ABOUT THE FEATURES OF THE PERSPECTIVE OF SIMPLE GEOMETRIC SHAPES AND PROBLEMS IN ITS TRAINING

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ANNOTATION

This article discusses the features of the perspective of a straight line and a plane of simple geometric shapes and the problems of its full understanding by students. It also offers ways to solve the problem and the possibility of developing students ' spatial imagination through it.

Keywords: central projection, perspective, imagination, spatial imagination, positional problem, metric problem, interiorization, perception, audiovisual perception.

Аннотация. *В данной статье рассматриваются особенности перспективы прямой и плоскости из простых геометрических фигур и проблемы ее полноценного понимания студентам. Также предлагаются пути решения проблемы и возможности развития через нее пространственного воображения студентов.*

Ключевые слова*: центральная проекция, перспектива, воображение, пространственное воображение, позиционная проблема, метрическая проблема, интериоризация, восприятие, аудиовизуальное восприятие.*

INTRODUCTION

One of the main branches of the science of descriptive geometry is perspective (central projection). The perspective image is directly related to the visual arts, since it is based on the central method of projection, and it is adapted to the peculiarities of human vision.

In order to make adjustments to it through the perspective image of the projected objects or to ensure the correctness and viability of the constructive structure of the future work of art, the rules of perspective are observed. Due to the breadth of the field of application, perspective is taught as a separate subject in universities focused on architecture and the visual arts. For this reason, in the educational areas 5150800 - "Painting", 5150900 - "Design", 5151000 - "Graphics", 5151100 - "Sculpture", 5151200 - "Applied art", perspective is taught as a separate subject, and in 5110800 - "Fine arts and Engineering Graphics "is taught as a section of descriptive geometry and a separate subject" Applied Perspective and Shadow Theory ". In addition, 5A110802 - Engineering Graphics and Theory of Design is taught in the Master's program in the discipline "Theory of visual images". While the science of mathematics forces a person to sharpen his mind, the science of descriptive geometry and engineering graphics requires a strong spatial imagination from a person and develops it. It is the vision of the perspective of simple geometric shapes and its comprehension that develops the spatial imagination of the student. Because understanding a geometric figure located in three-dimensional space, through its central projection on a two-dimensional plane, requires a certain mental load, knowledge, perception, imagination and imagination from the student.

"Imagination-comes from the Arabic word meaning to think, imagine, imagine, think in the mind, that is, information, knowledge, understanding contained in a person's mind about an object, phenomenon, etc."[1]

Spatial relations, the shape of things, their size, large and small, we perceive mainly with the naked eye[2]. A person perceives both monocular and binocular space with one or two eyes. While in descriptive geometry,

[1] O'zbek tilining izohli lug'ati. "O'zbekiston milliy entsiklopediyasi», 4- жилд, Тошкент: 2008, page 7
[2] Ivanov P.I., Zufarova M.E.Umumiy psixologiya. -T.: "O'zbekiston faylasuflari milliy jamiyati". 2008. Page 103.

abstract concepts such as a point, line, or plane are taught to create projections of geometric shapes and test the relationships between them. These geometric shapes should be designated and depicted conditionally. Because in his entire life, a person has not seen a single point, line and plane, they are conditional concepts. Consequently, a person must experience psychological processes of cognition, such as imagination, imagination, and thinking, when perceiving these geometric shapes.

Imagination is the reflection, perception in the mind of a person of a perceived, perceived thing or phenomenon[3]. One of the main directions of pedagogy in the field of descriptive geometry and drawing is the development of spatial imagination and thinking, creative and design abilities of students.

In the process of teaching descriptive geometry and drawing, a number of scientific studies were conducted to develop the spatial imagination of schoolchildren and students.

For example, the research of T. Riksiboev[4], S. Saidaliev[5], N. Yodgorov[6], A. A. Kakhkharov[7], Sh. D. Dilshodbekov[8] and others. P. Adilov[9] and A. Valiev[10] also wrote a number of scientific articles and textbooks on the science of perspective and problems of solving positional and metric problems.

However, the problems of structuring knowledge, skills and abilities related to the development of cognitive activity and spatial imagination of students in the process of teaching the subject descriptive geometry, checking their relationships of geometric shapes by the central projection method, have not yet been sufficiently investigated. In addition, there are problems with understanding and practical implementation of the uniqueness of the perspective of geometric shapes. There is also a need for a scientific and methodological recommendation aimed at solving this problem. All these circumstances indicate the relevance of the topic of this scientific and methodological article.

