

5.3 Formation of readiness of future teachers for environmental activities in primary school by means of using mental maps

The current environmental situation requires decisive steps in its solution. Nowadays importance is attached not only to active environmental actions, which society is forced to actively perform today, eliminating or preventing the consequences of natural disasters, natural disasters, but also to care for the future, preparing teachers for active environmental activities in primary school. The teacher's environmental activity is the ability to organize, interest and involve younger students in various environmental activities, to permeate the educational process with the problem of preservation and restoration of the natural environment, forming in young students ecological worldview, natural competence, humane attitude to the environment. Starting from primary school, students will develop environmental values that will accompany them throughout life, will determine the nature of their behavior in the environment. That is why today pedagogical institutions of higher education raise the issue of forming the readiness of future primary school teachers for environmental activities as an effective means of preserving the environment in the future. However, performing this social task, freelance teachers do not always manage to achieve a positive result. One of the effective means of forming the readiness of future teachers for environmental activities is the use of mental maps in the educational process. They allow future teachers to take a holistic view of the topic they are studying, to understand its main components and to study them thoroughly. Mental maps help to update knowledge of students, expand the panorama of their thinking, form a holistic vision of the scientific picture of the world, understanding by future teachers of the causes of environmental problems, their spread and ways to overcome. The use of mental maps allows future teachers to systematize their knowledge and understand their own steps in organizing students environmental activities.

The issue of forming a humane attitude to nature, active participation in environmental activities in a number of agreements signed by our state is widely covered, namely: Intergovernmental Conference on Environmental Education

organised by UNESCO in cooperation with UNEP, the communiqué of the Intergovernmental Conference “Tbilisi + 35: Environmental education for sustainable development” [272]. The concluded agreements provide not only active ecological activity of our country connected with preservation, restoration, increase of natural resources, but also preparation of teachers for education of the humane conscious population. The environmental policy of our state in the field of education is based on the Constitution of Ukraine, the Law “On Environmental Protection”, the Concept of the ecological world. The Law “On Education” defines the need for the formation of environmental competence and competence in natural sciences and technology in the younger generation [273]. The Concept of the new Ukrainian school proclaims the formation of ecologically appropriate behavior of the population, identifies the main directions of the educational process in the field of environmental protection [274]. The Law “On Higher Education” emphasizes the urgent task of forming a humane and rational attitude to the environment [275].

Issues of organization of environmental activities in educational institutions were considered by well-known scientists O. Bida, L. Vysocha, K. Guz, O. Hryhorovych, S. Deryabo, V. Ilchenko, O. Lavrentyeva, S. Lyulenko, V. Panov, G. Pustovit, S. Sovgira, V. Skrebets, K. Ushinsky, V. Sukhomlinsky, V. Yasvin and others. Issues of organization of environmental activities in educational institutions were considered by well-known scientists O. Bida, L. Vysocha, K. Guz, O. Hryhorovych, S. Deryabo, V. Ilchenko, O. Lavrentyeva, S. Lyulenko, V. Panov, G. Pustovit, S. Sovgira, V. Skrebets, K. Ushinsky, V. Sukhomlinsky, V. Yasvin and others. The use of mental maps in the educational process of future teachers was studied by foreign scientists T. Busen, H. Mueller, B. Santo, B. Twiss, R. Foster, W. Hartmann, J. Schumpeter and domestic scientists – O. Aksonova, L. Goncharenko, G. Ivanytsia, I. Kindrat, N. Tereshchenko, G. Kovalchuk, M. Sakovych, N. Khvesenya and others.

Despite the extensive coverage of the humane attitude of the younger generation to the environment, the formation of environmental and scientific competence of future

teachers in scientific and educational literature, the issue of formation of readiness for environmental protection of students in primary school is given insufficient attention.

