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Development of Biological Intuition and Logic in Students Through Solving Biological Problems

Rakhmatov Uchkun Ergashevich

Head of the Department of Biology and Methods of Its Teaching, Tashkent State Pedagogical University, Uzbekistan
E-mail: uchqunraxmatov0102@gmail.com

This work examines the development of biological intuition and logic in students through solving biological problems. According to the results of the study, the problem of developing biological intuition and logic among students remains relevant and requires further research. Teachers need to pay attention in the classroom, select non-standard problems that contain tasks of ingenuity and mathematical solution. The selection of such tasks helps students to think outside the box, draw conclusions, reason, and build logical reasoning.

Keywords: intuition, logic, biology, assignments, tasks, students.

1. Introduction

In biological education, it is not enough for a teacher to just teach how to solve problems. It is more important to ensure that students can generate effective and efficient ideas for solving biological problems. In order for students to create such ideas or concepts, it is necessary to improve their intuitive biological problem-solving skills. Intuitive skills help students a lot in solving problems. There is a tendency that intuition is a direct effort, without reference, and the result is accepted as truth, so that the person using his intuition feels that there is no need to prove or justify his thought [1].

The issue of the relationship between mathematical intuition and logic among students in Uzbekistan was dealt with by T.S. Malikov, who established that many components of the content of the educational process are determined through intuition. Also Malikov T.S. concluded that intuition is a connecting link in the knowledge system and serves not only to understand the material, but also to remember it [2].

Characteristics of thinking would be meaningless if its structure was not determined. L.S. Vygotsky believed that “The main logical forms in which thought is realized are considered to be analytical and synthetic activities of the mind, that is, those that first decompose the perceived world into individual elements, and then build new formations from these elements that help to better understand the environment.” [3, p. 199].

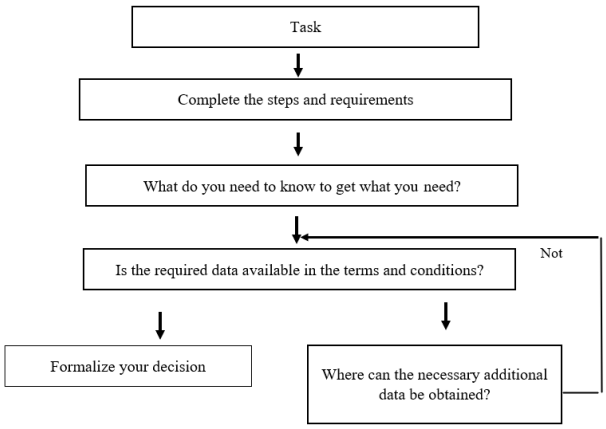
Students' problem-solving ability needs to be improved, especially the ability to improve problem-solving techniques and strategies, as well as the ability to synthesize problems. One thing a teacher can do when guiding students is to choose the best teaching method. Using an inappropriate model can make the lesson boring, make it difficult for students to understand the concept, and ultimately reduce students' motivation to learn.

Based on the above, we can conclude that operations such as analysis and synthesis are necessary for the functioning of mental activity. According to A.G. Voitov, the comparison operation is carried out on the basis of analysis and synthesis and represents a comparison of objects to identify their general similarities and differences [4].

Almost every person has the beginnings of biological intuition and develops it over time. A child arranging animals and plants in sequence, a person arranging books on shelves, each person has these skills. And already experienced biologists turn it into a weapon of their own brain. They sharpen it to such an extent that it becomes capable of becoming a research tool. Teachers' work should include specially oriented teaching methods that allow them to develop intuition at the highest level. Biological intuition in students can manifest itself without strict definitions and conclusions drawn on the basis of deduction.

In the branches of biology there is the so-called pre-knowledge and after-knowledge. They help develop the student's intuitive abilities. Intuitive knowledge must be developed through the introduction of specialized terms such as flora, fauna, assimilation, dissimilation, growth, development, cell, and so on. These concepts must be immediately explained, students must be brought up to speed and exercises must be performed aimed at their stability in the minds of students [5, p. 12].

