Pedagogical conditions for professional training of future primary school teachers to pupils' logical skills formation

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The article reveals the essence of the concept of pedagogical conditions for future teachers' training to pupils' logical skills formation on the basis of philosophical, psychological and pedagogical literature analysis. On the basis of the theoretical study of the current state of the problem under study in the psychological and pedagogical literature and the results of the qualifying experiment, we have determined and grounded the pedagogical conditions for the training of future primary school teachers to students' logical skills formation: purposeful motivation of future primary school teachers to mastering the methods of students' logical skills formation; improvement of the content, programmatic and methodological provision of the process of training students of the specialty "Primary education" in the context of students' logical skills formation; use of active and interactive forms and methods in theoretical, practical and methodical training of students to logical skills formation of junior pupils.

Key words: pedagogical conditions, intellectual development, formation of logical skills, junior pupils, primary school.

Changes in the content and conceptual foundations of primary education cause a social need of a new teachers' generation training. The purpose of future teachers' training to logical skills formation in primary school pupils is to explain students notions of basic logical concepts and methods of their operation, to be ready to solve logical tasks, which will contribute to pupils' logical skills formation.

The scientific novelty of the research results is: for the first time, pedagogical conditions, which provide an effective process of future teachers' training for the logical skills formation in primary school pupils have been substantiated.

The study of philosophical, psychological and pedagogical literature [3, 4, 7, 9] has given an opportunity to substantiate the concept under the study: we understand pedagogical conditions of future teachers' training to logical skills formation as a set of circumstances, content, forms and methods that provide effective training of future primary school teachers to logical skills formation of junior pupils.

On the basis of the theoretical study of the current state of solving the problem under study in the psychological and pedagogical literature and the results of the qualitative experiment, we have determined the following pedagogical conditions of future primary school teachers' training to pupils' logical skills formation:

- purposeful motivation of future primary school teachers to mastering the methods of pupils' logical skills formation;
- improvement of content and methodological provision of the process of training students of the specialty "Primary education" in the context of pupils' logical skills formation;

- use of active and interactive forms and methods in theoretical, practical and methodical training of students to logical skills formation of junior pupils.

The first pedagogical condition is the purposeful motivation of future primary school teachers to mastering the methods of logical skills formation of junior pupils.

As we have already noted, only that teacher can provide logical skills formation in students, who possesses logical terms and concepts and can reasonably use them. So, at the first stage of the process of future teachers' training to logical skills formation of junior pupils, it is necessary to orient students at active participation in the process, to use purposeful motivation.

Targeted motivation, in our opinion, is the individual internal and external motives, which encourage the individual to continuous action, behavior changes, reorientation to the active orientation of the individual to professional self-determination, self-development, aimed at the final result.

In the context of our study, we consider the formation of purposeful motivation of students to pupils' logical skills formation as a process of forming their interests, awareness of the need and positive attitude to mastering the necessary vocational and pedagogical knowledge and skills for the further formation of pupils' logical skills. We distinguish external and internal motivation: the external motivation depends on the environment (active promotion of the project "Intellect of Ukraine" and the lack of proper training of teachers to educating pupils on its basis; modern requirements of society for the high-intellectual development of pupils; changes in the organization of educational process, pedagogical practice, including the development of modern technical means of training and their use in the process of training future teachers and students (ICT: TVs, projectors, interactive whiteboards etc.); positive example and support of others; internal motivation due to personal instincts and beliefs (interest in the formation of junior pupils' logical skills and the desire to succeed in this activity; awareness of the need for specially organized work and persistence in achieving the goals; personal views on the pupils' logical skills formation acquired during the pedagogical practice; the curiosity and inclination of future teachers to work with junior pupils and seek ways for their logical skills formation.

Such factors contribute to the formation of positive motivation in the context of our research:

- development of confidence in ability to promote the acquisition of pupils' logical skills in future primary school teachers;
- awareness of the need to master the methods for solving tasks in "Logic" with the aim of further pupils' logical skills formation;
- constant interest to professional development in accordance with new training programs in primary school aimed at intellectual development of the individual;
- a belief in the need for a constant process of self-improvement and self-education.