An important area of training primary school teachers is the theoretical and methodological foundations of pedagogical education. Future teachers need to have theoretical and practical knowledge: to be well acquainted with the content of programs and textbooks; have innovative approaches to teaching junior high school students; to know the essence, possibility and expediency of application of new technologies in educational process at formation of natural concepts at pupils. The result of active training of the future primary school teacher is his professional readiness to work with students, in particular, the ability to environmental activities. V. Yaremenko interprets readiness as a state or property of a person who is ready, adapted to something, who can and wants to perform a certain action [276, c.128]. N. Lazarenko understands readiness as a special mental state, characterized by the presence of the subject of the image of the structure of certain actions and the constant tension of consciousness to perform them [277, c.150]. Instead, S. Maksymenko insists that readiness is a purposeful expression of personality that contains beliefs, views, motives, feelings, volitional and intellectual qualities, knowledge, skills, abilities, attitudes [278, c.101]. In his research, O. Demchenko defines readiness as a set of professional and pedagogical knowledge, skills, abilities and personal qualities that ensure the effectiveness of work. O. Demchenko, H. Kit, O. Holuk, N. Roduk believes that readiness is a complex personal education that provides high results of pedagogical work and includes professional and moral views and beliefs, professional orientation of mental processes, professional knowledge, skills, focus on pedagogical work, ability to overcome difficulties, self-assessment of the results of this work, the need for professional self-improvement [280, c.507]. L. Lubchack insists that professional readiness, as an object of research, belongs to complex phenomena, because its structure is not empirically observed, as it is difficult to access for direct decomposition [281, c. 42]. However, such a procedure can be performed using theoretical modeling based on a systems approach.

Content analysis shows that readiness for professional activity is a personal education, which consists of a set of knowledge, skills, abilities, competencies that are constantly evolving and improving. The professional readiness of students for pedagogical activity is evidenced by their confidence in their knowledge and skills, desire to solve professional problems, the ability to find an individual approach to students, to seek a rational pedagogical compromise.

In the modern scientific literature there are a number of innovative approaches to the formation of the readiness of future teachers for environmental activities, namely: worldview-ecological, axiological, environmental, synergetic. The worldview-ecological approach to the teaching of natural cycle disciplines in higher education institutions helps students realize that in the system of “humane –nature” every element of it is important. The worldview-ecological approach aims to form a caring attitude to the environment by ensuring “live communication” with it. Using this approach makes it possible to evoke personal attitudes to interact with nature, to put yourself in the place of a natural object, to immerse yourself in its space, situation or circumstances, to act actively and independently. It is worth remembering that the underestimation of the importance of moral and ethical feelings in contemplating the environment, as practice shows, leads to a pragmatic assimilation of the material, consumer, indifferent attitude to nature. The use of worldview-ecological approach in the process of studying natural science contributes to:

- *cognitive development* (creation of conditions for cognitive activity, experimentation with natural material, systematic observations of natural objects; formation of interest in natural phenomena, search for answers to questions of interest);
- *ecological and aesthetic development* (drawing the attention of future teachers to the surrounding natural objects, the formation of the ability to see the beauty of the natural world, the diversity of its colors and shapes);
- *rehabilitation* (use of environmentally friendly materials for interior design, didactic materials; competent design, landscaping, creating conditions for excursions, outdoor activities);

- *formation of moral qualities* (creation of conditions for regular care of living objects and communication with them, education of sense of responsibility, desire and ability to preserve the surrounding world of nature);
- *formation of ecologically competent behavior* (the student must be able to rational use of nature, care for animals, plants; notice the aesthetic expressiveness of nature, be able to enjoy it and appreciate);
- *greening of various activities* (creating conditions for independent research and study of natural material by future teachers; the use of natural material in all lessons in primary school, etc.).

The worldview-ecological approach assumes mastering by students of natural representations on the basis of values of experience, attitudes and creativity; the use of games, interesting conversations, various activities that would promote the development of self-esteem, would help students become more open, friendly, communicative, active in solving various life situations.

The environmental approach promotes the construction of harmonious relations between the teacher and the environment. Unobtrusively, often in a business or didactic game, students learn the basics of humane behavior in the environment, which are later transformed into a personal behavioral culture. The environmental approach is realized in the tasks which promote enrichment of emotionally-valuable experience of dialogue of students with the nature, a choice of the correct position, ecologically expedient type of behavior in the nature. The positive result of solving problems of this type serves as an example of a caring, compassionate attitude to nature. A special place is occupied by exercises in which students are invited to perform specific tasks: to recognize, return to the place, perform surgery, action, provide assistance. In the process of performing such tasks, future teachers acquire the ability to observe, compare, compare, highlight the main, see the problem and come to the rescue in time.