The development of intuitive and logical thinking in biology classes helps to develop students' methods of thinking. It is very important that students learn heuristic skills, and not just algorithms for completing tasks, learn fixed rules and not only biological laws, but also formulas. It is heuristic techniques that help solve creative problems and look for new logical proofs. To achieve success in the development of intuition and logical thinking in students, it is necessary to manage their mental activity and develop mental cognition, develop practical skills in mental activity.

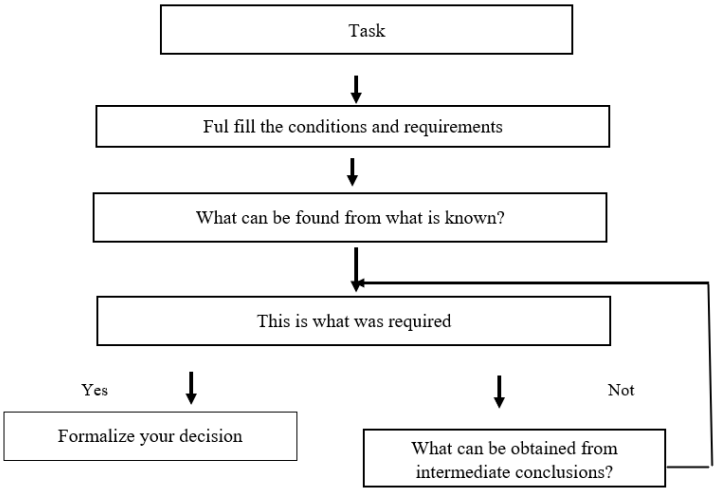


Picture. 1. Scheme for solving problems using intuitive and mental processes of the

analytical method of solutions

The daily development of intuition and logic should be carried out in the classroom, when each student will be involved in the process of solving standard exercises, but also developmental problems. The teacher must guide students in the stages of their development, that is, teach them how to correctly solve exercises and problems, analyze them, build and draw graphs, diagrams, etc. In the process of these classes, the student is educated and trained in search methods, involvement in the process of achieving a result, that is, mastering logical ways to achieve it. When learning to solve biological problems, logical exercises occupy a central place. They help to assimilate theoretical data, think logically, and engage intuition and thinking. Let us present to you an approximate scheme for solving problems from the point of view of the analytical and synthetic solution method (Fig. 1, 2) [6, p. 6].

Thus, the systematic use of various non-standard tasks, varying in level of complexity, contributes to the formation of intuitive and logical knowledge in students. Such problems are solved through trial and error and develop students' skills of ingenuity and ingenuity. Biological education sets itself the most important goal of teaching students mental techniques, skills of imagination and attention, the ability to reason logically, skills of intuitive cognition before solving problems, algorithmic and non-algorithmic problem solving [7, p.7].



Picture 2. Scheme for solving problems using intuitive and mental processes of the synthetic solution method

It is very important to learn analysis, the ability to distinguish between fact and hypothesis, and most importantly, the logical expression of one’s own thoughts, the development of imagination and intuition. Success in studying biology can only be achieved through the own efforts of the teacher and student. It is mental activity that is important. Organizing the mental work of students in lessons and extracurricular activities develops in them the skills of intuition, logic, thinking, attention, creative attitude to assigned tasks, the ability to think clearly and be able to correct their own mistakes. If a student does not have computational skills, he will find it difficult to study biology. Therefore, first of all, we work on this factor and then proceed to the formation of other skills. Ways to develop intuition and logic in

biology lessons are aimed at solving problems of varying complexity. They will allow students to reach their potential and understand what they really want to do. First of all, you need to correctly master the theoretical material, be able to isolate the necessary aspects from the main text, know the rules and techniques of calculations, be able to work with numbers, control and correct your own mistakes. All this will allow students to develop their intuitive and logical thinking skills over time [8, p. 77].

