

FORMATION OF ASTRONOMICAL MOTIVATION AND RESEARCH SKILLS FOR SCHOOLCHILDRENS OF GRADES 11

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Abstract

The paper examines the issue of developing schoolchildrens' interest in research activities in astronomy, professional orientation of students, and systematic preparation for Olympiads in the subject. It was shown that the task of astronomy, like any natural science subject studied in primary school or at the basic level in high school, is the formation of natural science literacy. Increasing the basic level of astronomical literacy is necessary for the full life of each person in modern society, adequate perception of heterogeneous information in modern information flows, the formation of skills in using natural science and physical and mathematical knowledge for object analysis of the structure of the surrounding world using the example of the achievements of modern astrophysics, astronomy and cosmonautics.

Keywords: Astronomers and cosmonautics, astronomical literacy, formation.

Introduction

The main goal of teaching and studying astronomy is to develop in schoolchildren's a holistic natural-scientific worldview, an understanding of cause-and-effect relationships, and processes occurring in nature. The study of astronomy at the basic level of secondary general education is aimed at achieving the following goals:

- understanding the role of astronomy for the development of civilization, the space activities of humanity, and the characteristics of scientific knowledge methods in astronomy;
- explanation of the causes of observed astronomical phenomena;
- developing an interest in the study of astronomy and ideas about possible areas of future professional activity related to astronomy.
- awareness of the fundamental role of astronomy in understanding the fundamental laws of nature and forming a scientific picture of the world;
- acquisition of knowledge about the physical nature of celestial bodies and systems, the structure and evolution of the Universe, the spatial and temporal scales of the Universe, the most important astronomical discoveries that determined the development of science and technology;
- mastering the skills of explaining the apparent position and movement of celestial bodies, the principles of determining location and time using astronomical objects, and the skills of practical use of computer applications to determine the appearance of the starry sky at a specific point for a given time;



➤ development of cognitive interests, intellectual and creative abilities in the process of acquiring knowledge in astronomy using various sources of information and modern information technologies.

The task of astronomy, like any natural science subject studied in primary school or at the basic level in high school, is to develop natural science literacy. Increasing the basic level of astronomical literacy is necessary for the full life of each person in modern society, adequate perception of heterogeneous information in modern information flows, the formation of skills in using natural science and physical and mathematical knowledge for the objective analysis of the structure of the surrounding world using the example of the achievements of modern astrophysics, astronomy and astronautics. Successful mastering of astronomy is possible only if interdisciplinary connections are implemented, since the subject "Astronomy" is a generalizing subject for natural science subjects (physics, chemistry, biology) and physical geography.

1. Methodology for increasing the basic level of astronomical literacy students.

The astronomy course should implement the ideas of interdisciplinary integration and interdisciplinary connection technologies :

- mathematics (use of approximate calculation techniques, replacement of trigonometric functions of small angles with the values of the angles themselves, logarithms, etc.);
- chemistry (discovery of new chemical elements in the atmosphere of stars, development of spectral methods, chemical properties of gases that make up celestial bodies, discovery of molecules containing up to 9 atoms in interstellar matter, existence of complex organic compounds);
- biology and ecology (hypotheses of the origin of life; adaptability and evolution of living organisms; pollution of the surrounding space with matter and radiation);
- history (the emergence of scientific knowledge and its influence on the development of society);
- geography (the nature of clouds on Earth and other planets, tides in the ocean, atmosphere and solid crust of the Earth, evaporation of water from the ocean surface under the influence of solar radiation, uneven heating of different parts of the surface by the Sun, creating the circulation of atmospheric currents) taking into account the above, it is possible to conduct integrated lessons on the specified subject.

Astronomical knowledge is necessary for the formation of a scientific worldview of schoolchildren. The study of astronomy contributes to the formation of a kind of immunity to various false theories, predictions, the development of a critical attitude to unreliable information, leaving no room for superstition and pseudoscience. It is necessary to note the change in the content of the astronomy course: the share of material on celestial mechanics and astrometry has been reduced, the number of topics devoted to astrophysics and cosmology has been increased. New scientific information has been introduced into the program, such as: gravitational waves, brown dwarfs, dark matter and dark energy. A special place in the program is occupied by the use of computer applications for determining the position of stars, the Moon, the Sun for any locality. The following forms of practical activity can be used in the educational process in astronomy: astronomical observations, practical work. Practical work connects the



theoretical material studied in astronomy lessons with the practical use of this knowledge. To conduct practical work within the framework of the traditional classroom-lesson form and to organize the implementation of practical work based on astronomical observations in the form of homework, it is recommended to use methodological and teaching aids that are an integral part of the educational and methodological complexes approved for use in the educational process.

