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STRATEGIES FOR ACTIVATING INDEPENDENT LEARNING ACTIVITIES OF STUDENTS IN BIOLOGY CLASSES

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Abstract. The article is dedicated to methods of activating students' independent learning activities during biology classes. It is proved that independent work in education holds significant importance for both the learning process and students of general secondary education. As noted by the authors of the article, the successful implementation of such activities depends on the teacher's ability to effectively manage them. Among the innovative methods there are: problem-based learning, projects and research, group work, utilization of internet resources and multimedia, task solving, and independent preparation of presentations or reports. By following these principles, it is possible to contribute to the development of students with their own worldview and a steadfast life position. The article highlights the importance of active independent learning activities during lessons, particularly in biology, and provides lesson plans developed using methods aimed at fostering such activities among seventh-grade students. Additionally, the results of student surveys are presented, demonstrating the level of interest in biological education, ranking of subjects in personal significance, level of students' independent activity, and their suggestions for diversifying and improving the process of biology learning. It was revealed that 13% of students exhibit a high level of independent learning activity, 54% demonstrate an average level, while 32% have a low level of independent learning activity. It is noted that activation of students' independent learning activities in the process of studying biology is crucial for both their personal growth and overall development. As biology has its peculiarities, students' independent activity becomes the foundation for their success and the development of scientific thinking. Taking into account these aspects, it can be argued that students' independent cognitive activity in the study of biology is essential for their comprehensive development and the formation of scientific thinking and skills useful in future life and professional activities. According to the research, to achieve such results, teachers should create conditions conducive to the development of students' independence and cognitive abilities, providing them with the opportunity to independently explore, study, and conceptualize new knowledge.

Keywords: independent work, project-based learning, activation of learning activities, biology, survey.

1. INTRODUCTION

Due to the rapid development and advancement of science and technology, there is a need to review the methods and approaches to education used in school education in order to effectively fulfill the educational and developmental tasks set, in pace with scientific progress. The main objectives of modern educational institutions are to educate enlightened and active members of society who can easily adapt and navigate in modern conditions, and to foster active, independent, and creative thinking in students during the learning process. There is a need to eliminate conventional and stereotypical thinking that has become entrenched in our society. Success in this task can only be achieved through active and

independent learning activities (Altukhova, 2012, p. 13).

In the 21st century, a graduate of a general educational institution should possess a system of knowledge in various fields of science, have their own scientific worldview, be prepared for active labor and cognitive activities, and be able to acquire knowledge independently. Active independent cognitive activity of students is a necessary feature not only in the education system but also in future professional and independent life.

To organize such activities, a teacher have to present the material in a way that is accessible and diverse, taking into account the age and individual characteristics of students. What was relevant decades ago and was successful may not satisfy the interest of students and, accordingly, will not be effective in today's world. It's important to remember that we are dealing with children who have grown up in an era where everyone has free access to various sources of information (Artemova, 2006, p. 24).

Obtaining thorough knowledge is impossible if a student simply lacks interest in educational activities and the material being studied. The task before the teacher is not only to impart a body of knowledge but also to identify and develop students' creative abilities, stimulate them to independently seek new information, and effectively apply knowledge in their daily lives (Dziabenko, Budnyk, 2019). It is important for educators to consistently determine the sequence and richness of independent work so that students can demonstrate their creativity and initiative. With each academic year, students' level of knowledge and cognitive abilities increases, leading to the complication of independent work, which is important for preparing students for independent activities in the future.

Biology is precisely the subject that occupies an important place in human life for self-discovery and understanding of the surrounding world. It directly engages students in research activities and contributes to the formation of creative abilities. During the study of biology, students engage in various activities such as observation, experiments, and tasks that require a creative approach, solve exercises and problems independently, implement their own ideas during participation in school biological projects, and conduct various research (Altukhova, 2012, p. 15).

Research objective: To identify the features of active independent cognitive activity in biology classes in the 7th grade and apply techniques to enhance such activity in school.