2. Research methods.

The purpose of this study is to study the literature on the development of mathematical intuition and logic in students through solving problems and presenting the results of the ascertaining stage of the experiment. During the study, the following methods were used: the theory of developmental learning, which is aimed at what to develop; theory of student-centered learning; problem-based learning theory, which focuses on how to develop and competency-based approach to student learning.

The objects of cognitive search activity are not only problems and tasks, but also the students themselves. The root causes of students' difficulties when solving problems are mathematical exercises, which in textbooks are limited to one topic. The main thing for a student is to learn a given topic, cope with problems on it and not use additional skills when thinking about various sections of mathematical material. Such tasks have little significance in learning - they can easily be forgotten after the end of the program for a given year. Therefore, when solving more difficult problems related to the development of logical thinking in students, difficulties arise.

The problems that students will be asked to solve can serve various learning purposes. The main one is the development of intuitive, logical and creative thinking of students, identifying their interest in studying mathematical science. Standard tasks are not suitable for solving these goals; they are useful at the initial stage of learning and then in the right quantities. And if you introduce students only to special ways of solving certain types of problems, then you can only achieve that students will create templates for solving them and will not be able to develop their intuitive and logical skills.

In training, tasks are required that will teach students the basics of independence, help them use their intuition in time, and help them master the skills of scientific and logical cognition that are necessary for real biologists. By providing targeted training to biologists in solving problems, using specially selected exercises, one can teach them to observe, use analogy, induction, comparisons, and draw appropriate conclusions.

3. Analysis and results.

The ascertaining experiment was conducted during 2023 among students of the Tashkent State Pedagogical University in the field of biology. Biology groups 302 and 303 were selected, the number of students was 49. The purpose of this stage was to identify means for developing biological intuition and logic among third-year students. To analyze the results, various research methods were used: analysis of literature, curricula, results of students' educational

achievements. To conduct research and identify the level of development of logical and intuitive thinking, students were offered a test. Levels of development of students' logical and intuitive thinking were developed. High level – the student scores more than 20 points; Intermediate level – the student scores from 12 to 20 points; Low level – the student scores less than 12 points. This test work gave us an idea of the techniques of logical and intuitive thinking for students at the beginning of the experiment. Let us give examples of tasks in which the obtaining of some conclusion based on the experiment is simulated. Conducting research and drawing conclusions. In the "Solving assignments and problems" class, the teacher asked students to independently count the number of chromosomes; the DNA chromatids will have daughter cells formed after mitosis if the mother cell has 4 pairs of chromosomes.

Solution:

8 cx-m, 8 cx-d, 2C DNA

↓

interphase — 8 cx-m, 16 cx-d, 4C DNA

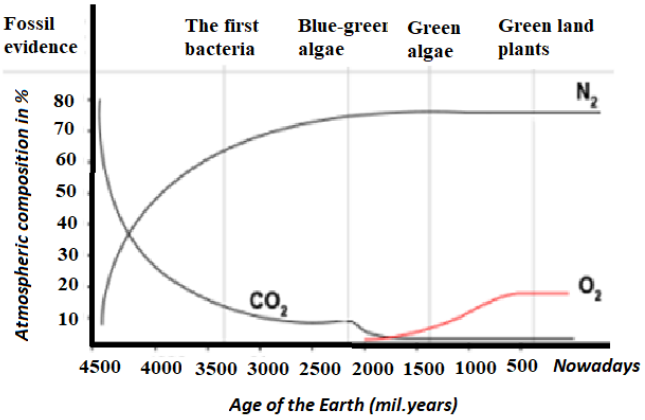
↙ ↘

Mitosis — 8 cx-m, 8 x-d, 2C DNA — 8 cx-m, 8 x-d, 2C DNA

As a result of mitosis, daughter cells with the maternal set of chromosomes are formed. Since during anaphase of mitosis it is not chromosomes, but chromatids that disperse to the poles of the cell, the daughter cells formed after mitosis will have 8 chromatid chromosomes.

