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# THEORETICAL BASIS OF DEVELOPING GRAPHIC IMAGINATION IN FUTURE TEACHERS

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**Abstract:** This article analyzes the theoretical foundations of developing graphic imagination in future teachers based on in-depth pedagogical and psychological approaches. Graphic thinking is highlighted as an important cognitive mechanism that forms the individual's spatial, visual and associative thinking. The article describes the structural components of graphic imagination, the psychological theories that develop it (Vygotsky, Piaget, Gardner), and methodological approaches aimed at forming this competency in the teacher training system. The importance of modern educational tools, interactive technologies, and visual learning environments is also indicated. This article serves to systematically study the formation of graphic imagination competency in pedagogical education.
**Keywords:** graphic imagination, visual thinking, spatial perception, future teacher, metacognition, psychological basis.

# ТЕОРЕТИЧЕСКИЕ ОСНОВЫ РАЗВИТИЯ ГРАФИЧЕСКОГО ИЗОБРАЖЕНИЯ У БУДУЩИХ УЧИТЕЛЕЙ

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**Аннотация:** В статье анализируются теоретические основы развития графического воображения у будущих учителей на основе углубленных педагогических и психологических подходов. Графическое мышление выделяется как важный когнитивный механизм, формирующий пространственные, визуальные и ассоциативные способности мышления человека. В статье описываются структурные компоненты графического воображения, психологические теории, его развивающие (Выготский, Пиаже, Гарднер), методические подходы, направленные на формирование данной компетентности в системе подготовки учителей. Также подчеркивается важность современных образовательных инструментов, интерактивных технологий и визуальных обучающих сред. В статье проводится системное исследование формирования компетенции графического воображения в педагогическом образовании.
**Ключевые слова:** графическое воображение, визуальное мышление, пространственное восприятие, будущий учитель, метапознание, психологическая основа.

# BO‘LAJAK O‘QITUVCHILARNING GRAFIK TASSAVURLARNI RIVOJLANTIRISHNING NAZARIY ASOSLARI

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*Nukus davlat pedagogika istituti*
*Matematika o'qitish metodikasi kafedrasi o'qituvchisi*

**Annotatsiya:** Ushbu maqolada bo'lajak o'qituvchilarda grafik tasavvurni rivojlantirishning nazariy asoslari chuqur pedagogik va psixologik yondashuvlar asosida tahlil qilinadi. Grafik tafakkur shaxsning fazoviy, vizual va assotsiativ fikrlash qobiliyatini shakllantiruvchi muhim kognitiv mexanizm sifatida yoritiladi. Maqolada grafik tasavvurning tarkibiy komponentlari, uni rivojlantiruvchi psixologik nazariyalar (Vygotskiy, Piaget, Gardner) va o'qituvchilar tayyorlov tizimida ushbu kompetensiyani shakllantirishga qaratilgan metodik yondashuvlar bayon qilinadi. Shuningdek, zamonaviy ta'lim vositalari, interaktiv texnologiyalar, vizual o'rgatish muhitining ahamiyati ham ko'rsatib o'tiladi. Mazkur maqola pedagogik ta'limda grafik tasavvur kompetensiyasining shakllanishini tizimli o'rganishga xizmat qiladi.
**Kalit so'zlar:** grafik tasavvur, vizual tafakkur, fazoviy idrok, bo'lajak o'qituvchi, metakognitsiya, psixologik asos.

## INTRODUCTION

The increasing importance of pictorial and visual expression in the educational process is becoming increasingly evident, especially in an environment integrated with digital technologies. In particular, the development of graphic, drawing and schematic thinking in students studying in the pedagogical direction is the basis not only for their individual cognitive development, but also for the ability to clearly, systematically and logically present educational materials in their future professional activities.

Graphic imagination is the ability of the human mind to abstractly and logically analyze visual information, perceive and reconstruct it spatially. This competence plays an important role in the teacher's activities in organizing demonstration lessons, explaining complex concepts through simple graphic expressions, and focusing students' attention during the lesson through important details.

Therefore, the formation and gradual development of graphic imagination in future teachers is an urgent issue in today's pedagogical education, requiring a theoretically and practically based, methodologically sound approach.

## LITERATURE REVIEW

According to Gardner, human intelligence does not manifest itself in a single form, but develops in multifaceted forms [1]. According to the "theory of multiple intelligences" put forward by him, visual-spatial intelligence exists as a separate cognitive ability, representing the ability to mentally imagine graphic images, shape, color, location, and spatial relationships. It is through the development of this type of intelligence in future teachers that their abilities to work with drawings, create didactic tools, and construct conceptual maps are formed.

From Piaget's point of view, human mental development occurs in stages, and it is precisely in the "formal operations stage" (adolescence) that the possibilities of graphic and abstract thinking increase [2]. Based on Piaget's theory of cognitive development, it follows that the development of graphic thinking in future teachers should be carried out gradually with visual tasks appropriate to their stage of preparation.

In the taxonomic approach developed by Anderson and Krathwohl, the levels of knowledge are described as "knowing, understanding, applying, analyzing, synthesizing, and evaluating" [3]. Graphic thinking is a type of activity that embodies these stages, directing the student to think

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deeply, restructure information, and express it in new forms. According to this approach, graphic tools are used as a means of achieving a high level of mastery.

In her scientific article, Soliyeva (2022) discusses the role of didactic tools, especially digital design, electronic resources, infographics, and schematic animations, in the development of graphic thinking [5]. According to her, the development of graphic thinking and imagination should not be limited to traditional methods, but should rely on new generation technologies.

RESEARCH METHODOLOGY AND EMPIRICAL ANALYSIS

Graphic imagination is a combined form of spatial, visual, analytical, and creative manifestations of human thinking. It refers to a person's ability to mentally model the relative location, shape, size and changes of objects. Psychologically, graphic imagination includes the following structural elements:

Spatial perception - understanding geometric shapes, directions and positions.