Research methods: Analysis and synthesis of theoretical sources, information synthesis, observation, surveys, and pedagogical experimentation.

2. ACTIVITY AND INDEPENDENCE OF THE STUDENT AS AN EDUCATIONAL ISSUE

The development of students' skills in independent learning activities is an important component of the educational process. The teacher's task is to teach students how to learn, acquire knowledge independently, and improve their skills and abilities. To achieve this, students need to be equipped with techniques for completing tasks, algorithms for processing the necessary educational material, and provided with all the necessary visual materials for its successful perception.

Organizing independent work for students in biology classes is a problem that many teachers seek to address. Comenius in his work "The Great Didactic" wrote, "*People need to be taught to observe nature themselves, not just to memorize the observations and explanations of others from books.*" Independent work in biology classes is of great importance as it contributes to the development of character, industriousness, independence, and improves skills in analyzing and systematizing acquired knowledge (Kovalenko, 2008, p. 407). It also creates conditions for conducting discussions, demonstrating initiative, and creative abilities (Budnyk, Mazur, Matsuk, et al., 2021). Additionally, activating students' activity through independent work can effectively combine the processes of acquiring new material and its consolidation, as well as assess and evaluate students' knowledge, skills, and abilities (Comenius, 1940).

Independence of students is viewed as a necessary condition for activating cognitive processes and the entire educational process as a whole. In the analysis of theoretical material on this topic, leading

pedagogical scholars understand “independence” as the formation of certain qualities of students' personalities in the process of their learning. Various types of independence are also encountered, such as creative, cognitive, intellectual, executive, and others.

P. I. Pidkasystyi explains this phenomenon as a more independent educational activity of students, less influenced by the teacher. This includes any organized active student activity directed at achieving a predetermined educational goal within a specially allocated time: searching for knowledge, processing it, consolidation, formation and application of skills and abilities, systematization, and generalization of knowledge (Tusheva, 2014, p. 251).

Activity and independence of students are related concepts, but different in their essence. O. V. Skrypchenko explained this as follows: “*Activity may or may not contain independence. This can be understood by examples such as situations in class where a student is active but does not demonstrate independence in involuntary reading, mechanical copying, eavesdropping on answers, or copying images or examples. In educational activity, independence is manifested in activity aimed at acquiring and improving knowledge, mastering work techniques. The latter element is associated with the formation of cognitive interests and other factors that stimulate and enhance volitional efforts to perform educational tasks*” (Psychological and Pedagogical Foundations of Teaching, 2008, p. 296).

Cognitive activity, in turn, accompanies any independent action that reflects a readiness for energetic, initiative-driven knowledge acquisition and requires volitional effort. Cognitive independence is always aimed at acquiring new knowledge, presupposes a student's readiness for investigative work, while cognitive activity takes place during the acquisition, reproduction, and consolidation of knowledge. Cognitive independence and creative abilities are related as generic and specific concepts, but they cannot be formed without active intellectual work. Cognitive independence arises from an internal need to acquire and deepen existing knowledge. Only when there is a certain need serving as a catalyst for certain activities does personal activity emerge. It is also important to remember that cognitive activity does not arise out of nowhere but requires certain conditions to serve as a catalyst for active cognitive activity in students (Altukhova, 2012, p. 14).

Thus, cognitive activity and independence are integral parts of cognitive activity, they are interconnected, but not identical. They complement and reinforce each other's significance in cognitive activity: in conditions of intellectual activity, a student's independence manifests itself, becoming an internal source of thinking development. Although they are related, each of them has different manifestations and is formed differently, thus being separate subjects of study in didactics.

A large number of educators have studied the issue of independent work, such as V.K. Buriak, P.I. Pidkasystyi, B.P. Yesypov, K.D. Ushynskiy, J.A. Comenius, and many others. In their view, independent educational activity consists of the following aspects: the teacher's attitude towards students' manifestations of independence; the ability of students to independently plan their educational activities; the ability to distinguish between primary and secondary aspects; the student's ability to assess the complexity of the material; the presence or absence of educational interest in studying a particular material; the ability to apply knowledge in practice without external assistance; the ability to independently evaluate one's educational results (Altukhova, 2012, p. 14; Artemova, 2006, p. 28; Sukhomlynska, 2005, p. 287).