When studying planimetry, students make their conclusions in most cases initially only on the basis of intuition: logical reasoning comes into its own after intuition has suggested this or that guess, and the task of reasoning is either to prove the correctness of this guess or to refute it.

Task 2. Analyze a graph reflecting changes in the gas composition of the Earth's atmosphere over time.



It is necessary to select statements that can be formulated based on the analysis of the proposed graphs:

1. Oxygen in the Earth's atmosphere arose millions of years ago.

2. Based on the graph, you can see a decrease in carbon dioxide concentration depending on time.

3. For the last billion years, the concentration of nitrogen in the atmosphere has remained unchanged.

4. The appearance of oxygen in the atmosphere can be associated with the emergence of the first bacteria on Earth.

Answer: 2, 3

In general, the same relationship between intuition and logic occurs when performing such tasks, however, the logic here is somewhat greater.

The ability to classify - the ability to distribute any objects into classes, departments, categories, depending on their general characteristics, one must use both logic and intuition.

Task 3. This task is to establish correspondence between classes of flowering plants and their characteristics.

A) Class Dicotyledons 1) seed has 2 cotyledons

B) Class Monocots 2) 1 cotyledon in the seed

3) tap root system

4) fibrous root system

5) leaf venation is parallel or arcuate

6) leaf venation is reticulate

7) most people have a supply of nutrients

In the endosperm

8) most people have a supply of nutrients

In cotyledons

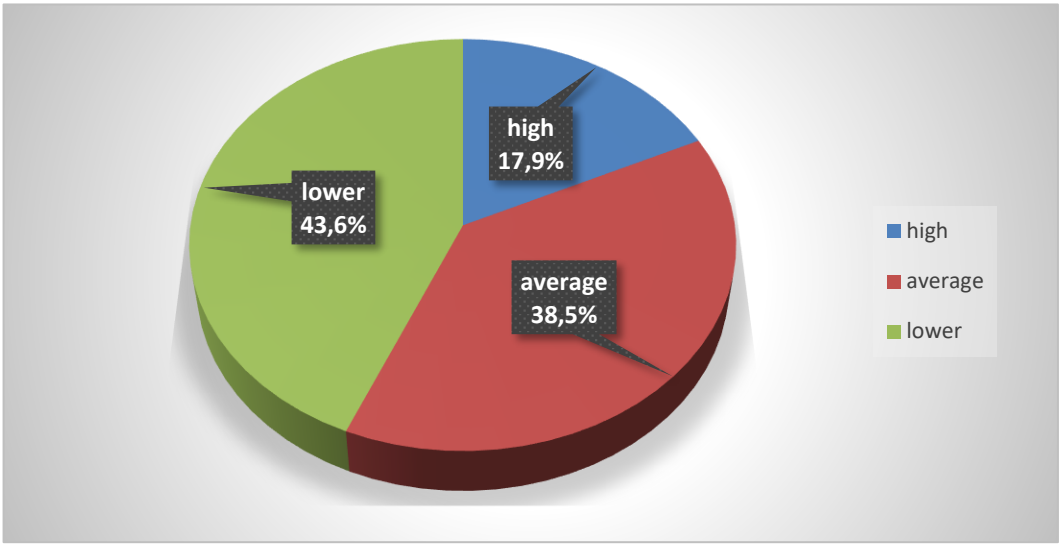
One of the ways to develop logical thinking is a game.

Psychologists prove that any person needs a game to provide psychological relaxation, activate thinking, and help overcome uncertainty. A person in a game actively thinks, creates freely and uses intuition. In classes on the subject "Solving assignments and problems in biology," riddles, crosswords, competition classes, game tasks "What's extra," "Guess" are used (to guess the name of the object, for this you need to rearrange the letters). For example, amred (derma), pakr (carp), actosech (scabies).

