

**THE METHODOLOGICAL RECOMMENDATIONS FOR TEACHING
THE SUBJECT "NATURAL SCIENCE (SCIENCE)" (ON THE EXAMPLE
OF KNOWLEDGE IN PHYSICS)**

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ABSTRACT

In this article, methodical recommendations for teaching chapters related to physical knowledge were given to non-physicist teachers specializing in teaching the integrated science of "Science". It aims to teach the content of the new subject using STAEM technology and many other methodological and didactic goals. This task may seem simple at first glance. But if we take into account the age, outlook, and psychological and physiological characteristics of the 6th grader, this assignment is a bit complicated.

KEYWORDS: *School, "Science" Subject, 6th Grade, Student, Mastering, STAEM Technology, National Curriculum, Physical Knowledge, Recommendations.*

INTRODUCTION

Forming the knowledge and skills of schoolchildren, educating them in the spirit of loyalty to national and universal values, increasing the prestige of the teaching profession and the quality of pedagogues, improving textbooks and educational methodical complexes based on the requirements of the times, establishing modern models of public education institutions that meet international standards, teaching general education subjects, ensuring continuity and consistency, introducing information communication technologies, effective forms and methods of education in general secondary education are among the urgent tasks of today [1, 2].

Theoretical analyses

As a result of the deep penetration of modern innovative techniques and technologies into the life of society, the increase of modern knowledge leads to the formation of new derivative sciences, the weight of necessary knowledge and the burden of the students to master it. In such cases, the optimization of the knowledge to be acquired through the integration of disciplines is appropriate and has been tested in the world experience.

In 2022-2026, it is planned to introduce the "Science" integrated subject, which covers biology, geography, physics and natural sciences in grades 1-6 in general secondary schools, and ensures their interrelationship with other subjects. This subject envisages the formation of students' natural-scientific, technical, ecological and economic literacy, and the development of critical and creative thinking.

The integrated science "Science" is the nature, causes and interrelationships of phenomena and processes occurring in living and non-living nature, the stages of the development of nature,

including the evolution of living organisms, the natural scientific bases of modern innovative technologies, the interdependence and influence of nature and society, natural and It aims to acquire the system of theoretical and practical knowledge by the students, the scientific basis of economical use of other economic resources, the principles of effective management and management of economic processes, the essence and importance of a healthy lifestyle.

In addition, "Science" teaches students to know and understand the natural and social world, and to apply this knowledge in practice, following a systematic methodology based on evidence.

Students' interest in acquiring modern knowledge, understanding of the natural and social environment, understanding of environmental and human problems, providing solutions and making decisions, and "Natural Sciences" integrated sciences play an important role.

"Science" forms in students the skills of describing the universe and natural phenomena, understanding and explaining them, making independent decisions, and researching based on observations and experiments.

Ensuring the connection and mutual integration of the sciences, students' understanding of nature as a whole creates the basis for the creation of a single natural-scientific view of the world in their thinking. It also forms and develops students' abilities and skills to understand the possibilities and problems of modern scientific and technical development, the essence of environmental problems, the rational use of nature, the observance of a healthy lifestyle, and the basics of economic literacy and use in everyday life.

In addition, students' communicative, working with information, communicative and social-emotional and civic basic competencies are developed.

The following main strategic goals are aimed at the introduction of "Science":

- Development of education;
- Improving the quality of education;
- Formation of students' life skills;
- To enter the top 30 countries in terms of quality and productivity of education by 2030.

The development of interdisciplinary communication and the introduction of integrated subjects in the educational process ensures that students acquire modern knowledge together with modern qualifications and skills, which confirms the above points.

The importance of interdisciplinary relations and integrated sciences was confirmed by the introduction of the integrated science "Science" in the 6th grade in the 2022-2023 academic years, which includes biology, geography and physics.

As a result of the revival of interdisciplinary relations and the introduction of integrated sciences in the educational process, students will acquire modern knowledge and skills and abilities of practical importance.

In the 2021-2022 academic years, "Science" textbooks were put into practice in the 1st and 2nd grades, and in the 2022-2023 academic year, the 3rd and 6th-grade natural science textbooks were put into practice.

The 6th grade Science textbook [3] consists of 12 chapters, five of which, i.e. Chapters 2, 6, 10, 11, and 12, provide for the teaching of physics. Here are the textbook chapters:

1. Nature.
2. Substance and its properties.
3. Diversity of living organisms.
4. Structure of living organisms.
5. Ecology and sustainable development.
6. Solar system and the universe.
7. Geographical maps.
8. The crusts of the earth.
9. My homeland.
10. Movement and power.
11. Energy.
12. Electric and magnetic phenomena.

According to the order of the Minister of Public Education No. 414 of December 24, 2021, it is envisaged that teachers of physics, geography and biology will organize lessons from the integrated science "Science". Also, according to the order, short-term (2-week) courses on the teaching and content of "Science" were organized for current science teachers at the scientific research institute for the study of the problems of public education named after A. Avloni.

Of course, these training courses are very useful for the trainees. It aims to teach the content of the new subject using STAEM technology and many other methodological and didactic goals. At the same time, due to the short duration of the training courses, teachers may face some difficulties in teaching the subject. That is, "Science" has a great responsibility on teachers because it includes knowledge of physics, astronomy, geography and biology. Because now it will be necessary for one teacher to deliver the knowledge related to several subjects to the students and ensure their effective learning. We considered that it is necessary to give some methodical recommendations to teachers of non-physical science in teaching physical knowledge in Science.