The importance of independent work in the educational process cannot be overstated, as through its application, a number of educational tasks can be accomplished, such as: raising students' awareness and strength of knowledge acquisition; fostering skills and abilities needed not only during the school years but also in adult life; teaching students to apply knowledge and skills in life situations; developing students' cognitive abilities, logical thinking, and creative potential; and instilling in them a culture of intellectual work.

The significance of independent work has been emphasized in the works of many educators. For example, K.D. Ushynskiy believed that independent student activity in lessons is the “sole strong foundation of any fruitful learning” (Artemova, 2006, p. 23). According to him, the educational process

should be organized so that "children, as much as possible, work independently, while the teacher guides this independent work and provides material for it" (Sukhomlynska, 2005, p. 285).

A. Diesterweg attached great importance to fostering students' independence. According to him, only knowledge and skills acquired independently are valuable: "The mind cannot be filled with anything. It must encompass and process everything independently." He also coined the famous quote that reflects the role of the teacher in the educational process: "A bad teacher presents the truth, a good one teaches to find it" (Altukhova, 2012, p. 15).

Therefore, independent work has great educational and developmental significance. The success of this type of educational activity depends on the teacher's skill in managing it, adhering to the logic of the pedagogical process, ensuring its accessibility and appropriateness, taking into account the age and individual characteristics of students, creating problem situations in the classroom, and correctly and rationally organizing students' independent work, which is associated with overcoming certain difficulties. Additionally, for the effectiveness of independent work, it is necessary to maintain a connection between different types of such activity and strive to diversify it. Homework and classroom independent work should complement each other. By adhering to these principles, it is possible to educate a student with their own worldview, a defined life position, and their place in modern society.

3. RESEARCH OBJECTIVE, METHODOLOGY AND DATA

To study the level of independent learning activity in biology classes, a pedagogical experiment was conducted with 7th-grade students. The experiment involved 22 students from class 7-A of Ivano-Frankivsk Lyceum named after Mykola Sabat. The experiment took place during the period from February 27 to April 8, 2023.

Research problem: At the present stage, schools require the application of modern teaching methods and technologies that effectively stimulate children to independent learning and the development of their creative abilities.

Research object: The educational process in biology classes for the 7th grade at Ivano-Frankivsk Lyceum named after Mykola Sabat. Research subject: Independent learning activity in biology classes.

Research hypothesis: If various pedagogical methods and techniques for activating cognitive activity are applied in the teaching process of biology, we will be able to educate children with a high level of knowledge, independence, and activity.

To address these tasks, the following research methods were applied:

- Analysis and synthesis of methodological literature on the topic.
- Pedagogical observation.
- Testing of students.
- Questionnaire survey.

Questionnaire 1 "Assessment of students' interest in acquiring biological education and personal ranking of the importance of school subjects in the 7th grade," Questionnaire 2 "Determining the level of independent learning activity," were created based on the samples of surveys by Pashnev B.K. and O.O. Gorchynska (Questionnaire for Studying Cognitive Activity of Students, 2007; Tusheva, 2014)

The research was conducted in 3 stages:

- The first stage (February 2023) began with studying the literature on the topic, planning the pedagogical experiment, and preparing materials for conducting student surveys.

- The second stage (March and early April 2023) involved conducting the pedagogical experiment, including administering surveys to determine the level of significance of the biology subject among others, ranking school subjects, and assessing the level of independent learning activity among students of class 7-A.

- The third stage (April and May 2023) included data processing and analysis of the results of the pedagogical experiment, as well as drawing conclusions and preparing the report (Pedagogical

Experiment: Teaching Methodological Guide, 2008).

4. RESULTS AND DISCUSSION

Independent learning activity occupies a significant and prominent place in the educational process, as the skills of independent work are needed not only during schooling but also in students' adult lives.