"Who is the odd one out": omul, crocodile, turtle, lizard, chameleon (omul). The answer requires explanation. Why extra?

Thus, we come to the following conclusion: the development of logical thinking and intuition of students is one of the priority areas when solving assignments and problems in biology.

The data obtained during the experiment was processed and the following results were obtained, which are presented in the diagram (Picture. 3).



Picture 3. Distribution by level of students during the ascertaining experiment

Based on the data, we can conclude that: when completing tasks, 17.9% have a high level of logical and intuitive thinking, which indicates that students can formulate hypotheses well and do not experience difficulties in choosing the value of the coefficient.

38.5% showed an average level of logical and intuitive thinking. This suggests that the students did not use logical sequence in their reasoning, the answers were not reasoned, and difficulties arose in finding the coefficient and finding errors in the reasoning. The majority of students, 43.6%, showed a low level of development of intuitive and logical thinking. Students had difficulty formulating a hypothesis about how to solve a problem, were unsuccessful in finding the coefficient, and could not figure out the drop-down lists for problems. In the course of the analysis, we made the assumption that in order to eliminate the listed shortcomings, in order to increase the effectiveness of learning, it is necessary to increase logical and intuitive thinking.

4. Conclusion

Selection of tasks helps students to think not “according to a template”, to draw conclusions, reason, build logical reasoning, and make an “estimate” of the answer [9, p. 54]. Teachers should take a more responsible approach to the selection of this kind of tasks in order to develop logical and intuitive thinking in students. To do this, it is necessary: - Select diverse and non-standard tasks that are not repeated in the classroom; - Tasks should not be too easy or too difficult; - Give similar tasks for independent work, and be sure to evaluate them. Involve students in the educational process, regularly use interesting non-standard tasks in classes that will contribute to the development of logic and intuition in students. It should also be noted where intuition is still very important: this is the analysis of the answer, the estimation

of the answer, the solution of biological problems. Teachers need to create learning situations in the classroom that would involve all students in active search activities to “discover” new knowledge in the process of carrying out biological activities.

References

1. Yohanes R.S. Pengembangan Model Pembelajaran Matematika untuk Mengaktifkan Otak Kanan Unpublished Disertation. – Surabaya: UNESA, 2007. – 108 h.
2. Malikov T.S. The relationship between intuition and logic in mathematics and its teaching: monograph. – Almaty: Scientific Research Center “Gylym”, 2002. – 166 p.
3 Vygotsky L.S. Thinking and speech. Psyche, consciousness, unconscious. – M.: Publishing house “Labyrinth”, 2000. – 368 p.
4. Voitov A.G. Self-instruction manual for thinking. – 2nd ed. – M.: Information and Implementation Center “Marketing”, 2001. – 408 p
5. Shakhmurova G.A., Azimov I.T., Rakhmatov U.E., Akhmadaliyeva B.Sh. Solution of biological problems and exercises (human and health). Teaching - methodological guidance. "Literature sparks". T., 2017. 156 p. [in Uzbek].
6. Shakhmurova G.A., Azimov I.T., Rakhmatov U.E. Problem solving from biology (zoology). Teaching - methodological guidance. Brok Class Servis LLC. T., 2016. 132 p. [in Uzbek]
7. Slepkan Z.I. Psychological and pedagogical foundations of teaching mathematics: method. allowance. – K.: Glad. school, 2018. – 192 p.
8. Shchukina G.I. Activation of students' cognitive activity in the educational process. – M.: Education, 2019. – 77 p.
9. Dvoryatkina S.N., Shcherbatykh S.V. The role of the system of additional professional education in the development of a new style of thinking of a modern specialist (on the example of retraining a mathematics teacher) // Psychology of education in a multicultural space. – 2019. – No. 3 (47). – pp. 76–88.