As we all know, "*metric tasks involve determining their metric based on the mutual situation of geometric image data, or determining their mutual situation based on a predefined data metric.*"[11]

In our opinion, the transition to one value of the third geometric figure, using the relative position of the two geometric figures, can be considered as a matter of measure. For example, we can show the measurement of the true magnitude of the angle formed by the ratio of a straight line and a plane as a metric problem. It is also a positional question to determine the point of intersection of this line with the plane. If we define the positional problem, we get the following: the definition of the third geometric shape formed from the mutual situation of

[3] O'zbek tilining izohli lug'ati. "O'zbekiston milliy entsiklopediyasi», 4- жилд, Тошкент: 2008, page 7
[4] Riksiboev T., Xalimov M. O'quvchilarning fazoviy tasavvurini shakllantirishda ijodiy o'yinlardan foydalanish. –Toshkent, "Pedagogik ta'lim", 2012, 5-son, page 80-85.
[5] Saidaliev S.S. Sharq me'morchiligi an'analari vositasida o'quvchilarning fazoviy tasavvurini rivojlantirish. . Candidate dissertation. -T.: 2010. page 130.
[6] Yodgorov N.J. Fazoviy almashtirishlar jarayonida o'quvchilarning bilish faoliyatini rivojlantirish omillari. . Candidate dissertation. -T.: 2009. page 142.
[7] A. A. Kakhkharov Chizma geometriya va muhandislik grafikasi fanini o'qitishda talabalar fazoviy tasavvurini multimediali kompyuter texnologiyalari asosida rivojlantirish. Candidate dissertation. -T.: 2020. page 179.
[8] Dilshodbekov Sh.D. kompyuter grafikasi asosida muhandislik grafikasi fanlarini o'qitishning innovasion usuli. Candidate dissertation. -T.: 2020.page 162
[9] Adilov P., Valiev A. Markaziy projektsiyalarda positionon masalalarni yechish zharaenida ko'rinar-ko'rinmaslikni aniqlashga doir muammolar yechimi. - Toshkent:/ / "Pedagogik talim", 2007, 6-son, page 61-65
[10] Valiev A. Perspektiva. –Toshkent: "voris-nashriyot", 2012,91- page 118.
[11] Murodov Sh., Hakimov L., Odilov P., Shomurodov A., Jumaev M. Chizma geometriya kursi. –Toshkent: "O'qituvchi", 1988.

two geometric shapes is called the positional problem. The solution of such positional and metric problems by the method of central projection (perspective) is important in the construction of perspective images.

THE MAIN PART

The central projection of objects in space is distinguished by its clarity and originality. However, the teaching of questions aimed at testing the positional and metric relationships between the geometric shapes that make up this object, and its understanding and assimilation by students, caused problems. Therefore, with the Central Projection, it is necessary to eliminate problems in the teaching methodology for solving positional and metric problems. Therefore, with the Central Projection, it is necessary to eliminate problems in the teaching methodology for solving positional and metric problems. In other words, there is a need for methodological recommendations aimed at ensuring that the actions performed in solving such tasks can be visualized by students, and they can work independently. To avoid these difficulties, we believe that the following issues need to be addressed.

1. The difficulty of getting used to (adapting) students to the peculiarities of the perspective of geometric shapes.

2. The inability to adequately represent the relationship between the spatial position of a geometric figure and its working state (plot).

3. The fact is that in the process of learning (problem solving), computer animation is not used, that is, audio-visual perception is not provided.

4. The desire to achieve on the basis of the algorithm of solving the problem its blind solution (the answer to the problem), i.e. the inability to imagine the spatial situation of solutions in the process of solving the problem.

