

**IV Міжнародна конференція
на честь О. В. Погорелова
ПРОБЛЕМИ ВИКЛАДАННЯ
МАТЕМАТИКИ У ЗАКЛАДАХ ОСВІТИ:
ТЕОРІЯ, МЕТОДИКА, ПРАКТИКА**

Тези доповідей

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ХАРКІВСЬКА АКАДЕМІЯ НЕПЕРЕРВНОЇ ОСВІТИ

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**ПРОБЛЕМИ ВИКЛАДАННЯ МАТЕМАТИКИ
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THE INFLUENCE OF THE JUNIOR ACADEMY OF SCIENCES ON THE FORMATION OF SCHOOLCHILDREN COGNITIVE SKILLS IN CONDITIONS OF DISTANCE LEARNING

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Abstract. Using the examples of organizing scientific research by schoolchildren in applied mathematics, the role of the Junior Academy of Sciences of Ukraine in overcoming the challenges of distance learning is explored in terms of forming internal motivation to learn.

Keywords: challenges of distance learning, cognitive skills, mathematics education, practice-oriented learning, lifelong learning.

There are two main subjects in school: native language and geometry. One teaches a person to express thoughts correctly, the other – deductive reasoning

Oleksiy Pogorelov

In today's difficult conditions, the educational process in Ukraine is facing serious challenges. Many schoolchildren and higher education students are now forced to study remotely. And it's good if, thanks to the use of Internet technologies, students and teachers have the opportunity to communicate in real time, that is, learning takes place online. However, problems with light and the Internet, which periodically arise, lead to the fact that learning can occur asynchronously. In this case, the student is forced to independently master educational materials that were previously formed by the teacher and placed on special platforms, such as Moodle, Google Classroom and others. It should be noted that the advantage of modern information technologies is that they are able to fully provide a person with access to quality knowledge, and also give him the opportunity to work at his own pace. However, such training is effective when a person has internal motivation, when he is aimed at self-development and consciously chooses this method of training. Now in the eastern part of Ukraine, the mass transition to distance learning is forced, and certain disadvantages of this method of training are already making themselves felt.

One of the biggest drawbacks of distance learning is the limitation of social contacts, which prevents students from developing communication skills [1, 2]. But this is a psychological problem. As for the quality of the educational process, a more significant drawback should be considered the reduction in the effectiveness of students' cognitive activity. The use of gadgets in preschool age has led to the formation of such features in the generation of modern children as fragmented perception of information. The role of working memory is also gradually increasing, while the role of long-term memory is decreasing and, accordingly, the ability to deeply analyze information and determine cause-and-effect relationships is decreasing. Since distance learning involves the use of digital tools, to ensure the effectiveness of education it is necessary to form a conscious attitude towards learning in students, which, in turn, requires internal motivation to obtain high-quality knowledge, high self-discipline and time management skills. Psychologists claim [3] that those students who use gadgets primarily for learning and self-development are psychologically more resilient and have high self-esteem.

The purpose of this study is to determine the impact of involving high school seniors in scientific work at the Junior Academy of Sciences of Ukraine on the formation of a responsible attitude towards learning outcomes, on their cognitive skills and ability to integrate new information into their own system of existing knowledge. The paper presents the results of my own experience in supervising scientific research of schoolchildren who participated in the work of the Mathematics department of the Junior Academy of Sciences, the Statistics section.

The Junior Academy of Sciences, or JAoS, is a state institution of extracurricular education of a scientific nature [4]. The very idea of uniting school scientific circles of various directions into a single system under the leadership of the Ministry of Education and Science was successfully implemented in the late 1960s. At the same time, physics and mathematics schools were created for seniors of high school, which later turned into physics and mathematics lyceums. But the direction of activity of JAoS of Ukraine is not limited to the exact sciences. Thus, the Kharkiv territorial branch of the Junior Academy of Sciences has 12 different directions, which gives students the opportunity to choose their own direction of research. A single coordination center for managing the work of the Junior Academy of Sciences of Ukraine was established in 2004, and in September 2018, JAoS of Ukraine began operating under the auspices of UNESCO and received the status of the Copernicus Academy. Such cooperation allows Ukrainian schoolchildren to participate in various international events remotely [5].

