

# Development of students' visual thinking based on the use of sketchnoting techniques

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**Abstract.** The article presents a theoretical analysis of key concepts. The article proves that in the process of teaching students at the university it is necessary to apply innovative means and methods of developing visual thinking. One of the means to supplement and enhance the process of memorization, as well as the analysis of information using simple images that contribute to the effective development of visual thinking, is sketchnoting techniques. The article discusses the ways of using sketchnoting as a technology for developing students' visual thinking. The study reflects the developed diagnostic tools for determining the level of development of visual thinking of first-year students. The article describes the main stages of experimental verification of the effectiveness of the methodology for the development of visual thinking of students based on the use of sketchnoting techniques: primary diagnostics, the stage of introducing the methodology into the scientific and educational process of the university, the stage of verifying the effectiveness of the methodology (through secondary (control) diagnostics). Based on the analysis of the results of diagnostic measurements, a positive dynamics of the level of development of visual thinking of students was revealed, which made it possible to prove the effectiveness of the applied techniques involving the use of sketchnoting techniques.

## 1 Introduction

The form of thinking as a method of creative problem solving in the context of figurative modeling can be called visual thinking (from Latin – visual). The basis of this form of thinking is visual-effective and visual-imaginative thinking, where during the interaction of subject-practical and sensory-practical actions to the properties of objects, external perceptual actions are formed, and in the future there is a reduction and internalization of these actions [16].

In theory and practice, the problem of the development of visual thinking has been implemented in the following areas:

- study of the psychophysical foundations of perception of visual images [4];
- study of the psychological structure of visual thinking, definition of various types of visual operations [8];

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– study of visual thinking in meaning from the point of view of various fields of humanitarian knowledge:

- a) philosophy [10; 21];
- b) pedagogy [16; 22].

In Russian pedagogical psychology, the problem of the development of visual thinking of the individual has been studied from various positions. So, today the phenomenon analyzed by us in this study is considered in psychology as:

- an indicator of the development of visual culture [11];
- a necessary component of logical and spatial thinking [9];
- a condition for building a constructive educational dialogue [12];
- psychological condition for the formation of visual culture of the individual [13].

Despite the existence of numerous studies devoted to various aspects of visual thinking as a phenomenon, the statement of the insufficiency of its development in modern schoolchildren and students justifies the need to develop effective methodological systems aimed at increasing the level of development of this personal property.

The development of methodological systems aimed at the development of visual thinking of the younger generation requires, first of all, the implementation of diagnostic operations to identify the level of formation of the personality property studied in this study.

Thus, this study is aimed at studying the theoretical aspects of the phenomenon of visual thinking, the selection of objective diagnostic tools to determine the level of its formation among first-year students, the analysis of the effectiveness of the developed methodological approach to the development of visual thinking of students.

## **2 Materials and methods**

The methodological basis of the research is determined by scientific provisions on the essence of the process of cognition; the activity nature of the individual's abilities; the direct connection of theory with practice; the laws of mental formation of personality; theoretical and methodological foundations for the formation of graphic knowledge, skills and abilities, the theory of visual thinking, the provisions of sketchnoting techniques.

The research is based on a set of theoretical (psychological and pedagogical analysis of educational and methodological literature to substantiate the theoretical provisions of the study, systematization of theoretical data in order to determine ways to resolve the main issues) and empirical (observation, diagnosis, analysis of the dynamics of the formation of visual thinking, mathematical statistics, experiment) methods.

The theoretical basis of the research is the works on the development of mental abilities of the individual (L.S. Vygotsky, P.Ya. Galperin, Y.S. Gilbukh), on the basics of psychological activity in the assimilation of visual information (B.G. Ananyev, T.V. Kudryavtsev, A.N. Leontiev, B.F. Lomov, N.A. Menchinskaya, A.A. Ponomarev, I.S. Yakimanskaya), on the issues of human development of visual reality (S.L. Rubinstein, V.P. Zinchenko, A.I. Mirakyan, V.A. Barabanshchikov, V.I. Zhukovsky, D.V. Pivovarov, V.I. Panov, R. Arnheim, J. Gibson), according to sketchnoting techniques (O.A. Vatkova, A. Paivio, D. Bruf).

### 3 Results and discussion

The expediency of research into the visual thinking of a future specialist is of crucial importance due to the increase in the volume of visual information and the mastery of ways and means of working with it in the information age.