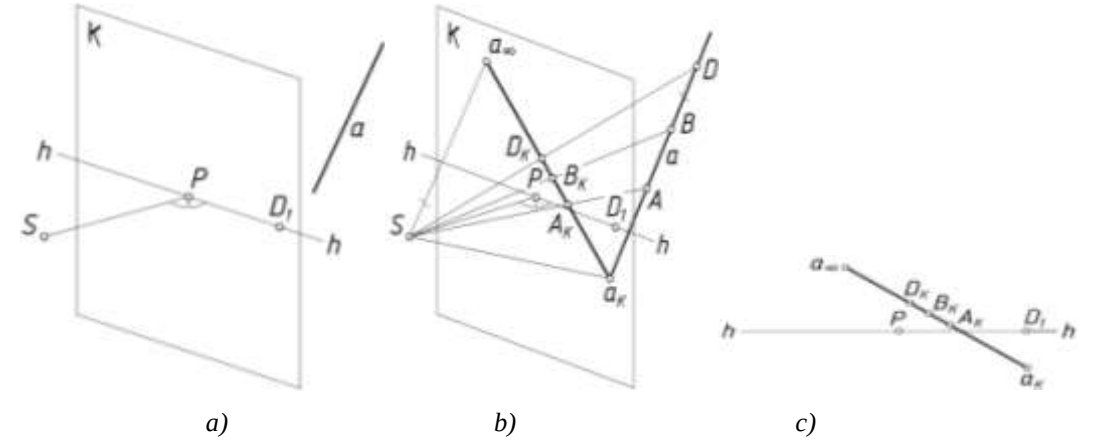
5. Do not rely on existing knowledge (in an orthogonal projection) in the process of solving the problem, do not use it and do not conduct their mutual comparative analysis.

6. The student can not connect in a sequence a lot of questions used in the process of solving one problem, using his thinking, and does not know how to work according to the most correct algorithm, i.e. his thinking is weak.

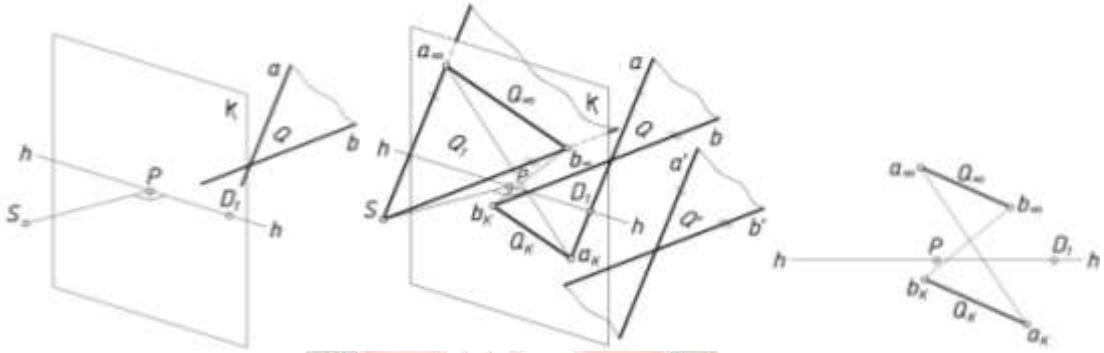
DISCUSSION

We will consistently present our proposals aimed at solving these problems.

Fixing the first problem. Since the central projection (perspective) is a mono projection, it has its own peculiarities in the perspective of the simplest geometric shapes. Therefore, in the process of teaching positional, metric questions, you will first need to fully explain these features. That is, the perspective of a straight line should be represented through the point of its meeting and the trace of the picture (Fig. 1, *a*, *b* and *c*), and the perspective of a plane-through the point of meeting and the trace of the picture (Fig. 1, *d*, *e* and *f*) together with its spatial position and working position. As a result, these drawn images affect the visual and auditory sensory receptors of the student, as a result of which they perceive, understand and interpret this process. Again, the teacher should remind students that parallel lines have one disjoint point (mastered in an orthogonal projection), and formulate as a problem what the perspective of the line will be. In this order, the perspective of the parallel plane is also explained.