The synergetic approach becomes a universal interdisciplinary means of communication, able to overcome the diversity of scientific knowledge, to establish new interdisciplinary links. Synergetics is actively and confidently included in all spheres of modern human creativity. Synergetics is a theory of self-organization in

systems of various natures. It deals with phenomena and processes, as a result of which new directions, properties, characteristics of certain objects of nature may appear in the system of natural interrelations. Synergetics provides an opportunity to understand the diversity and variety of the world around us, helps to expand the future teacher's panorama of thinking, to form a holistic, scientific picture of the world. Synergetics serves as a basis for the “interpenetration of natural and humanitarian content of education”, offering to use “a methodological key that allows the analysis of reality in accordance with the modern style of socio-cultural process”.

The axiological approach vividly presents the priority of humanistic values in the activity interaction of the future teacher with the natural environment. In the process of learning, the student must understand on an inner, deep level that nature is the cradle of life, and the task of man is to protect and care for it. Therefore, in the context of this approach, it is important to ensure maximum impact on the emotional and sensory sphere of future teachers, as well as to promote the development of intellectual and effective-practical sphere.

A component of the future teacher's professional readiness is his readiness for environmental activities. Environmental education is a continuous process of learning, education and personal development, which aims to form a system of scientific and practical knowledge, values, behavior and activities that ensure a responsible attitude of man to the socio-natural environment. S. Lyulenko's research shows that “a large number of organizations engaged in environmental activities work in the following vector areas such as: environmental education and upbringing; environmental advocacy and information; organization of environmental actions, quests, briefings, ecological trails, etc .; eco-journalism and interaction with the media; solving issues of sustainable development and rational use of nature [283, c. 63]. Environmental activities of primary school teachers are aimed not only at implementing the same vector areas as environmental organizations, but also to prepare students for the environment. Thus, in Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University during the educational process students have the opportunity to study the following scientific and natural disciplines, namely: natural sciences with methods of

competence formation in the natural field, ecology, wonderful world of nature and man, methods of acquainting children with nature. The study of natural sciences is aimed at the formation of environmental competence and competence in science and technology of future teachers; to reveal the prospects of using the potential of nature for the humanization of the pedagogical process, intellectual, moral, aesthetic development of the individual, strengthening the health of primary school children; outline the content of information about objects and phenomena of the natural environment, accessible to the understanding of preschool children, which meets their needs and interests; master the methods of acquainting students with nature; learn to use appropriate forms of cooperation between teachers and students in the process of learning about the world of nature; to form and develop patriotic feelings and national self-consciousness of students on the basis of feelings of love for nature and caring attitude to it; to enrich the aesthetic impressions of future teachers and to form a system of aesthetic and ecological values. Among the main functions of the disciplines of natural science in the process of forming readiness for environmental activities, we can identify the following:

- *motivational function* stimulates the internal needs of the individual in preserving the environment, rational use of natural resources, reducing the ecological footprint of human activity, the formation of stable beliefs in the field of nature protection;
- *cognitive function* involves the acquisition by students of scientific and natural knowledge, their expansion and deepening, the establishment of interdisciplinary links through integration, provides independent search for information, its generalization and verification;
- *educational function* is focused on the formation of humane, ecologically appropriate behavior, responsibility for their own actions in relation to the environment, active life position, ecological culture, professional ethics;
- *organizational function* aimed at effective organization of the educational process of primary school students (lessons “I explore the world”; participation in natural

laboratories, quests, trails, environmental actions; visiting the station of a young naturalist, botanical garden, zoo);

- *axiological function* is aimed at forming in the younger generation attitude to nature as the highest value of mankind;
- *reflexive function* involves self-analysis, self-assessment and self-control of their own activities, professional self-improvement.

The formation of the readiness of future teachers for environmental activities is through the inclusion of environmental information in educational subjects; study of environmental protection issues at the elective; by integrating different educational subjects; visiting clubs, participating in round tables, briefings, promotions; volunteering.

The use of mental maps is important for the formation of the readiness of future primary school teachers. Intelligence maps (mental maps, mind maps, “mind maps”, “memory cards”), according to T. Busen, reflect the natural way of thinking. For perception of any information it is possible to refuse linear record, and to use radial. That is, the main topic of the problem should be placed in the center of the sheet. It is not appropriate to write down everything in a row, but only the key words (the most characteristic ones, the ones that are the most memorable). Keywords should be placed on multicolored branches that diverge from the central theme. Relationships (branches) should be associative rather than hierarchical. Associations, as T. Busen noted, promote memorization, can be supported by symbolic images [284, c. 123].

