is the most important feature of all mental processes and ensures the unity and integrity of a person. The specificity of the activities in which the process of memorization and retrieval takes place is the basis for distinguishing between different types of memory.

Some types of memory are defined according to three main criteria:

1) moving, emotional, figurative and verbal-logical according to the nature of mental activity;

2) depending on the nature of the purpose of activity - free and compulsory;

3) according to the duration of strengthening and storage of the material - is divided into short-term, long-term and operational types.

When studying any information, it is important to keep in mind that human memory has the ability to choose. Although human memory is of a mixed type, different types of memory predominate in different people. Therefore, the simultaneous use of different textbooks creates a more conducive environment for understanding. In this case, students can rely on a more advanced analyzer.

Here are some aspects of the psychological and pedagogical problems of computerization of the educational process:

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 10 , October 2021

- It is possible and necessary to use a computer to organize educational activities, taking into account the development of personal qualities of students;

- expands the possibilities of providing computer training information;

- computer allows to eliminate and quickly correct failures in education;

- The computer can be an effective means of organizing the interaction of teacher and student, students, providing various forms of interaction;

- The computer dramatically enhances the creative process, performs natural and routine operations that almost always occur in all human activities;

- The computer actively engages students in learning activities, that is, controls the actions of students. The set of practical learning tasks using a computer will be expanded;

- computers allow you to use tasks to model and diagnose various situations, as well as expand the range of tasks for planning;

- The computer allows you to change the quality of student control. This technical device allows you to check all the answers, it is possible to determine the nature of the error; helps to determine the level of formation of individual components of educational activities;

- The computer helps students to reflect on their activities, because the computer allows the student to visualize the results of their actions.

The geometry of the product is first formed in the imagination of the designer, and then reflected on paper or computer. In the process of forming an imaginary model of the product being created, the basic subjective ability of the designer, called spatial imagination, is used. Advanced spatial imagination allows not only to create models of products, but also to perform imaginary processing operations on them and create a more advanced model in the automated design system used.

People with a rich spatial imagination are quick to absorb and analyze information. They are experts in their field. For example, science fiction writers, cartoon and film directors, architects of buildings and structures, designers of mechanisms and machines. Works created by such experts first appear in several forms in their imagination, choose the best of them, and only then present the result to the public.

The detailed imagination is gradually formed and developed in man. First of all, a variety of spatial puzzles and fun tasks, computer games and constructors will help. Then, in the process of studying geometry and drawing at school, spatial imagination develops. In higher education, subjects such as descriptive geometry, drawing and design are taught. The nature of education leaves its mark on the development of spatial imagination. For example, students in architecture prefer pluton views, students in technology prefer volumetric sections, and students in mathematics prefer isolines and volumetric sections.

Imagination is divided into abstract and concrete types, depending on the nature of the images on which the imagination is based. High-level generalization images that have common features belong to the abstract imagination. Characteristic features: changes in the image in the visual plan, the formation of an image that is partially or completely unobserved and corresponds to a specific task of activity or cognition. Thus, the abstract imagination is embodied in the form of schemes, drawings, pictures, and in mathematics it is symbols, formulas, graphs. Drawing geometry has the characteristics of a science and a science, because the main geometric images used in it are abstract elements: a point, a straight line and a surface, that is, the object of abstract imagination.

As MP Titova rightly points out, if a student does not have a developed spatial imagination, he will not be able to meet the technical conditions, such as cuts and cuts, in order to visualize the external and internal shapes of the objects under study. Applying them means that the drawing is complete. Visual and emotional support is needed to correct mistakes. The action that accompanies the imagination leaves the deepest impression on the memory.

Spatial imagination is a type of mental activity that allows the creation and operation of detailed images in solving practical and theoretical problems. It is a complex process that involves not only logical operations but also many promising actions. That is, to identify objects based on adequate images, which are objectively depicted using real or graphic means, and to present them. Spatial imagination is a type of figurative imagination that retains all its basic features and at the same time differs significantly from it. This is manifested, first of all, in the fact that the spatial

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 10 , October 2021

imagination is based on images. During this operation, they are changed in the desired direction. The images here are the basic operational unit and the raw material of the imaginary process.

Theoretical data developed by IS Yakimanskaya can be used to determine the structure of the spatial imagination:

The structure of the spatial imagination is determined by the content of the subject and is formed on its basis.

1. An important condition for the formation of spatial imagination is the use of different visual graphic material.

2. The structure of the spatial image depends on the role of the spatial image in solving the problem.

3. Features of the structure of spatial imagination are determined by the nature and content of the subject's activities. The direction and content of this activity will be determined by the methods of the problem developed (or found in the solution process) by the presentation methods.