Before the introduction of the new National Curriculum, our works [4-9] elaborated on the interaction of knowledge in the textbooks, and several methodological recommendations were given. In the 2022-2023 academic year, it is desirable for the teacher to familiarize himself with physics in the teaching of physics in the 6th grade of "Science", in particular, to be armed with basic knowledge such as physical terms, units of measurement, names of laboratory equipment, laws.

The national curriculum includes a textbook as well as a teacher's book, and students can view the pictures in the textbook in the live 3D form in the "Digital Textbooks" application for mobile phones. However, the teacher's book for the 6th grade "Science" has not been made available to the public and it is necessary to take into account that the 6th grade "Science" subject is not included in the mobile application.

"Why does a teacher need to get acquainted with physical knowledge?" - the question arises. We can also think that the knowledge that the student needs to learn is given as information in the textbook. In the right textbook, all the information is presented to the students in a simple, understandable and easy-to-learn format. At the same time, the new science introduced into this practice requires a responsible approach from the teacher. This is because, at the beginning and end of each topic, problematic questions and materials that are partially covered in the topic or not covered in the topic text are given as homework. As an example, let's take the chapter "Substance structure" in the textbook. At the end of the practical exercise called "Three states of matter" - "Make three states of matter from thin wooden sticks and plasticise" - a homework assignment is given. This task may seem simple at first glance. But if we take into account the age, outlook, and psychological and physiological characteristics of the 6th grader, this assignment is a bit complicated. It is necessary to reveal the content of this assignment to the student in any sense. That is, he should explain to the student what exactly he should do. A teacher with physical knowledge will explain to the student that in this task it is necessary to make a crystal lattice, of course. Up to this part of the chapter, the arrangement of the molecules of substances is not considered once, except for figures 1 and 2 below on pages 15-16. Therefore, the caption to the pictures does not focus on the location of the molecules. That is, he should explain to the student what exactly he should do. A teacher with physical knowledge will explain to the student that in this task it is necessary to make a crystal lattice, of course. Up to this part of the chapter, the arrangement of the molecules of substances is not considered once, except for figures 1 and 2 below on pages 15-16. Therefore, the caption to the pictures does not focus on the location of the molecules. That is, he should explain to the student what exactly he should do. A teacher with physical knowledge will explain to the student that in this task it is necessary to make a crystal lattice, of course. Up to this part of the chapter, the arrangement of the molecules of substances is not considered once, except for figures 1 and 2 below. Therefore, the caption to the pictures does not focus on the location of the molecules.



Figure 1. The aggregate state of substances.



Figure 2. Molecular structure of solids, liquids and gases.

Logically, there are two complex aspects of the assignment. Molecules of liquids and gases, unlike molecules of solids, do not stay in a specific place. Liquid and gas molecules are constantly in chaotic motion. Well, a new question arises as to how the reader makes their location. We recommend a simple approach to this problem, i.e., the student can arrange the molecules of a solid in an orderly manner, the arrangement of a liquid molecule in a slightly more disordered manner, and a gas molecule in a very disordered manner.

Another example is from the chapter "Structure of Matter" we will consider the practical exercise called "Diffusion Phenomenon Study". Here is an excerpt from the beginning of the topic - "You have studied the non-stop and disordered movement of particles in solids, liquids and gases." Before this practical training, the topics "Gases" and "Liquids" were given, and the above information was not given in these topics and in the previous topics. Only in the topic "Liquids" - "... liquid particles move more than solid substances..." information is mentioned.

The next example is an experiment with a tangerine fruit, the subject of "Density of matter". In the experiment, the fruit is first placed in a container filled with water with its peel, and then it is removed from the peel and placed in water. As a result, in the first case, the fruit does not sink, in the second case; the fruit sinks to the bottom of the water. There is some abstraction in the textbook in explaining the content of the experiment to the students.

If we pay attention to the chapter "Electric and Magnetic Phenomena", an encouraging task is given to make a logical-scientific conclusion on the topic "Electrification of Bodies". The content of the task is as follows - "... take two bubbles, rub them first on silk fabric, the second time on silk and the other on fur and bring them closer to each other...". After the task, the following spheres touching each other and moving away from each other are depicted, and the students are asked to interpret this situation (Figure 3). However, the topic only provides information about the electrification of two bodies as a result of rubbing against each other.



Figure 3. Interaction of charged bodies.

CONCLUSIONS AND SUGGESTIONS

There are many such examples in all physics-related chapters. But it is also necessary to stop at their solution. Until the adoption of the national program, it is possible to use the materials in the form of a table [9-11], which are given in the textbooks and analyse the relationship of the 6th-grade physics course with other subjects in the section of topics and chapters. Using this information, it is possible to find answers to questions that arise from students using previous editions of textbooks. Students can also be recommended additional reading material to supplement their knowledge.

Taking into account the above, in the teaching of physics knowledge of the 6th grade "Science" subject, non-physicist teachers should learn additional information on topics from the Internet and various literature, get acquainted with physics literature, teach students to work with information, especially literature, teach students physics it is necessary to recommend informative literature, to get acquainted with effective methods for teaching physics, to master them and to be able to apply them, in addition, to constantly develop and strengthen their knowledge.

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