In his research, I. Kindrat argues that mindmapping (mindmapping, mental maps) is a very effective technique for visualizing thinking and alternative writing [285, c.153]. According to O. Shikirinska, V. Vushkivska, T. Aleksandrovuch, Mind maps are a way of depicting the process of general system thinking with the help of schemes. Memory cards are used to create, visualize, structure, and classify ideas, as well as a means of learning, organizing, solving problems, making decisions, and writing articles. A memory card is implemented in the form of a diagram showing words, ideas, tasks, or other concepts connected by branches that deviate from the central concept or idea. This shows the infinite variety of possible associations and the

inexhaustibility of the brain. The traditional intelligence map consists of several basic elements. In the center of the location is a description of the main goal or problem. Usually, it is an image of a certain geometric shape, such as an oval or rectangle. The branches depart from the central figure to the first level of the map sections. Usually, these are the main aspects of the task. From these sections you can draw branches to smaller units. All elements are denoted by keywords, various symbols and short descriptions. Sections and subsections are recommended to be placed around the central theme. They can then be linked in the desired order according to the logic of further reasoning. The author of the concept of radian thinking, T. Busen, gave a number of practical recommendations for compiling intelligence maps:

- emphasis, ie concentration of attention on the central image;
- intensive use of graphic images, work with at least three or more colors;
- three-dimensional image (primarily due to convex letters and pseudo-three-dimensional graphics);
- synesthesia – a combination of all types of emotional and sensory perception;
- frequent variation of the size of letters (fonts), line thickness and scale of graphics;
- use arrows to emphasize the connections between the elements of the intelligence map;
- coding of information and invention of abbreviations;
- strict principle “One keyword per line”;
- restriction of blocks of important information by means of lines [284, c. 125].

Forming the readiness of future teachers for environmental activities in primary school, teachers can use mental maps to prepare lectures. According to H. Ivanytsia, such a lesson is easier to prepare, it gives both the teacher and the student the opportunity to perceive the educational material in a structured and visual way. As the level of knowledge of the lecturer from year to year is constantly growing, the intellectual map is expanded, supplemented and allow to know information holistically. While working on the lesson, the teacher can supplement the map with appropriate elements. This allows you to schematically represent the course of the teacher's thinking process, as well as the structure of the lesson.

The graphic method of presenting information fascinates the audience, allows it to better remember and assimilate the educational material. After class, students can receive copies of such a mental map, which can be colored and supplemented by hand [287, c. 61]. In his professional activity O. Groshovenko uses work with mental maps in classes with “Science with the method of forming competence in the field of natural education” (Figure 1, Figure 2).