For example, the Astronomy 10-11 teaching and methodological kit from the Spheres series includes a practical workbook. By completing the practical workbook, students will be able to apply the theoretical knowledge they have acquired in class in practice: conduct research on real astronomical objects and phenomena, analyze the results, and draw conclusions. Each practical workbook contains additional information needed to complete the assignments. At the same time, the theoretical material does not repeat the content of the textbook, but supplements and expands it. Completing the practical workbook contributes to the successful mastery of the astronomy course. The number of practical works on the Astronomy subject should correspond to the approximate basic educational program of secondary general education or the author's program, on the basis of which the teacher creates his or her work program.

As part of the implementation of the practical part of the program, it is recommended to systematically form in the lessons the skills of students aimed at understanding the astronomical phenomena observed in everyday life: the ability to find a number of constellations and bright stars in the sky; explain a number of astronomical phenomena; separate astronomy from astrology. Particular attention should be paid to astronomical observations. Moreover, astronomical observations are divided into *educational*, which are carried out as part of class activities, and *scientific research*, which it is advisable to carry out as part of extracurricular activities on the subject. The purpose and objectives of educational observations are to teach the methodology for their implementation, to instill skills in working with optical instruments, with reference literature, with atlases and maps and to prepare students for conducting scientific research observations. General educational observations should be repeated over time, since during the school year the appearance of the starry sky changes, visibility conditions and the location of the planets against the background of the constellations change, and the phases of the Moon change. General educational observations can be a vivid illustration of theoretical classes.

An approximate list of educational observations carried out during the study of the astronomy course.

Naked eye observations:

The main constellations and the brightest stars of the autumn, winter and spring sky, and their changes in position over time.

- The movement of the Moon and the change of its phases.
- Observations through a telescope:
- Relief of the Moon.
- Phases of Venus.
- Mars.

- Jupiter and its satellites.
- Saturn, its rings and satellites.
- Sunspots (on screen).
- Double stars.
- Star clusters (Pleiades, Hyades).
- Great Orion Nebula.
- Andromeda Nebula.

When organizing educational observations, students are given specific tasks: what and how to observe, while the actions are regulated by the corresponding instructions for conducting these observations. In the process of educational observations, students learn not only the methodology for conducting them, but also the rules for recording the results obtained, and processing methods. They develop regulatory universal educational actions (goal setting, control, correction, assessment, self-regulation). Let us note the distinctive features of an astronomy lesson.

The astronomy course is quite extensive in content, but compact in terms of study time - only 35 hours (1 hour per week). In this regard, almost every astronomy lesson involves studying new material, while it is also necessary to consolidate and control students' knowledge, perform practical and laboratory work. *A combined lesson satisfies such tasks best*. The purpose of such a lesson is to master new knowledge and methods of activity for schoolchildrens, improve knowledge, skills and abilities and apply them to solve various problems, generalize and systematize knowledge. A combined lesson should include the following stages of educational activity: studying new material, consolidation, primary control of knowledge, their correction, summing up, reflection, differentiation of homework.

The calendar-thematic plan for astronomy is a mandatory document of the teacher. The calendar-thematic plan must include the following elements: lesson number, lesson topic, number of hours, date of the lesson (plan, fact). The teacher has the right to include other additional sections in accordance with the specifics of the subject.

2. Organization of extracurricular activities in astronomy

In order to motivate students in grades 11 to study astronomy, develop skills in astronomical research and the basics of project activities, and provide a study of individual aspects of the content of the Astronomy subject program, it is recommended to organize extracurricular activities in the following forms: excursions, clubs, sections, round tables, debates, Olympiads, competitions, search and scientific research, etc. When conducting extracurricular activities on the subject, it is possible to make homemade universal angle measuring instruments, refractors with a darkened screen for sketching the Sun, and other astronomical instruments. Homemade angle measuring devices can be used when conducting the following practical work:

- measuring the height of ground structures and angular distances between them;
- measurement of angular distances between stars and the sizes of constellation figures in angular measure;
- measuring angular distances from the Moon and planets to neighboring stars to determine the magnitude and direction of movement against the background of the starry sky;



- determination of the altitude of the Moon and planets at different times of day and on different days at the same hour;
- measuring the altitude of the North Star to determine the latitude of the observation point, and others.

Conclusion

Extracurricular activities at the Youth Astronomy Club "Zvezda" provide for the formation of interest in scientific research activities in astronomy, professional orientation of school childrens, and systematic preparation for subject Olympiads. Materials for the organization of additional education for children to help the astronomy teacher prepare for Olympiads and conduct astronomical observations can be found on the website in the "Distance Education Center" section.

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