The current stage of development of the world economy is defined as the Fourth Industrial Revolution (Industry 4.0), or the Knowledge Economy. In the conditions of digitalization and automation of production, the development of Artificial intelligence, today's schoolchildren, who in a few years will become direct participants in the industrial revolution, need not only to master a certain amount of information, but also

to be able to implement the “Lifelong Learning” paradigm and have the skills for creative search. And in our country, this can be ensured by involving schoolchildren in the work of the Junior Academy of Sciences.

One of the key components of the work of the Junior Academy of Sciences of Ukraine is the preparation and competition-defense of scientific and research works of schoolchildren-members of JAOs. It is advisable to involve schoolchildren, starting from the 9th grade, in the work of the Junior Academy of Sciences, so that they gradually accumulate experience and have the opportunity to adequately present their research at all levels of the competition. The implementation of scientific research involves not only the processing of a large amount of material, but also, thanks to its comprehensive analysis, the formation of one's own point of view on the object of research, the identification of new results obtained in the process of research, and the expression of one's own conclusions on this basis. It should also be noted that research work takes place in close cooperation between the student and the supervisor, who can be not only a school teacher, but also a university lecturer. This is another advantage of involving students in work at the Junior Academy of Sciences, since communication with the supervisor teaches the student to effectively use feedback, helps to practice the ability to correctly formulate questions and defend their own opinion.

Work on the project begins with a discussion of the research subject, since it is important that this direction of research is interesting to the student. As an example, one can cite such a topic that was proposed by the student himself. Thus, in 2024, Jaroslav Tatkov, a class 11 student at Kharkiv Lyceum No. 72, presented the research work “Statistical View of “Trukha–Ukraine”: Analysis in Figures”. In this work, using the example of the Telegram channel “Trukha–Ukraine”, social networks were considered as a tool for influencing young people. Very interesting statistical data was collected and, based on their processing using MS Excel built-in functions and add-ins, a psychological portrait of subscribers to this Telegram channel was formed and the reliability of the results obtained was analyzed. Another example is the research of Anastasia Biryukova, a student of Kharkiv Lyceum No. 72, on the topic "Cobb-Douglas Function vs Regression: Mathematics of the Development of the Processing Industry in Ukraine", which was submitted to the JAOs-2025 competition. Based on data from the State Statistics Committee of Ukraine for 15 years, the author conducts a multifactor analysis, including not only factors such as labor and capital, but also time.

It should be noted that the problems of online learning are also of interest to the students themselves. Thus, in 2023, Olena Klysak, a 9th grade student of Kharkiv Lyceum No. 36, presented the work “Disadvantages and Advantages of Online Learning through the Eyes of a Schoolchild: A View from the Inside”. Again, the team of the research was proposed by the student herself. In the process of work, she developed a questionnaire and conducted a survey among students of her school regarding their attitude to the level of organization of distance learning and assessment

of the quality of knowledge obtained in various disciplines. Using statistical methods, she conducted a comparative analysis of the points of view of respondents in Ukraine and abroad, as well as different age groups: from 10 to 12 years old, from 13 to 15 years old and from 16 to 18 years old.

Therefore, it is advisable to conduct an approbation of the research in the form of a report in front of the class to discuss the results of the study and present the idea of the JAoS itself. This is useful for both the researcher and other students, as it allows them to see on the specific example of their classmate what a person is capable of if he is oriented towards cognition. And the presentations of modern methods of statistical data processing, obtaining objective information and its analysis form in students the understanding that it is not enough to have your own opinion, you must also be able to provide objective arguments to substantiate it. In addition, students receive visual information about the activities of the Junior Academy of Sciences, and perhaps next year some of them will also want to try their hand at scientific activities.

The baton of involving young people in scientific activity is continued by Ukrainian universities. Thus, at Simon Kuznets Kharkiv National University of Economics, starting from the first semester, the technological map (the work plan) of mathematical disciplines provides for the implementation of an independent creative task on the application of mathematical methods to solving real problems of economics and management using the knowledge acquired during the academic semester. The results of such research are provided either in the form of a scientific article or in the form of a report at a conference. And if in the first year the percentage of students who participate in the implementation of a creative task is about 10%, then in the second year it already increases to 30% and above.

However, the task of the Junior Academy of Sciences is not limited to the fact that, by involving children in scientific activities at school age, to cultivate in them an interest in learning, to teach them to formulate questions and seek answers to them, and then to defend their point of view using objective evidence. The active partnership of the Junior Academy of Sciences with the Ministry of Education and Science of Ukraine allows us to determine ways of reforming the education system itself. This is especially true for natural sciences.

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