Visual thinking, in fact, as a form of human activity, consists in operating and manipulating visual images and, as a result, creating new, often abstract images that have a semantic load and make the meaning visible [14].

Visual thinking, as a kind of nonverbal thinking, is actively studied by psychologists who believe that the main function of visual thinking is the ability to coordinate various meanings of images into a complete picture. Visual thinking also helps the individual to ontologize the results of abstract verbal thinking so that the abstract entity becomes intellectually visible. Using it to study and analyze various works can give new ideas and a more complete understanding in areas ranging from scientific to artistic [3].

In psychological science, visual thinking is understood as a specific integrative type of thinking that regulates the process of connecting the practice of sensory experience with abstract thinking [19]. The analyzed type of thinking is based on a combination of the specifics of imagination, productive perception and visual-imaginative thinking [14].

The structure of visual thinking by the following components:

- analytical and synthetic activity (the ability to detail from general to partial);
- the ability to generate new visual forms;
- verbalization of images.

Visual thinking is the basis of the creative process with a combination of sensory and rational forms of cognition of the world, mental actions that are conditioned by direct observation and logical thinking [14].

In order to find effective methodological approaches for developing the level of visual thinking of students and checking their effectiveness, we decided to conduct a primary diagnostic assessment. The experiment was conducted on the basis of the Humanitarian Pedagogical Academy (branch) of the Crimean Federal University named after V.I. Vernadsky in Yalta. The respondents of the experimental study were 1st-year students of the Institute of Pedagogy, Psychology and Inclusive Education of the Humanitarian Pedagogical Academy (42 people), united in experimental and control groups.

Chronological framework of the experiment: the second semester of the 2020-2021 academic year.

At the preliminary stage of testing the methodological approach in the framework of the experiment (January 2021), a primary diagnostic assessment was carried out. For its implementation, we used the following diagnostic methods of P. Torrens:

- The "Freedom of Association" test (imaginative creativity).
- Creative thinking test (nonverbal block) [20].

The criteria and indicators of the study of the level of visual thinking were:

- ease as a quantitative indicator (the ability to create an associative series in the form of ideas or images);
- flexibility (the ability to move from one aspect of a problem to another, while using different solution strategies);
- originality (ability to solve problems by non-standard methods);
- development (ability for constructive activity, teamwork).

Taking into account these criteria and indicators, as well as the structure of visual thinking as a personality property, allowed us to determine three levels of its formation among first-year students: elementary, advanced and creative.

The data of the primary diagnostic assessment of the experiment indicate an insufficient level of formation of visual thinking of students of the experimental and control groups. The diagnostic results by levels and criteria are presented in Table 1, where the insufficient level of formation of visual thinking of students is statistically determined and mathematically presented. So, within the framework of the implemented experiment, we selected the "Sketchnoting" techniques as a methodological basis.

Using sketchnoting as a way of taking notes of lectures, conferences, brainstorming sessions and business meetings, allows you to capture information graphically (drawings, symbols), creating a visual map of any material.

This technology is used to develop information assimilation skills that optimize the work of the brain. This technique is based on the theory of double coding proposed by Allan Paivio in 1970 [2], according to which the brain uses two channels for data processing: verbal and visual.

Sketchnoting technology makes it possible to use both of these channels simultaneously and allows you to create a visual map of what a person hears, sees, and thinks about. The advantages of sketchnoting should also include the fact that this technology helps to focus attention.

**Table 1.** Levels of visual thinking development of first-year students (primary examination).

Levels	Criteria				General level
	Ease (fluency)	Flexibility	Originality	Elaboration (thoroughness, detail of images)	
Experimental group					
Elementary	41.2	37.2	39.6	41.6	39.9
Advanced	49.1	51.6	42.3	45.2	47.5
Creative	9.7	11.5	18.1	13.2	13.1
Control group					
Elementary	41.4	43.7	47.1	46.1	44.5
Advanced	53.1	49.8	46	49.6	49.6
Creative	5.5	6.5	6.9	4.3	5.8

The main unit of technology is a sketch of the future drawing, a quick sketch, a reflection of the idea as quickly as possible, efficiently, transfer your idea on paper, cardboard, sometimes on plastic.