In general, spatial imagination is a basic skill in understanding, comprehending, and comprehending objects in the real world.

Detailed imagination and thinking are used interchangeably in educational psychology, regardless of whether there is a difference between these terms. Spatial imagination is the ability to visualize, which is an innate ability. Imagination is learned or acquired through practice.

J. Eliot and I.M. Smith divide the history of the study of spatial imagination into three distinct stages. An additional fourth stage was proposed by S. Strong and R. Smith (Figure 1).

The first stage covers the period from 1901 to 1938 and is characterized by the attempt of psychologists to identify a single spatial imaging factor. During this period, research focused on identifying visualization as an important factor in perception. Because at that time, verbal tasks were considered as the main indicator of cognition. It should be noted that the research and development of the graphic design department of the American Society for Engineering Education (EDGD) focuses on visualization. S.L. Miller provided a historical overview of the research on the development of spatial imagery from 1920 to 1940 (EDGD).

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 10 , October 2021

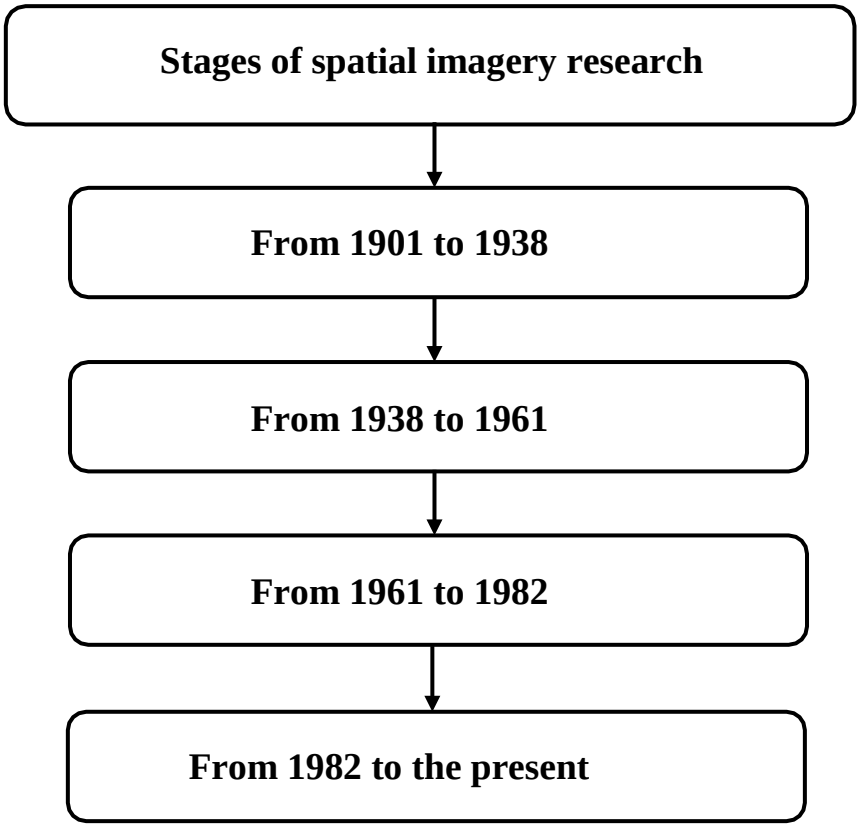

Figure 1. Stages of spatial imagery research

The second phase, covering the period from 1938 to 1961, focused on the search for several spatial imaging factors, two of which were identified. The first factor is geometric figures

the ability to detect in space, and the second is related to the ability to mentally control these geometric shapes.

In the third stage, from 1961 to 1982, the spatial imagery was further enriched. The effects of age, gender, and experience on individual spatial imagination were studied. Engineering software was enriched with 2D two-dimensional and 3D three-dimensional spaces, complemented by graphical presentations and 2D CAD models. Since the 1970s, automated design systems have been created as an effective and inevitable tool.

The fourth stage involves the process of determining the impact of computer technology on spatial perception and measuring this psychological feature of the individual, arising from engineering graphics. 2D and 3D CAD systems have been introduced in the engineering graphics education system and are still in use today.

The importance of the problem of forming and developing a spatial image is that a lot of research has been done on it. In particular, Uzbek scientists on the development of spatial imagination R.Khorunov, Yu.Kirgizbaev, I.Rakhmonov, R.Ismatullaev, Sh.Murodov, T.Azimov, D.Kuchkarova, E.Ruziev, P.Adilov, S.Saydaliev, Sh.Abdurahmonov, A.Hamrakulov and others, from foreign scientists I.P.Istomina, O.V.Razumova, L.V.Zanfirova, L.P.Rusinova, A.V.Piliper, Yu.A.Volkova, Ye.P.Benenson, N.S.Podkhodova, A.I.Xubiev, L.N.Anisimov, X.A.Arustamov, A.D.Botvinnikov, A.V.Ivanov, I.Ya.Kaplunovich, Yu.F.Katkhanov, Ye.I.Korzinov, I.I.Kotov, M.N.Makarov, A.A.Pavlov, V.S.Stoletnev, V.I.Yakunin, P.A.Ostrojkov, I.P. These include scientific research by scientists such as Kaloshin.