To assess the level of independent learning activity, experiments were conducted at Ivano-Frankivsk Lyceum named after Mykola Sabat among students of class 7-A. During the research, two lessons were developed on the topics "Comparison of the skeletons of different animal groups" and "Animal digestion". These lessons were designed to activate students' independent work, and the following methods and forms of work were applied: team projects, problem questions, and laboratory work with experiments.

The properties of activating independent learning activity in 7th-grade students were investigated using two methods: the first demonstrates the level of interest of students in biological education and the personal ranking of subjects, while the second determines the level of independent learning activity.

Method 1: Survey of students to assess their interest in obtaining biological education and the personal ranking of subjects in the 7th grade.

The aim of this experiment is to determine the level of students' interest in acquiring biological education and to determine the ranking of subjects in personal significance. The survey was conducted using printed copies of the questionnaire. During the experiment, students filled out these questionnaires, indicating the level of significance of each proposed subject and answering three written questions. After collecting the completed forms, the results were processed and systematized.

Method 2: Determination of the level of independent learning activity.

The purpose of this research is to determine the level of independent learning activity among 7th-grade students. This experiment was conducted using a questionnaire based on the models developed by B.K. Pashnev and O.O. Horchynska (Questionnaire for Studying Cognitive Activity of Students, 2007; Tusheva, 2014).

The questionnaire contains three-answer options, each of which expresses a certain level of independent learning activity. Thus, most answers "A" indicate a high level of independent learning activity, answers "B" indicate an average level, and answers "C" correspond to a low level.

Moving on to the processing of results. Out of 26 students in the class, 22 participated in the experiment. Analyzing the results of the first survey, it becomes clear that students of class 7-A have an average level of interest in obtaining biological education. Out of the 14 proposed subjects, only two students ranked biology in 2nd place, one in 3rd place, and none in 1st place. The majority of students, namely 5, ranked biology in 7th place (Fig. 1).

As for the rest of the subjects (Fig. 2), it can be noted that English language, which is at the first position for nine students, holds the highest popularity in students' personal rankings. Algebra occupies the second position for four students, Ukrainian language is in third place for four students, and Ukrainian history is in the fourth position for five students. Therefore, biology does not occupy the leading position among other school subjects in the 7-A class and demonstrates an average level of interest in its study.