A sketch is a kind of structured note combining elements of both a drawing and a text; in other words, it is a way of thinking using images and words [1].

The structure of the sketches includes a pictogram and a concise text, a thesis.

According to M. Roadi, sketches are always unique and the specific features of the compiler's personality are expressed in them [18].

According to the authors of research in the field of visual thinking development, the creation of notes through the sketchnoting method significantly increases the level of memorization and subsequent reproduction of information, because the sketch makes it possible to highlight the main, important details and, most importantly, allows for a fleeting

glance at the note to restore in memory all the information, thoughts and feelings accompanying the task [5; 7; 15; 17].

In order to increase the level of visual memory of first-year students, as part of the experiment being implemented, we used a number of sketchnoting trainings in order to form basic skills and abilities that allow to increase the level of visual memory, namely:

- in large information flows, highlight the main thing;
- fast processing of new information;
- acceleration of the process of concentration on the studied information;
- memorizing a large amount of information.

Sketchnoting trainings were combined by us into a comprehensive training "Development of visual thinking", which is a purposeful, specially organized in the conditions of the university process of developing visual thinking of first-year students by activating their mastery of the "Sketchnoting" techniques [6].

The respondents of the study participated in a comprehensive training during the experiment (February-March 2021). The comprehensive training was implemented in a number of mini-sketchnoting trainings conducted in general psychology classes, as well as through the implementation of long-term training within the framework of the special seminar "Types of thinking, ways of their development". Within the framework of this special seminar, students, before starting training tasks, were familiarized with the theoretical provisions of sketchnoting techniques and the specifics of using the technique in practice.

During the implementation of the trainings, students were asked to make visual summaries of textual information of various styles, types and purposes in the sketchnoting technique. The main condition of the students' work was their use of at least three types of information visualization.

At the end of the training sessions, a control measurement of the level of visual memory of the students – respondents of the study was carried out as part of the experiment. At the same time, the same diagnostic methods and criteria system were used as in the primary assessment.

As we can see, the results of the respondents of the experimental and control groups increased significantly after the introduction of sketchnoting techniques and the development of the content of the special seminar "Types of thinking, ways of their development" by students.

The diagnostic results are presented in Table 2.

**Table 2.** Levels of visual thinking development of first-year students (control diagnostics).

Levels	Criteria				General level
	Ease (fluency)	Flexibility	Originality	Elaboration (thoroughness, detail of images)	
<b>Experimental group</b>					
Elementary	22.7	25.2	27.6	24.3	24.95
Advanced	53.1	58.6	51.3	52.6	53.9
Creative	24.2	16.2	21.1	23.1	21.15
<b>Control group</b>					
Elementary	21.6	29.7	26.1	30.2	26.9
Advanced	59.1	52.8	52.7	56.6	55.3
Creative	18.8	17.5	21.2	13.2	17.6

Most of the participants in the experiment after the introduction of the technique showed a developed level of visual thinking, and the number of students who had a fixed creative level increased significantly. These data allow us to substantiate the effectiveness of the developed methodology for the development of visual thinking of students.

## 4 Conclusions

Summarizing the above, we conclude that the role of visual thinking has been growing significantly over the past decades due to the development of the information society, in which the main unit of value is information, and the leading way of its presentation is visual, thanks to the emergence of numerous information and visual means.

The need to develop visual thinking of the younger generation and search for effective technologies, methods and means to achieve this goal is justified by the fact that visual thinking helps to analyze, systematize, creatively interpret information. Thus, the low level of development of visual thinking has a direct impact on the success of the process of formation of all personal formations.

In order to increase the level of development of students' visual thinking, we have developed a methodological system based on sketchnoting techniques. The effectiveness of this technology is justified by the positive dynamics of the level of formation of visual thinking of first-year students who became respondents of the study. The fact of positive dynamics, justifying the effectiveness of the methodology proposed in the study, justified the analysis of the difference in the results of primary and control diagnostic measurements of the level of development of visual thinking.

The results of theoretical study and psychological analysis obtained in the course of the study can be used in evaluating the effectiveness of university educational programs, in substantiating the content and methods of implementing the development of visual thinking of trainees and students, in diagnosing the development of visual thinking, in conducting practical classes in age and pedagogical psychology and, above all, in implementing the process of purposeful improvement of the level of visual thinking of schoolchildren or students.

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