The work of LP Rusinova on the use of graphic tasks in the research work, which have a degree of difficulty in the systematic formation of students' spatial imagination, is also of particular interest from the point of view of our research.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 10 , October 2021

On the basis of S.S.Saydaliev's Oriental architectural traditions the scientific research work on development of spatial imagination in students is carried out, offers, recommendations and methods on development of spatial imagination are given. The study focused on developing students' spatial imagination through the use of architectural monuments.

An analysis of the traditional practice of teaching the subject of "Construction Drawing" shows that in the teaching of graphic education, students' spatial imagination is developed using a variety of detail models, posters, handouts, etc. It can be seen that the visual materials used in the subject "Construction Drawing" taught in universities are composed only of paper posters, there is a lack of visual materials, and most of the existing ones have become obsolete due to obsolescence. Today, modern multimedia tools and video projectors are used in education. Demonstration of lessons is one of the most important tasks of a teacher today. As a result, there are problems with the science teacher bringing in the necessary materials for the lessons. Therefore, teaching without these materials will not result in the spatial imagination of students who have significant learning competencies in graphic education. This is because it is difficult for students to understand what is being said and to imagine what it looks like. It takes a lot of imagination to imagine it.

This means that solving the problem of spatial imagination, which students lack in the teaching of "Descriptive Geometry and Engineering Graphics", is one of the most pressing issues of today. To solve this problem, science teachers need to make extensive use of multimedia computer technology as the best and most appropriate tool for solving existing problems.

Today, the development of the theory of computerization of teaching requires the establishment of general and specific criteria for the creation of educational and electronic developments that really increase the effectiveness of educational activities, form a positive attitude and interest in the subject.

Student activism and independent thinking problems are one of the didactic roots of the practice. If students do not have a spatial understanding of the state of the graphic materials, the teacher's work will not be effective in terms of positive learning outcomes. Modern computer technologies and software based on them effectively help students to think independently and form spatial ideas in the study of science.

In addition to the use of multimedia e-books in the teaching of "Building Drawing", the use of automated design systems (ALT) software is highly effective. This category of programs can include ArchiCAD, Revit, AutoCAD, 3d Max, Lumion.

To date, the capabilities of ALT graphics programs include 3D geometric modeling, parameterization, and 4D modeling, and the use of ALT graphics software in science teaching is highly effective. The ALT ArchiCAD program, which is widely used in educational institutions and design organizations today, has such capabilities. These opportunities help students develop their spatial imagination and independent thinking. The ALT ArchiCAD graphics program can explain many topics in science. For example, it can be widely used in teaching the plan of the building, the facade of the building, the trim of the building, roofing, interior, exterior and other topics.

Today, the combination of new pedagogical technologies, traditional teaching methods and modern computer technology is the basis for improving the quality of education. There are several problems with the use of computer graphics in the teaching of construction drawing:

- Lack of knowledge of science teachers on graphics programs, computer technology and hardware, as well as graphics;
- unwillingness of teachers to create modern electronic reports on science topics that develop students' spatial imagination;
- The existing electronic lectures, textbooks, guidelines are not enough to develop students' spatial imagination;
- Lack of space for the subject of construction drawing and lack of computers and equipment in the lecture halls;
- Lack of methods for effective use of graphic programs in the development of students' spatial imagination in the teaching of construction drawing;
- Lack (in some cases, lack of computers) for the use of graphics programs that reveal the essence of the science of construction drawing;
- Lack of teachers who are well versed in graphics;
- Lack of classrooms for students to work in a graphic program for independent extracurricular activities.

Based on the above considerations, it is necessary to develop manuals, recommendations, multimedia teaching programs for computer modeling of problem-based problems based on computer modeling, their synthesis, analysis, comparison in order to develop students' spatial imagination.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 10 , October 2021

Using computer graphics in the classroom requires a lot of effort and time from the teacher. Because creating themes in a multimedia form on a computer takes a lot of work. But then it becomes a tool for the educator to provide a convenient and easy demonstration. The advantages of an electronic textbook based on multimedia computer technology are:

- Easy to edit and fill in information;
- does not require financial resources, ie the problem of printing can be solved;
- if the server is hosted on a computer, it can be used by several users at the same time;
- Created multimedia e-textbooks, ease of reproduction when the demand for manuals increases;
- Convenience in the system of distance education;

The main purpose of the use of computer-assisted learning technology is to develop students' information processing skills, to independently search for, find optimal solutions for the development of their intellectual abilities, to strengthen research activities. This technology does not negate pedagogical technologies, but helps them. The combination of pedagogical technologies and modern computer software and equipment is of great interest to students.