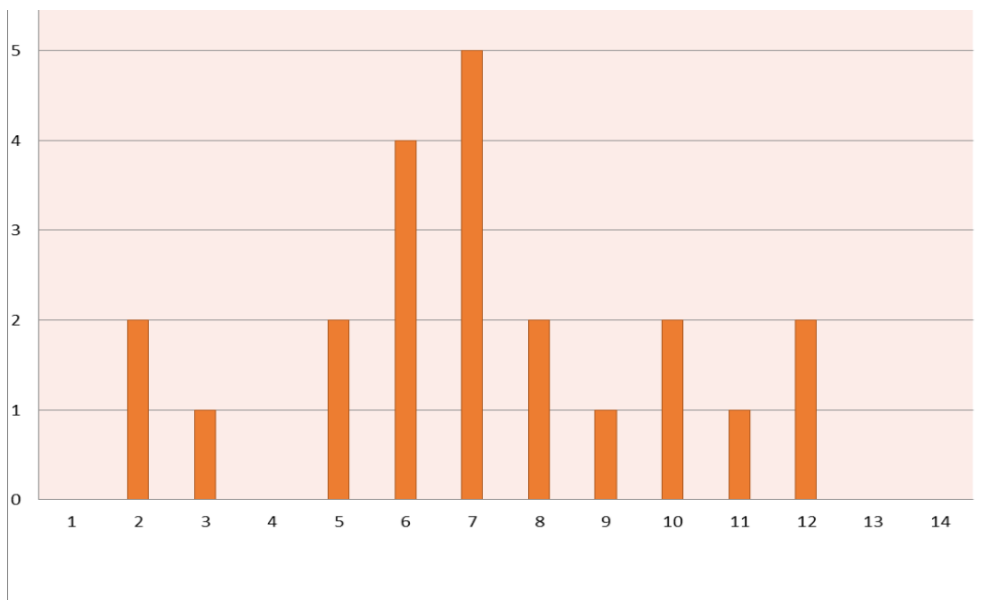


Fig. 1. The level of students' interest in acquiring biological education

Source: The survey was conducted by the authors of the article

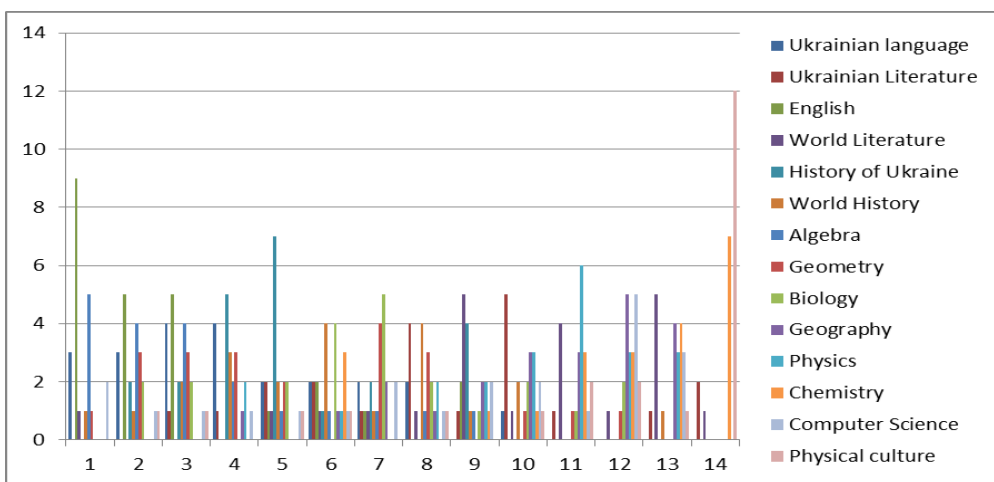


Figure 2. Ranking of subjects in personal significance

Source: The survey was conducted by the authors of the article

As for the question: “If you were a biology teacher, what would you change in the way biology is taught?” 8 out of 22 students wouldn't change anything. Ten students suggested diversifying the study of biology through various games, working in pairs, conducting more laboratory work, watching interesting videos, and presenting intriguing facts during lessons.

One student mentioned conducting lessons outdoors. Additionally, four students have a unique perspective on school biology, suggesting omitting the study of sponge structure, cells, flies, fish, crabs, spiders, arguing that they are scary. One of them expressed a desire to study more about arteries and the circulatory system.

To the question: “How much time do you spend on doing biology homework?” students responded that they spend on average between 30 to 60 minutes, depending on the volume of homework assigned to them.

The question: “What sources of information do you use to complete your biology homework?” gave the following result: the main source of information is the school textbook, workbook; presentations and videos (links to which the teacher attaches in Classroom); Internet resources; answer keys; ChatGpt, and two students seek help from family members (mom and elder brother).