Visual memory - remembering and re-imagining depicted objects.

Associative thinking - forming a connection between a concept and a graphic expression.Dynamic thinking is the ability to visualize the movement of changing objects.

A person who does not develop these aspects has difficulty understanding the content of complex schemes, drawings, formulas or graphs. A teacher has these skills in his profession: he creates didactic tools, facilitates understanding using graphic elements in the design and explanation process.

Any form of thinking is formed in a certain historical and cultural context. Graphic imagination is no exception. In the early stages of human development, information was transmitted through pictograms, petroglyphs and geometric images, which represented the first visual manifestations of thinking. These visual tools are not only a means of communication, but also a graphic reflection of logical systems, conceptual units and situations.

The development of graphic thinking in today's education is a combination of historical experience with modern forms. In pedagogy, knowledge expressed through drawings, diagrams, schemes, models, graphs and pictograms often provides a clearer and more effective understanding than text. That is why graphic tools should be considered not only as an auxiliary element, but as an independent educational unit.

Also, in Eastern culture - in particular, in the ancient scientific schools of Transoxiana, working with graphic foundations in the fields of science, medicine, and engineering, drawing diagrams, and presenting scientific information based on landscapes were widespread. By integrating this cultural heritage into modern pedagogy, graphic imagination can be reinterpreted in the context of national pedagogy.

RESULTS

The development of graphic imagination serves not only individual cognitive activity, but also the formation of social competence. Future teachers actively use graphic expressions in their educational activities to effectively communicate with students, express information in a clear way, work in groups, and present projects. This increases their socio-communicative potential.

Students make their communication more meaningful by visually expressing their thoughts with the help of graphic images, sharing them with group members, and reflecting the main ideas in drawings in their presentations. Graphic thinking is also a tool that increases the effectiveness of the processes of team discussion, project decision-making, and reasoning.

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In addition, graphic thinking creates the opportunity to convey the same content in an understandable way to students with different cultural, linguistic, or intellectual levels. This aspect shows that graphic images are an important tool in pedagogical inclusion.

The level of graphic thinking of each person differs depending on innate abilities, intellectual orientations, learning styles, and previously acquired experiences. Therefore, a differentiated approach should be used in the development of graphic imagination in future teachers.

In other words, if graphic tasks become the main learning activity for students with strong visual perception, graphic and textual materials should be given in a combined form for students with a verbal orientation. Students who are inclined to analyze can deepen their graphic thinking by modeling complex schemes.

It is also useful to develop a level model of graphic thinking. For example:

Stage I - perception of a ready-made graph;

Stage II - changing, transforming the graph;

Stage III - creating an independent graph;

Stage IV - analysis and decision-making based on graphs.

Based on these stages, it is possible to track the development rate of each student and form an individual growth trajectory.

Modern education is closely connected with digital technologies, which has initiated a new stage in the development of graphic thinking. FutureTeachers now need to work not only with hand-drawn drawings, but also with vector graphics, interactive diagrams, 3D models, and digital infographics.

The modern education system is not only focused on acquiring reproductive knowledge, but also on creative thinking, creating new approaches, and finding creative solutions to problem situations. Graphic thinking is a visual expression of such a creative approach. Through it, a person not only restructures existing information, but also models it in a new way in his own way.

A future teacher, especially in primary education, will have to creatively create many didactic tasks: these are cards, schemes, “mind maps”, “storyboards”, visual lesson plans, etc. A teacher with a strong graphic imagination creates them not only technically, but also aesthetically and functionally at a high level.

Through the formation of creative thinking on a graphic basis, future teachers will be able to stimulate the creative potential of students, help them master complex topics, and work effectively with students of different ages.

Reflective teaching plays an important role in today's pedagogy. After each lesson or activity taught, the student must analyze his learning experience, evaluate himself, and identify his achievements and shortcomings. Graphic images can be an effective tool for reflection.

For example, if a student describes the lesson not in a simple written form, but schematically, that is, if the main concepts, points of contact, causal chain, problems and solutions are placed in a visual drawing, he will see what he knows more clearly. This activates reflective thinking, and the need for self-study and development arises.

Also, through reflective graphs (diagrams, timelines, goal-oriented progress maps), it is possible to determine one's own learning path, track growth in pedagogical competencies, and create a personal development plan. This forms a conscious and systematic approach in the future teacher.

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Graphic thinking is not limited to pedagogical activities. It serves as a universal tool for harmonizing the teacher's knowledge in other subjects, creating integrated lessons, and combining multidisciplinary topics.

For example, timelines in history, systematic trees in biology, functional graphs in mathematics, and map-based modeling in geography - all these are areas of application of graphic thinking. Having mastered these interdisciplinary skills, the future teacher can visually demonstrate the connection between different subjects to students.

Currently, graphic imagination is also becoming an indispensable tool for the teacher in the integration of STEAM (Science, Technology, Engineering, Art, Mathematics). Modeling each project, experiment or solution on a graphic basis allows the student to integrate complex concepts. The future teacher must be ready for this.

**CONCLUSION AND DISCUSSION**

The formation of graphic imagination in future teachers is not only a didactic skill, but also the formation of the intellectual resource of a modern pedagogical personality based on visual thinking. The development of this competence helps the teacher organize the lesson in an understandable, structured and modern way. A teacher with strong graphic thinking skills is successful in quickly conveying each topic to the students' minds, attracting their attention on the basis of visual support, and expressing complex concepts in a simplified way. Therefore, a special module for the formation of graphic imagination, methodological training and reflective analysis exercises are necessary in the higher pedagogical education system.

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