Students' independent and creative thinking skills can be divided into 3 levels:

- The student looks for ways to solve problems, complete assignments, think independently and think.
- The student completes the assigned task independently, but does not have a creative approach. Solves problems independently, but does not monitor the accuracy of the results. Can fix similar tasks or problems.
- Strives to use ready-made solutions to the problem. He asks for help when he has a problem. Lacks the ability to solve a problem or task independently.

The purpose of teaching with the help of computer technology is to provide students with a modern view of the knowledge base and the multimedia form in them, to master the topics studied together, to enrich their knowledge, to develop creative and logical thinking skills, to develop spatial imagination. The creative approach to their work with the help of the acquired knowledge is to move towards a clear goal and to raise the level of research activities.

Graphics are an important part of developing students' spatial perceptions and related skills. After all, no science can develop spatial imagination and spatial hypothesis like drawing. In order for a student to have a clear idea of the shape of an object from a drawing, he or she must have a clear idea of the geometric objects and their relationships. It is especially important for students to have spatial imagination as well as spatial imagination in their graphic preparation.

Based on our existing perceptions, we call the activity of our mind, which consists of creating images of things and events that we have previously perceived. Imagination can be interpreted in different ways, depending on the specific tasks of human practice. For example, in graphic activity, spatial imagination is involved in the process of reflecting the relationships and properties of objects in space. Therefore, the role of spatial imagination in the formation and development of skills specific to different areas of graphic representation is invaluable. It is important to note that spatial imagination and spatial imagination are involved in graphic activities related to the solution of spatial metric problems.

Experts say that the level of mastery of the material is 10% when reading, 20% when hearing, 50% when seeing and hearing, and 70% when discussing with others. This means that multimedia combines several modes of information transmission - text, static image (picture, drawing and graphics), dynamic image (animation and video) and audio (digital and MIDI) - as an interactive product.

The use of computer technology in the educational process is especially noteworthy as it replaces all visual aids.

New requirements included in the complex psychological and pedagogical requirements of the lecture courses of the multimedia educational system: syncretism of the presentation of educational information, full provision of the system of educational activities, the norm of educational information excess, complementarity of traditional and multimedia technologies, as well as the requirements of the dynamically developing theoretical image of students and their impact on the emotional management of learning activities.

This means that the use of computer graphics, or more precisely, graphics programs based on automated design systems, has a positive effect on the development of students' spatial imagination. With the help of these programs, educators will be able to determine the level of development of spatial imagination in students and overcome the shortcomings in their spatial imagination. In addition, the principle of operation of these programs is based on the same laws, ensuring that students have the same idea about space, planes, the relationship of objects in space, and so on.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 10 , October 2021

REFERENCES

1. Freyberg S. A. Development of cognitive abilities and independence of students in the study of engineering graphics based on the introduction of computer technologies. Diss... Candidate of Pedagogical Sciences: 13.00.02. - Moscow: RGB, 2007– - 134 s
2. Madumarov K.Kh., Kakhkharov A.A. Factors of spatial thinking enhancement. Problems of integration of science and production.- Namangan. May 29-30, 2008 - pp.399-400.
3. Titova M.P. The study of the formation of spatial representations on the example of some graphical problems. Diss. Candidate of Pedagogical Sciences. - M., 1980– - 190 p.
4. Shuvalova S.S. Spatial imagination and descriptive geometry. Innovative technologies in engineering graphics: problems and prospects. Proceedings of the International Scientific and Practical Conference. April 20, 2016. - Brest, Republic of Belarus. - Novosibirsk, Russian Federation. - From 175-176.
5. Yakimanskaya, I. S. Development of spatial thinking of schoolchildren / I. S. Yakimanskaya. - Scientific.-research. in-t total. and ped. psychology of the Academy of Pedagogical Sciences. - M.: Pedagogy, 1980. - 240 p.
6. Sorby, S. A. (1999). Developing 3D spatial visualization skills. Engineering Design Graphics Journal, 63(2), 21–32.
7. Alimov Q.T. Theoretical and methodological basis for creating a new generation of educational literature in special subjects. The Dis. ...ped.science.the dock.- T.:2006.- 288 b.
8. Ning Qian. Computational neuroscience with an emphasis on stereo vision, motion analysis, and motion-stereo integration; visual psychophysics. Binocular disparity and the perception of depth. Neuron 18:359-68, 1997.