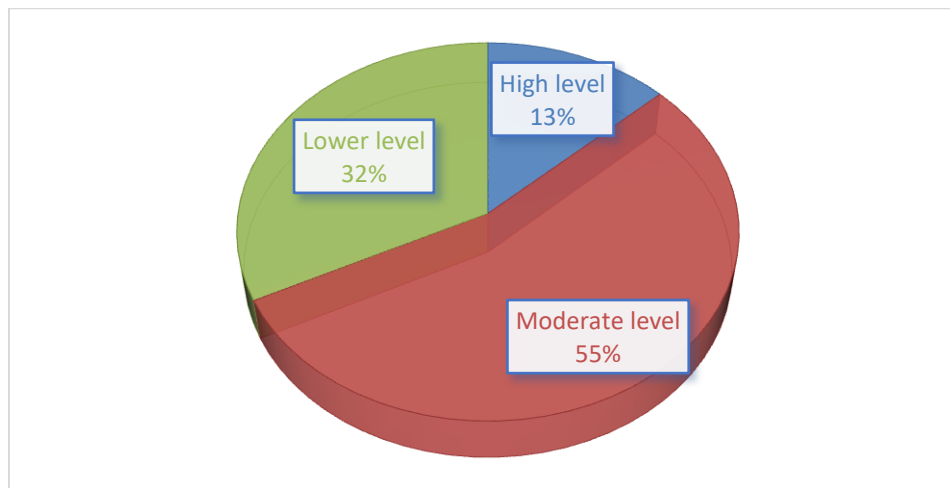


Fig. 3. The level of independent learning activity of students in class 7-A

Source: The survey was conducted by the authors of the article

Based on the analysis of the responses from the students of class 7-A (Fig. 3), it can be concluded that the level of independent learning activity varies among them. The majority of students demonstrated a moderate level of independent learning activity, as indicated by their responses and engagement in various classroom activities. However, there were also some students who showed a high level of independent learning activity, actively participating in discussions, completing assignments with enthusiasm, and seeking additional information beyond the classroom materials. Contrariwise, a few students exhibited a lower level of independent learning activity, requiring more guidance and encouragement to complete tasks and participate in class activities. Overall, the level of independent learning activity among the students of class 7-A appears to be satisfactory, with room for improvement in certain areas. It was found that a high level of independent learning activity accounts for 13% (3 students), an average level is present in 54% of surveyed seventh graders (12 students), and a low level in 32% (7 students).

5. CONCLUSION

Activation of independent learning activity in the process of studying biology holds significant importance for both students and their overall development. Considering the specific nature of the biology subject, active independent learning becomes a cornerstone for their success and the formation of scientific thinking. Activating independent learning in biology education encompasses several important aspects and values, including the development of critical thinking, engagement in active learning, deepening of knowledge and understanding, and fostering self-organization skills.

Taking into account these aspects, it can be argued that independent cognitive activity in the school process of learning biology is necessary for students' comprehensive development and the formation of scientific thinking and skills that will be beneficial in their future lives and professional activities. To achieve such results, teachers should create conditions that cultivate a solid foundation for the development of independence and cognitive abilities in students, providing them with opportunities to independently explore, study, and conceptualize new knowledge, which will contribute to their development in all directions.

REFERENCES

- [1] Altukhova, A. (2012) The Principle of Knowledge Solidity and its Implementation in the Pedagogical Heritage of A. Disterweg. *Pedagogy of Forming a Creative Personality in Higher and Secondary Schools: Collection of Scientific Works*, ed. by T.I. Sushchenko (Chief Ed.) et al. Zaporizhzhia, 27, 11-15. (in Ukrainian)