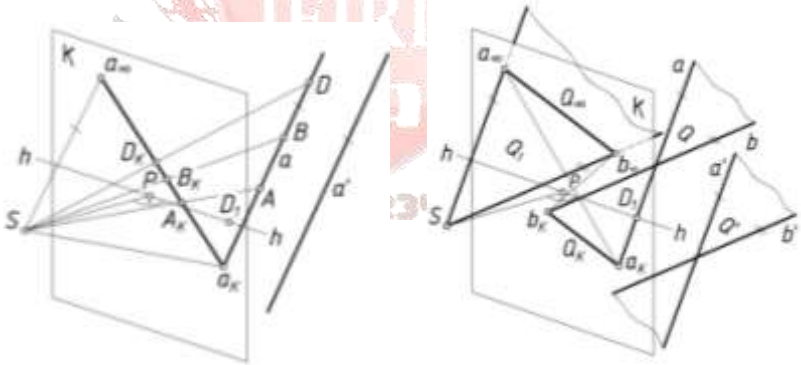


a) *b)* *c)*



d) *e)* *f)*

fig 1



a) **fig 2** *b)*

The student, on the basis of the above concepts and knowledge, synthesizes and generalizes individual phenomena in accordance with their general and essential features in the analytical-synthetic process of thinking on the merits of the issue. As a result, the student realizes that the meeting point and the meeting line of mutually parallel lines and planes are units, that is, he makes an inductive conclusion: a straight line and planes in a mutually parallel situation have a disjoint point and a straight line at infinity. The spatial representation of these states is shown in Figure 2.

Fixing the second problem. It will be necessary to form the student's ability to represent its position in space from the point of view of a geometric figure. To do this, you need to master the reading of the drawing, so that geometric shapes directly reflect their place in space, shape, and quantity based on three dimensions. This is the perception of space. Figure 3 (a, b, and c) shows a straight line, and d, e, and f show the transition from the working position of a flat perspective to its spatial position.

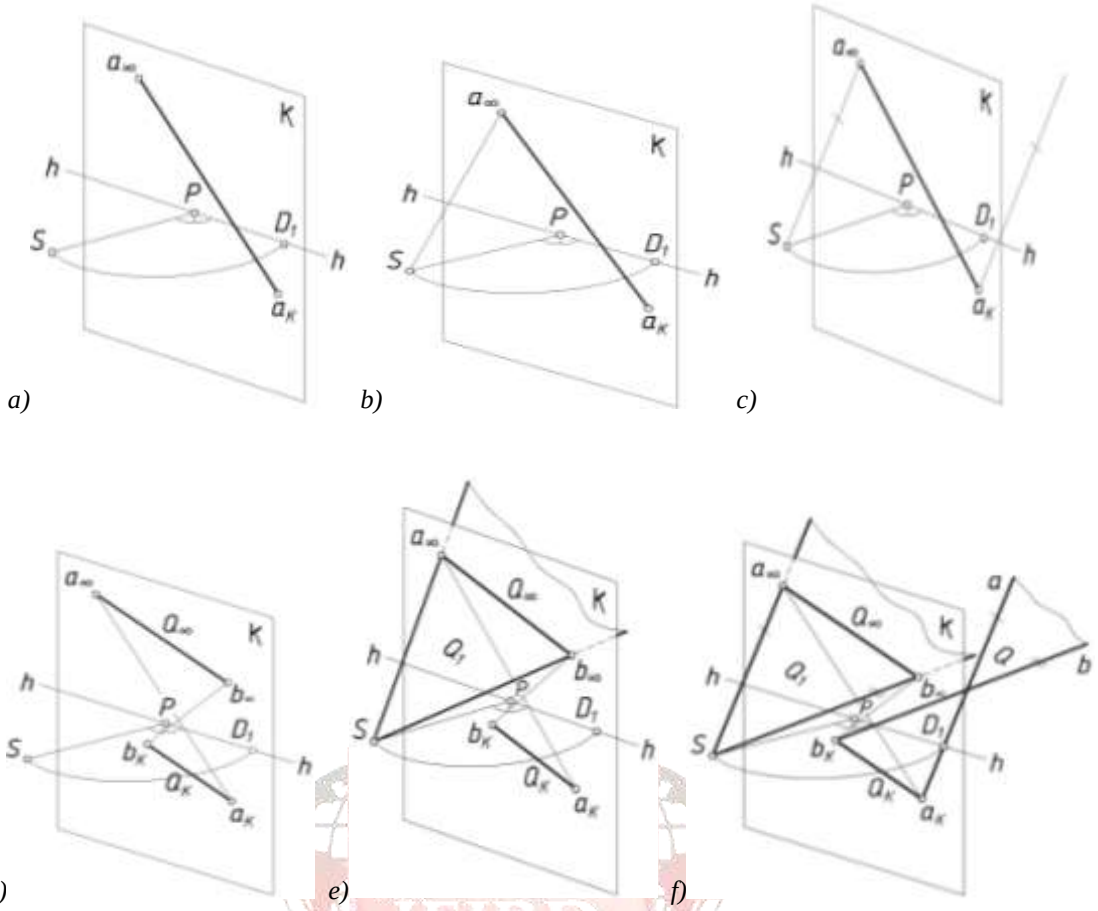


fig 3

This is one of the most basic factors or indicators. Because the student is faced with a "transition" from a flat drawing to a spatial one, or, conversely, from a space to a flat drawing. In this process, the perspective image (flat drawing) is read. At the same time, the process of transformation of external practical actions into internal mental actions, i.e., *interiorization*, is achieved.