In order to form a positive attitude towards the problem under study at lectures on pedagogy and psychology, mathematics and methods of teaching mathematics, students got instructions about requirements to a teacher in modern conditions (the new law "On Education", "The Concept of the Development of Education of Ukraine for 2015- 2025" etc.); the role, possibility of logical concepts application in

career and pedagogical activity has been demonstrated: the direct relationship between the level of training to pupils' logical skills formation and the quality of the educational process has been confirmed by concrete examples from school practice; the fixation on the need of mastering this type of activity has been given; this kind of activity and approaches to the solution of tasks on the subject "Logic" in primary school has been demonstrated in practice; meetings and discussions with teachers were organized.

Thus, the formation of the students' purposeful motivation to mastering the methods of junior pupils' logical skills formation is a necessary pedagogical condition for career education of future primary school teachers and their training to future professional activity in the context of the problem under study.

The second pedagogical condition is the improvement of the content, programmatic and methodological provision of the process of training students of the specialty "Primary Education" in the context of pupils' logical skills formation.

Determining the second condition, we rely on the theory of a holistic pedagogical process of teacher's personality formation. In accordance with this theory, holism is evident in integration processes based on the synthesis of various scientific disciplines knowledge and is manifested in new organizational forms and teaching methods that provide the stock of theoretical knowledge and set the system of transition from educational activities to professional ones.

In order to implement the second condition, we try to reveal the possibilities of disciplines of the general cultural, psychological, pedagogical and subject blocks in future teachers' readiness formation for pupils' logical skills development. In particular, special attention was given to such disciplines as Philosophy, Pedagogy, Psychology, Mathematics and Methods of Mathematics.

It has been established that the course "Philosophy" introduces philosophical ideas and their place in the spiritual culture of society, the structure of philosophical knowledge, concepts of "consciousness", "knowledge", "reality", "thinking", "logic" and "language".

Studying the course "Pedagogy" students get acquainted with the factors of personality development (physical, intellectual, social and spiritual), study such topics as intellectual development of students and their mental education.

Studying "Psychology" students pay attention to types, forms, properties of the thinking process; essence, species, characteristic of attention; processes, types, quality of memory; means of students' psychological development, peculiarities of cognitive processes development (memory, attention, thinking); educational activity as a source of psychological development of junior pupil's personality; teacher as a subject of pedagogical activity; features and structure of pedagogical activity.

In the process of studying "Mathematics" students study elements of theory of sets and mathematical logic, different approaches to constructing a set of nonnegative integers, methods of applying the theory of sets and mathematical logic to the definition of concepts of the school course of mathematics; mathematical statements and their structure; functions, equations, inequalities; quantities and their measurement; values studied in primary school; geometric quantities studied in primary school, their definition, properties and characteristics.

The course "Methods of Mathematics" introduces students to the description of the basic concepts of the initial course of mathematics and the sequence of its study; development of primary school pupils in the process of studying mathematics; formation of computing skills; methods for solving problems; methods for teaching algebraic and geometric material; methods of working on the quantities; analysis of alternative programs and textbooks in math for primary school.

Consequently, in the process of mastering disciplines, students get knowledge about the essence of "Logic", the peculiarities of psychological (intellectual) development, the use of methods, techniques, means of pupils' intellectual development; students get acquainted with various authoring methods of diagnostics and further intellectual development of junior pupils; receive theoretical, methodological and practical knowledge about organization of the process of studying in general educational institutions.

However, this training is fragmented, it does not show the peculiarities of pupils' logical skills formation.

Thus, for the implementation of the second condition, it is necessary to include a training material on diagnostics and peculiarities of the junior pupils' logical skills formation and methods of work in such disciplines as "Philosophy", "Pedagogy", "Psychology". During the study of "Mathematics" and "Methods of Mathematics" it is necessary to expand the sections, themes, subtopics of studying the basic logical concepts, operations on them, logical laws, etc.; pay more attention to the methods for solving tasks from "Logic". It is also advisable to increase the number of hours to study such sections.

Improving the content, in our opinion, can contribute to junior pupils' logical skills development. In particular, studying the disciplines, we propose the following topics:

1. The role and place of the junior pupils' logical skills formation in the system of education at the lessons of mathematics.
2. Logical concepts, propaedeutics of which is conducted in primary school.
3. Propedeutics of the concepts "statement" and "predicate".
4. Methods of concepts formation in primary school.
5. Methods of forming skills to classify concepts.
6. Methods of forming the ability to perform operations on speeches.
7. Methods of forming the ability to build the right considerations.
8. Content and methods of pupils' logical skills formation by alternative programs.
9. Means of pupils' logical skills formation in educational process (didactic game, projects, IKT).