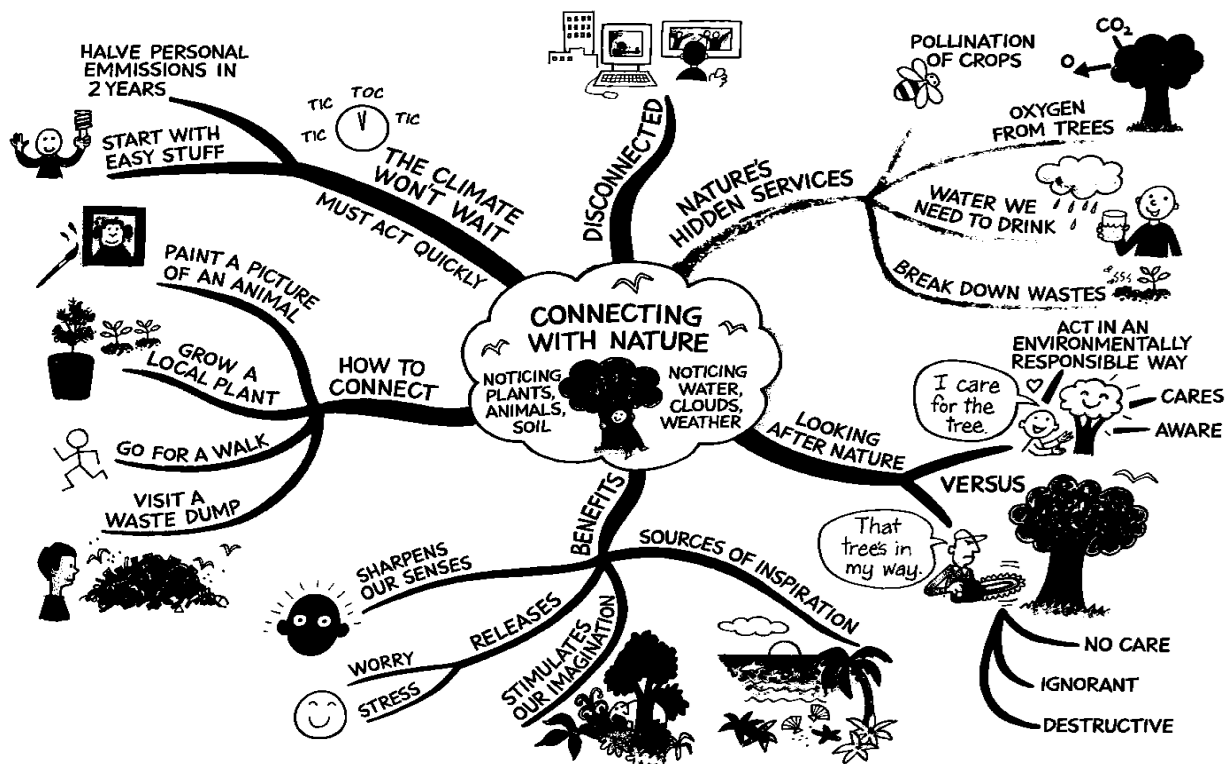


Figure 1. Mental map “Connection with nature” as a means of forming students readiness for environmental activities in primary school

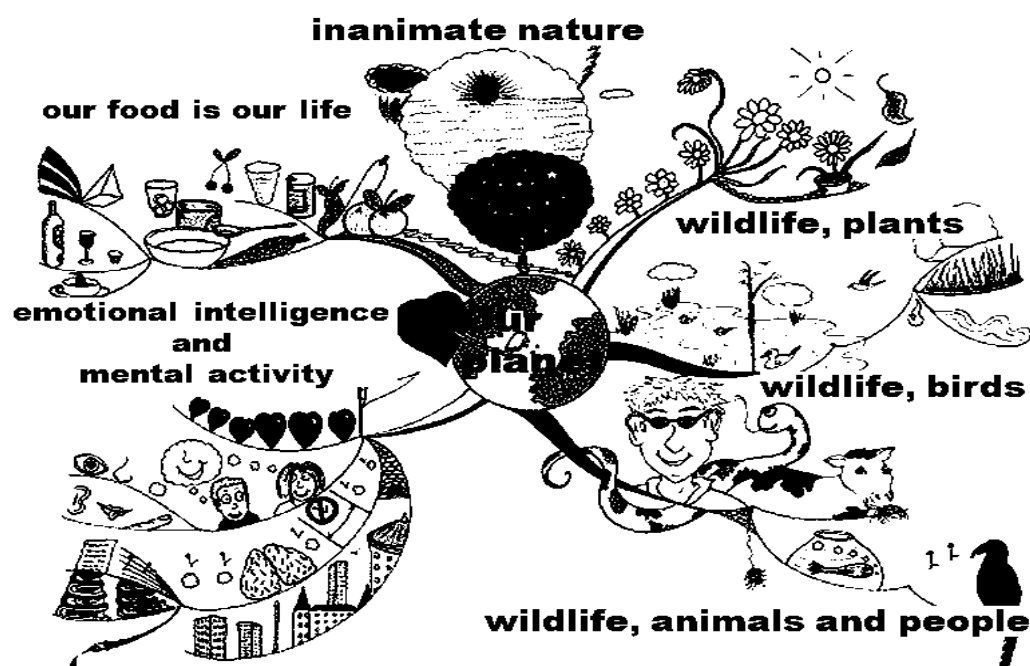


Figure 2. Mental map “Our Planet” as a means of forming students readiness for environmental activities in primary school (Olga Groshovenko)

We conducted an experimental study to establish the effectiveness of the use of mental maps in the process of forming the readiness of future teachers for environmental activities in primary school. The study involved 15 teachers of the Department of Primary Education and 59 students of higher education “bachelor” specialty 013 Primary Education of the third year (29 respondents of the control group and 30 respondents of the experimental group) Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University.

The study lasted from September 2020 to March 2021, the relevance of the experiment was related to adjustments in the educational process caused by the COVID-19 pandemic. Distance learning has proved that it is quite difficult to study theoretical material at a distance, to conduct lectures. Despite classes on the Zoom, Google Meet, Collaborator platforms, the issue of studying, processing and summarizing information with the help of mental maps remains quite effective.