Based on the above, the student is given a straight line, the perspectives of the planes, and as a task, the definition of their position is given. With the help of the acquired knowledge, the student independently makes a deductive conclusion on the task. To do this, it relies on visual and imaginative thinking. Several tasks for constructing the perspective of straight lines and planes, determining their position in space in a straight line, the student can perform independently, i.e. through practice, he achieves the formation and improvement of certain skills (Fig. 4 and 5). Also, with the help of logical memory, it is possible to visualize the process of solving positional and metric problems.

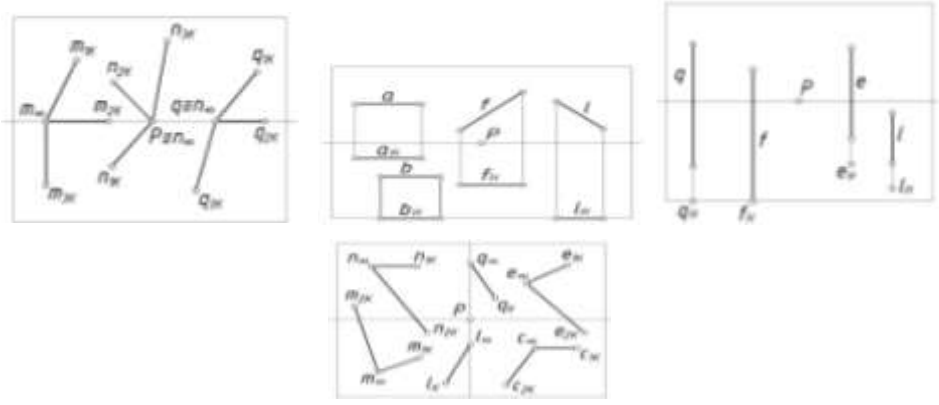


fig 4

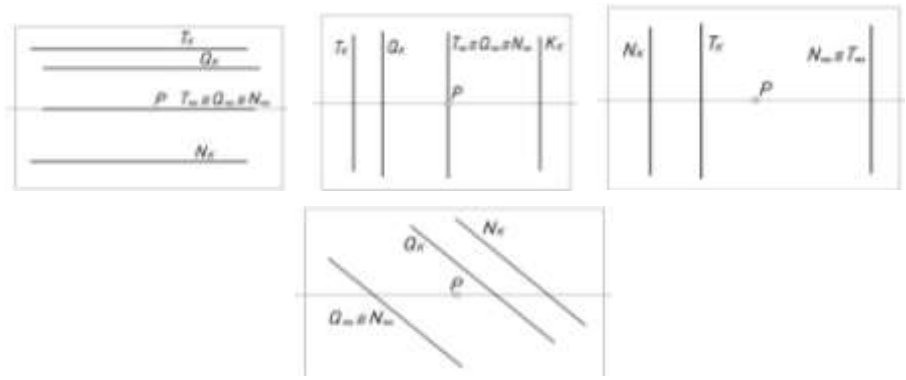


fig 5

Elimination of the third problem. The perspective images in the above 5 (especially 1-4) solutions to the problems will be appropriate if they are explained using animation. Because the display of drawings in a mobile state, the ability to observe them from any point, the explanation of these drawings by the teacher live (recorded voice) provides audiovisual perception. As a result of the audiovisual perception, the student gets the opportunity to independently work out the question, i.e. goes to the process of visual-effective thinking. Today, there is a huge need for modern educational resources. One of these educational resources is the preparation of electronic textbooks and textbooks with a perspective.

CONCLUSION

In this article, we have outlined our methodological recommendations aimed at solving the 3 above-mentioned problems, and the remaining 3 (4, 5 and 6) we plan to share in the next article about the problem. If the above guidelines are followed, when teaching the solution of positional, metric problems in the central projection, the spatial imagination and thinking of students develops, the ability to move from a flat drawing to a spatial one or from a spatially flat one to a straight one is formed, in short, the adaptation (habituation or adaptation) of students to the central projection method is accelerated.

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