For further consolidation of the studied material it is necessary to allocate and reveal logic concepts in consideration of the corresponding topics of mathematics. For example, when studying the topic "Equation and inequality" it is necessary to consider the interpretation of the equation as a predicate (according to the current program) and reveal the logical content of the work proposed to conduct on this topic in school, in parallel with the presentation of the methods for studying equations.

During seminars and practical classes, it is advisable to study the following issues:

1. Disclosure of elements of logic implicitly present in the initial course of mathematics.

2. Allocation of tasks from the textbooks of mathematics for primary school, which implicitly contain elements of logic.

3. Methods of work with tasks, in the course of which logical skills are formed.

4. The development of a system of tasks similar to those given in the textbook, with the only difference that logical concepts and skills, propedeutics of which is carried out in the process of performing these tasks should be more clearly described.

5. Methods for correction the most common logical errors of junior pupils.

6. Selection of tasks to prevent such errors.

Important means of improving the process of future primary school teachers' training for the pupils' logical skills formation is to introduce special courses, seminars, workshops, etc. into the variational part of the curriculum. We have chosen a special course "Logical foundations of the initial course of mathematics".

Different forms of lectures (review lecture, problem lecture, lecture-conversation, etc.) were used to describe the main topics of the special course.

The lectures concentrated the most important material and provided the students with the necessary knowledge and skills. Basically, all lectures included elements of practical classes.

Students presented lectures, reports, business games. The structure of practical classes in general corresponds to I. Lerner's didactic conception about three levels of mastering knowledge: the reproduction of knowledge, the application of knowledge on a model, and implementation of knowledge in a changed, non-typical situation.

Students acquired the experience of independent activities (approbation of theoretical knowledge in practice) during the educational and pedagogical practice including attending classes and further analysis and self-analysis of them.

In order to solve pedagogical tasks in the context of the problem under study, the student must use obtained knowledge in psychological, pedagogical, methodological and special disciplines not in isolation, but in a complex way. Students were offered the tasks that contribute to junior pupils' logical skills formation. Future teachers attended lessons conducted by their classmates and primary school teachers, analyzed and discussed them. All classes, where students from experimental and control groups were trained, had the same tasks:

a) tasks aimed at the development of analysis and synthesis.

1. The combination of elements into a single whole:

Example.

The end of the first and the beginning of the second word is the name of the unit of mass.

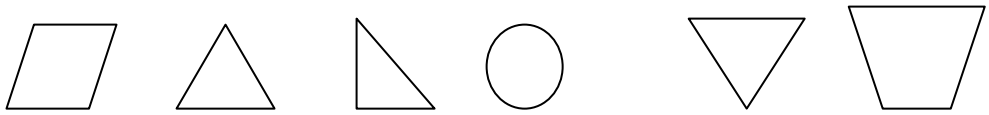
Milli (...) ophone

2. Finding different signs of the subject:

Example.

1) How many angles, sides and vertices in a hexagon?

2) Paint the figures with three angles. How are they called?



3. Recognition of the object according to the specified features.

Example.

The object has the following features: it is sour, yellow, oval.

What it is?

4. Consideration of the object in terms of different concepts.

Example.

The concept "a spit".

What signs of this concept can you name? (long, sharp, wood, metal, lush, dense).

What kind of object appears in your imagination?

b) tasks aimed at developing the ability to compare.

Study the drawings (submit pictures) and find the differences. Explain.

c) tasks aimed at forming the ability to classify.

1. Formation of the ability to divide objects into classes according to specified description.

1) Numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Divide them into two groups:

a) even numbers;

b) odd numbers;

Which group should include numbers 12, 21, 33, 16?

2) Find the puzzle. "Match it" (submit the corresponding drawings).

In practice, students conducted the study necessary for writing coursework and final qualification papers.

The third condition involves the use of active and interactive forms and methods in theoretical, practical and methodical training of students for the junior pupils' logical skills formation.

In active study students become the subject of educational activity, are engaged in dialogue with a teacher, actively participate in the cognitive process, realizing creative, exploratory and problem tasks. Active teaching methods are ways in which teachers and students interact with one another, and students are active participants in the educational process.