- [2] Artemova, L. V. (2006) Pedagogical Thought in the Second Half of the XVIII-XIX Centuries. In: *History of Pedagogy in Ukraine: Textbook for Students of Higher Pedagogical Educational Institutions*. Kyiv: Lybid. (in Ukrainian)
- [3] Budnyk, O., Mazur, P., Matsuk, L., Berezovska, L., & Vovk, O. (2021). Development of professional creativity of future teachers (Based on comparative research in Ukraine and Poland). *Amazonia Investiga*, 10(44), 9-17. <https://doi.org/10.34069/AI/2021.44.08.1>
- [4] Comenius, J. A. (1940). The Great Didactic. In: *Selected Pedagogical Works*. Vol. 1, ed. prof. A. A. Krasnovskiy. Kyiv: Radyanska shkola.
- [5] Dziabenko, O., & Budnyk, O. (2019). Go-Lab Ecosystem: using Online Laboratories in a Primary School. *11th annual International Conference on Education and New Learning Technologies*. Palma de Mallorca, Spain. 1st - 3rd of July, 2019. EDULEARN19 Proceedings, ISBN: 978-84-09-12031-4. <https://library.iated.org/view/DZIABENKO2019GOL>
- [6] Kovalenko, Y. I. (2008) Comenius, Jan Amos. In: *Encyclopedia of Education*. Edited by V. Kremen. Kyiv: Yunikom Inter, 407-408. (in Ukrainian)
- [7] Questionnaire for Studying Cognitive Activity of Students. (2007) In: B. K. Pashnev, *Psychodiagnostics of Giftedness*. Kharkiv: Osnova. (in Ukrainian)
- [8] *Pedagogical Experiment: Teaching Methodological Guide* (2008) Compiled by O. E. Zhosan. Kirovograd: Publishing House of the Vasyl Sukhomlynskyi Kirovohrad Regional Institute of Postgraduate Pedagogical Education. (in Ukrainian)
- [9] *Psychological and Pedagogical Foundations of Teaching: Educational Manual*. (2008) Kyiv: Ukrainian Center for Spiritual Culture, 1. (in Ukrainian)
- [10] Sukhomlynska, O. V. (2005). Ushynskiyi Konstiantyn Dmytrovych. In: *Ukrainian Pedagogy in Personalities: Textbook for Higher Education Institutions Students: in 2 books. Book 2. 20th Century*. Edited by O. V. Sukhomlynska. Kyiv: Lybid, 284-292. (in Ukrainian)
- [11] Tusheva, V. V. (2014) *Fundamentals of Scientific Research: Educational Manual*. Kharkiv: Fedorko. (in Ukrainian)

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Стаття присвячена висвітленню прийомів активізації самостійної навчальної діяльності учнів під час вивчення біології. З'ясовано, що самостійна робота у навчанні має велике значення як для процесу навчання, так і для виховання здобувачів загальної середньої освіти. Успішне проведення такої діяльності залежить від вміння вчителя ефективно керувати нею. На думку авторів статті, важливо дотримуватися певної логіки викладу, забезпечувати доступність матеріалу та враховувати індивідуальні особливості учнів. Серед інноваційних освітніх методів визначено: проблемне навчання, проекти та дослідження, групову роботу, використання Інтернет-ресурсів та мультимедіа, розв'язання завдань та кейсів, самостійну підготовку презентацій або доповідей. Враховуючи ці принципи, можна сприяти формуванню учня з власним світоглядом та стійкою життєвою позицією.

В статті висвітлено значення активної самостійної навчальної діяльності учнів на уроках, зокрема, і на уроках біології, і подані розробки уроків, які зроблені з застосуванням методів, які сприятимуть розвитку такої діяльності в учнів 7 класу. Також подані результати опитування учнів, які демонструють рівень зацікавленості учнів у здобутті біологічної освіти, рейтинг предметів особистої значущості, рівень їх самостійної активності та пропозиції учнів стосовно урізноманітнення та покращення освітнього процесу вивчення біології. Виявлено, що 13% учнів мають високий рівень самостійної навчальної активності, у 54% опитаних спостерігався середній рівень, а 32% - низький рівень самостійної навчальної діяльності. Доведено, що активізація самостійної навчальної діяльності учнів у процесі вивчення біології важлива як для їхнього особистісного зростання, так і для загального розвитку. Оскільки біологія має свої особливості, самостійна активність учнів стає основою для їхнього успіху та формування наукового мислення. З'ясовано, що активізація самостійної навчальної діяльності учнів у процесі вивчення біології має кілька важливих аспектів: розвиток критичного мислення, залучення до активної діяльності, глибше освоєння знань та розуміння, а також формування навичок самоорганізації. Враховуючи ці аспекти, можна стверджувати, що самостійна пізнавальна діяльність учнів у процесі вивчення біології є важливою для їхнього повноцінного розвитку, формування наукового мислення та навичок, корисних у майбутньому житті та професійній діяльності. Обґрунтовано, що для досягнення таких результатів, вчителі повинні створити умови, які сприятимуть розвитку самостійності та пізнавальних здібностей учнів, давати їм можливість самостійно досліджувати, вивчати та уявляти нові знання.

Ключові слова: самостійна робота, проектна діяльність, активізація навчальної діяльності, біологія, опитування.