The essence of the experiment was that the students of the control group on the subject “Science with the method of forming competence in the field of natural education” processed the study material by re-reading and taking notes, and students of the experimental group learned the material by compiling mental maps.

Among the teachers of the Department of Primary Education, we conducted a survey on the effectiveness of the use of mental maps in the educational process of future teachers. Thus, Olena D. (*27 years of teaching experience*) believes that “creating an intellectual map in the classroom allows students to place the necessary emphasis on the topic, to holistically perceive the material, in particular, such a map always puts new tasks for teachers and stimulates them to new searches, growth”. Halyna K. (*30 years of teaching experience*) argues that “creating maps allows you to systematize information, create in the imagination of students a general picture of the topic they are studying, visually remember all the key components”. Olga G. (*teaching experience 21 years*) insists that “the use of mental maps allows you to clearly imagine all aspects of the topic, understand its depth, organize your thoughts and expand the panorama of natural vision”.

Diagnosing the formation of the readiness of future teachers for environmental activities, we have identified the following criteria, such as:

- *motivational* (the desire to engage in pedagogical work, during which to form a humane attitude of students to nature);
- *cognitive* (knowledge of the disciplines of the natural science cycle, respectively, formed skills and abilities);
- *activity* (ability to apply the acquired knowledge in practice, methodically competently implement environmental activities in working with children of primary school age);
- *reflexive* (internal ecological values, humane attitude to nature at the subconscious level).

Based on the criteria, we identified the levels of readiness of future teachers for environmental activities, namely:

- *low* (future teacher is not completely confident in his choice of profession, hesitates about environmental activities, his knowledge is limited, full of gaps, the student is not ready to work in primary school, he does not have the necessary skills, does not reflect on the future);

- *average* (future teacher is confident in the chosen pedagogical activity, but does not fully understand the full range of tasks that await him, students' knowledge is sufficient, but need clarifications and additions on certain science issues, future teachers are responsible for the organization of environmental activities in primary school, are included in the environmental education of primary school children, reflect on their pedagogical activities);
- *high* (the student has clearly defined his future professional activity, seeks to work in primary school, engage in environmental activities, has deep knowledge of natural sciences, has developed pedagogical competence, loves to organize educational activities with younger students, sees his future as a teacher, an environmentalist who educates a humanely conscious population).

To diagnose the formation of readiness of future teachers for environmental activities by motivational criteria, we used the method of T. Dubovytska “Professional orientation”. To calculate the indicators by cognitive criterion, we offered students a set of test and practical tasks developed by O. Groshovenko. To analyze the results according to the procedural criterion, we asked future teachers to compile a lesson outline from the integrated course “I am exploring the world” and shoot a video fragment on this outline. Investigating the indicators of the reflexive criterion, we invited the participants of the experiment to pass the verbal associative method of S. Deryabo, V. Yasvin “EZOP” to determine their natural values. The results of the answers of students of the control group are processed and presented in table 1.

Table 1

Diagnosis of the formation of readiness of future teachers of the control group for environmental activities in primary school

Criterion Level	motivational	cognitive	activity	reflexive
low	8 (27,6%)	10 (34,4%)	8 (27,6%)	9 (31%)
average	16 (55,2)	15 (51,8%)	16 (55,2%)	15 (51,8%)
high	5 (17,2%)	4 (13,8%)	5 (17,2%)	5 (17,2%)

The results of the answers of the students of the experimental group are processed and presented in table 2.

Table 2

Diagnosis of the formation of the readiness of future teachers of the experimental group for environmental activities in primary school

Criterion Level	motivational	cognitive	activity	reflexive
low	2 (6,7%)	4 (13,3%)	5 (16,7%)	3 (10%)
average	18 (60%)	14 (46,7%)	15 (50%)	15 (50%)
high	10 (33,3%)	12 (40%)	10 (33,3%)	12 (40%)

The obtained results showed that the indicators of the experimental group (low level – 4 (13.3%), average level – 16 (53.4%), high – 10 (33.3%), which used mental maps in the process of studying the discipline “Science with the method of forming competence in the field of natural education” is much higher than the indicators of the control group (low level – 9 (31%), average level – 16 (55.2%), high – 4 (13.8%), whose students worked reproductively memorizing information. The general results of the study are presented in Figure 3.