The notion "interactive" is derived from English word "to interact" (syn."to collaborate") [8]. In the context of interactive learning, knowledge acquires a different form. Interactivity in learning can be explained as the interaction of students, finding them in the mode of conversation, dialogue, joint action [5].

Interactive learning methods can be considered as the most perfect form of active methods. In other words, unlike active methods, interactive ones are oriented towards a broader interaction of students not only with the teacher, but also with each other and they are aimed at the dominance of student activity in the educational process. The determining features of active and interactive learning are the students' intellectual activity intensification, their independent decision-making skills formation.

Interactive learning in the context of this problem involves the modeling of life situations with the help of logical concepts and operations on them; solving creative

tasks with the help of logical schemes and laws; joint solution of assumptions, extraction method, finding the worst variant, etc.

A participant in interactive learning, a future teacher, must set certain learning goals, develop learning activity, master the reflection of his learning activities. The teacher, in his turn, must be able to create an atmosphere that encourages students to engage actively; the process of teaching must be based on such methods that would promote the development of logical skills and independent learning of students, stimulate reflection, apply effective methods of teaching and search for new teaching methods. The use of an interactive strategy changes the role and functions of the teacher – he ceases to be a central figure, he regulates the educational process, is responsible for its general organization, defines the general direction (prepares the necessary tasks for the lesson, formulates the questions for a discussion in the groups, controls the time and order of the intended task, gives advice, helps in case of serious difficulties).

The structure of the educational process in establishments of higher education contains three groups of organizational forms in education: theoretical, practical and methodological. The choice of organizational forms of education is determined by the peculiarities of the subject, the content of the educational material, the peculiarities of the study group, etc. Each of the organizational forms of training in establishments of higher education has certain features. Forms of theoretical training are lectures, seminars, educational excursions, educational conferences, consultations. The forms of practical training are laboratory classes, practical and seminar ones. Credits, exams, course papers, final qualifying projects and practical training – are forms of students' knowledge and skills control. Independent and extracurricular activities occupy intermediate place.

During theoretical and practical training of students it is advisable to use the following types of interactive teaching methods for students' logical skills formation:

The method "brainstorming" is a method of solving urgent tasks in a short time. The essence of the method lies in the fact that it is necessary to express as much ideas as possible in a small amount of time, discuss them and classify them. This method is used to solve complex problems. The method of brainstorming can be used in various types of activities: working with teams, small and large training groups, in individual work.

For example, when studying the topic "Solving problems in many ways" teacher should present the statement of the problem, using a projector, and formulate questions clearly, then suggest everyone to express ideas for solving a given task, to analyze each statement mentioned. It is obvious to note all the ideas in the notebook in the order they were presented without comments or questions. It is necessary to warn students not to miss any idea of their colleagues, not to criticize it, but to offer new ideas, perfecting the previously pronounced ones. Teacher should encourage students to formulate as much as possible ideas, because this amount generates the quality of solving the problem.

"Round Table" – a method of giving classes with students who are already familiar with the methodology for solving the problem. At "round table" they can and should try to ask questions on the topic of discussion, to argue for approaches to

solving a certain task and to report on a successful and bad experience. The "Round Table" is a kind of meeting on the exchange of experience and discussion of practical knowledge, achievements and mistakes. In this way, students learn the content of the topic, its key aspects.

"Discussion" is a method of giving classes, aimed to mobilize the practical and theoretical knowledge, the views on the problem under consideration. The discussion is successful when considering controversial issues in the study of the topic, but in educational process such a situation may not appear. For these reasons, planning classes as a discussion in advance is not entirely correct. The main preconditions for using the discussion in active learning are: it is necessary to include in the subject under study some tasks that have different solutions, or deliberately adhere to substantially different points of view. It can be done during lectures and other classes [2].

"Aquarium". The participants form groups of 4-6 people and read the tasks. One group takes place in the middle of the room, receives an instruction for conducting a group discussion: "Read the tasks aloud, discuss it in the group, take a joint decision within 3-5 minutes or sum up the discussion." When the time is over, the group returns to its place. It is necessary to discuss the task: Do you agree with the group's opinion? Was this idea sufficiently argued? Then another group takes place in the center of the circle. The following group may discuss another issue or another problem [6].

Reflection: why did we do that?

Method of team support for individual learning. The essence of the method is to enable small groups to advance in learning material at an individual pace. Groups are offered individual assignments on specific topics of the program, in which students can ask each other for assistance and advice. They can also check the work of each other, correct the errors. The quality of the tasks is checked by the teacher or his assistants. At the end of the topic, which includes several lessons, the results are summarized [1, 6, 10].

Further we will consider the interactive exercises used in the classroom during the study of the mathematical section “Elements of Mathematical Logic”. Before implementation such exercises, teacher must necessarily explain the rules.

Topic: "Concepts and their definitions"

"Microphone". Rules:

- only person with an imaginary microphone can speak;
- the submitted answers are not commented and are not evaluated;
- when someone speaks, the rest of the group does not have the right to interrupt or tell something.

Students pass round an imaginary microphone and make statements about the subject, the image of which is demonstrated by the teacher. Students indicate the size, color, shape and other features of the subject.

For example, a tangerine.

1st student. Tangerine is orange.

2nd student Tangerine is sweet.

3rd student Tangerine is round.

Conclusion. The idea of an object, expressed in a word or phrase, is a concept.

Work in pairs. This form of educational and cognitive activities organization of students and pupils can be used to achieve a variety of didactic goals: retention, reinforcement, verification of knowledge, etc. Work in pairs, all students get an opportunity to express their point of view, have time to think, exchange ideas with each other and only after that to express their thoughts. This kind of group work helps to develop communication skills, ability to express, persuade and prove the opinion.

In the process of such work, student can quickly and thoughtfully perform tasks that in other circumstances require a significant amount of time. While working in pairs (or groups), students can study the textbook as well as do teacher's tasks. For example, students, having the task of finding common essential features of a subject, discuss the problem with the partner and come to a common agreement and distinguish objects with common features, etc.

To determine the essential features of the subject, the teacher can use such exercise as the "Box". Students are grouped together. Each group chooses a leader. The leader of each group takes the box and pulls out a card with a task for rivals. If a group of competitors cannot answer the question, then the group that ask it has to give an answer. If the answer is wrong, competitors should argue using counterexamples.

It is a matter of the teacher what methods and techniques to use giving educational material. As a variant, the method "Press" can be used. Students are grouped together. Participants need to take and clearly explain their position on the solution of the task, to convince others. This method gives the opportunity to learn how to formulate and express opinion during a discussion in a reasoned, clear and concise form, to influence the opinion of other participants. In order to be concise and persuasive, each statement should have the following structure:

Position: Start with the words "I believe that ..." and express your opinion.

Substantiation: Start with the words "... because ..." (the reason for the emergence of such an opinion must be substantiated).

Example: Continue the statement by the word "... such as ..." and give the facts confirming the position of the participant.

Conclusions: to finish the statement "So (that's why) I believe ..." and to summarize opinion, draw a conclusion. For example, "I believe that the definition of the concept "square is a quadrilateral having equal sides" is inaccurate because not only the square is equal to the side, but also the diamond, which is also a quadrilateral, the sides are also equal. Therefore, I believe that in this notion it is necessary to replace the concept of a quadrilateral with the nearest generic notion - a rectangle.

Conclusion: Teachers should combine several teaching methods in different combinations in any type of training session. Applying certain teaching methods depends on the task and conditions of each type of classes.

Therefore, organizing an educational process based on the use of interactive learning methods, teachers must take into account the active participation of all students in the process of learning. Joint activity means that everyone makes their personal contribution, in the course of work there is an exchange of knowledge, ideas, means of activities.

Concluding the analysis of the conditions for future teachers' training to the junior pupils' logical skills formation, we note that we have intensified such conditions

that provide the formation of motives in future primary school teachers for mastering theoretical knowledge and skills of junior pupils' logical skills formation and their use in practice; improvement of content, programmatic and methodical support of training students in the specialty "Primary education" in higher educational establishments in the direction of forming logical skills in primary school pupils; use of active and interactive forms and methods in theoretical, practical and methodical training of students for the junior pupils' logical skills formation. All this contributes to raising the level of knowledge and practical skills necessary for future teachers to intensify the junior pupils' logical skills formation and increase the effectiveness of the process of training to this type of activity in general. Prospects for further research on the subject of research are seen in approbation of the model of future teachers' training to junior pupils' logical skills formation.

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