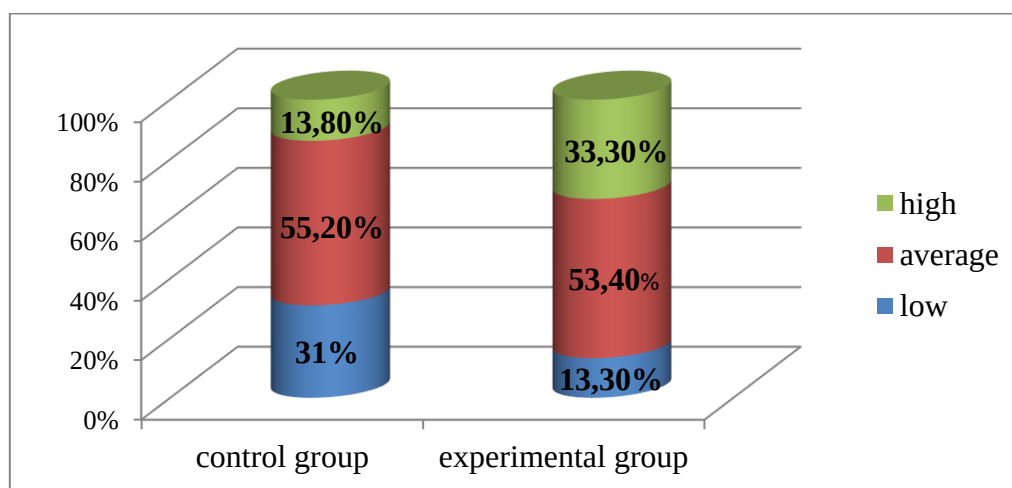


Figure 3. Diagnosis of the formation of readiness of future teachers for environmental activities in primary school

The analysis of the research results allowed us to single out the following methodological recommendations for teachers of pedagogical institutions of higher education on the formation of readiness of future teachers for environmental activities in primary school through the use of mental maps:

- it is necessary to make mental maps after studying the study material well;
- the topic (problem question) should be placed inside the map;
- it is appropriate to use colored markers to separate the various components of the mental map;
- it is necessary to establish connections between concepts by means of lines, arrows of various length, hatching, color, thickness, etc;
- to each component of the scheme it is necessary to use no more than 5 branches, it will allow to perceive a theme integrally;
- if keywords from adjacent branches are related to each other, they should be linked.

In science classes we recommend using mental maps for: compiling a natural passport of living and inanimate objects, developing projects of varying complexity in practical classes on science and methods of science, creating presentations, “brainstorming”, the development of intellectual abilities of primary school students etc.

Intelligence maps can be used in the educational process, in the self-educational activities of future teachers, preparation of material on a particular topic, solving creative problems, to train creative thinking, creativity, development of creative imagination and more. In order to intensify educational and cognitive activities, it is advisable to offer students to independently compile certain parts of the mental map that relate to the studied theoretical material. This practice develops memory, stability of attention, arouses interest. The mind map encourages the study of the material in such a way that all the blocks of the topic studied in the lesson are connected. After drawing up mental maps, future teachers should comment on their actions, try to use the map to reveal the essence of the topic.

Difficult ecological situation, urgent environmental problems encourage society to make radical decisions regarding the environment. Thus, pedagogical institutions of

higher education actively train teachers for environmental activities, the main task of which is to educate humane, environmentally conscious behavior of the population in relation to the environment. Forming the readiness of future teachers for environmental activities is a complex and long-term process, the use of mental maps will make this process more effective. Mental maps help to understand the educational topic, to understand all its components and the relationships between them.

Mental maps can be used directly in class (asking a problem, discussing, explaining new material, consolidating knowledge, conducting a survey, working on a ready-made algorithm or rule, etc.), in preparing an independent (homework) (individually or in a group), under time of work related to the organization of design and research activities, as materials for preparation for competitions, contests, etc., in distance learning.

The use of mental maps allows you to holistically understand the cycle of natural sciences, to understand the internal connections between all components in the environment, the causes of environmental threats and ways to eliminate them. Creating mental maps is one of the effective means of forming the readiness of future teachers for environmental activities in primary school.

Further topics for research may be: “The system of forming students' readiness for environmental activities in primary school”, “Ways of forming the readiness of future primary school teachers for environmental activities”.