DEVELOPMENT OF A SCIENTIFIC WORLDVIEW IN THE TEACHING OF THE TOPIC "THE SUN AND ITS PHYSICAL NATURE"

J.Akimova – *candidate of physical and mathematical sciences, associate professor*
A.Otarbaev – *asisstent teasher*
Nukus state pedagogical institute named after Ajiniyaz

Tayanch so‘zlar: ilmiy ta’lim, ilmiy dunyoqarash, quyosh, jismoniy tabiat, o‘qitish usullari, so‘rovga asoslangan ta’lim.
Ключевые слова: научное образование, научное мировоззрение, солнце, физическая природа, методы обучения, обучение, основанное на исследовании.
Key words: science education, scientific worldview, sun, physical nature, teaching methods, inquiry-based learning.

The sun, our nearest star, holds a central position in both our solar system and our understanding of the universe. Its study not only unveils the secrets of celestial mechanics but also serves as a gateway to fostering a scientific worldview among students. In this article, we delve into the significance of teaching "The Sun and its Physical Nature" as a means to develop critical thinking skills, promote evidence-based reasoning, and nurture a deep-seated curiosity about the natural world [1:5-7].

A review of existing literature reveals the pivotal role of science education in shaping students' perceptions of the world around them. Studies indicate that traditional lecture-based approaches often fail to engage students fully or foster genuine comprehension of scientific concepts. Instead, pedagogical methods emphasizing inquiry-based learning, hands-on experimentation, and collaborative problem-solving have shown promising results in promoting scientific literacy and cultivating a scientific mindset.

Incorporating inquiry-based learning strategies into the teaching of "The Sun and its Physical Nature" can significantly enhance students' learning experiences. By encouraging active exploration and experimentation, educators can guide students to ask questions, formulate hypotheses, and analyze data independently. Utilizing multimedia resources, such as simulations and interactive models, further enriches the learning process by providing dynamic visualizations of solar phenomena [2:15].

Developing a scientific worldview in the teaching of "The Sun and its physical nature" involves fostering an understanding of scientific principles, critical thinking skills, and an appreciation for evidence-based reasoning. Here's a suggested approach:

- Introduction to Scientific Method: Start by introducing students to the scientific method and how it applies to studying celestial objects like the Sun. Emphasize the importance of observation, hypothesis formation, experimentation, and data analysis.

Dive into the fascinating realm of the scientific method and how it pertains to studying celestial objects, such as the Sun. The scientific method is like a roadmap that scientists use to investigate the mysteries of the universe in a systematic and rigorous manner. Whether they're exploring the depths of the ocean or peering into the vastness of space, scientists rely on this method to guide their inquiries.

First and foremost, the scientific method begins with observation. Scientists carefully observe natural phenomena, noting patterns, behaviors, and anomalies. In the case of studying the Sun, astronomers observe its movements, its interactions with other celestial bodies, and the various phenomena that occur on its surface, such as sunspots and solar flares [3:165].

Once observations are made, scientists formulate hypotheses to explain these observations. A hypothesis is essentially an educated guess based on existing knowledge and observations. For example, a scientist studying the Sun might hypothesize that sunspots are caused by magnetic activity beneath the Sun's surface.

- Historical Context: Provide a brief overview of how our understanding of the Sun has evolved over time, from ancient civilizations' views to modern scientific theories. Highlight key figures and discoveries that have shaped our current understanding.
- Core Concepts: Break down the fundamental concepts related to the Sun's physical nature, such as nuclear fusion, electromagnetic radiation, solar flares, sunspots, and the solar cycle. Use visual aids, simulations, and hands-on activities to help students grasp these concepts.

Let's break down these fundamental concepts related to the Sun's physical nature one by one, and I'll suggest some visual aids, simulations, and hands-on activities for each:

Nuclear Fusion:

- Concept: Nuclear fusion is the process where two atomic nuclei combine to form a heavier nucleus, releasing a tremendous amount of energy in the process.
- Visual Aid: Diagrams showing the fusion process in the Sun's core.
- Simulation: Online simulations demonstrating nuclear fusion reactions and their energy release.
- Hands-On Activity: Model building using small magnets to represent atomic nuclei coming together to form a heavier nucleus.

Electromagnetic Radiation:

- Concept: Electromagnetic radiation is energy that travels through space in the form of waves or particles. The Sun emits electromagnetic radiation across a wide spectrum, including visible light, ultraviolet light, and infrared radiation.
- Visual Aid: Spectrum charts showing the different types of electromagnetic radiation emitted by the Sun.
- Simulation: Interactive simulations demonstrating how different wavelengths of electromagnetic radiation behave.
- Hands-On Activity: Using prisms to split sunlight into its constituent colors to observe the visible spectrum.

Solar Flares:

- Concept: Solar flares are sudden, intense bursts of energy and radiation emitted from the Sun's surface. They are often associated with the release of magnetic energy stored in the Sun's atmosphere.
- Visual Aid: Videos or animations showing solar flares erupting from the Sun's surface.
- Simulation: Simulations depicting the magnetic processes leading to solar flare formation.
- Hands-On Activity: Building a simple electromagnet model to understand how magnetic fields interact and can release energy.

Sunspots:

- Concept: Sunspots are areas on the Sun's surface that appear darker than surrounding regions due to magnetic activity inhibiting convection. They are cooler than their surroundings but still incredibly hot.
- Visual Aid: Images of the Sun showing sunspots and their magnetic structures.
- Simulation: Simulations illustrating the formation and movement of sunspots over the Sun's surface.
- Hands-On Activity: Creating models of sunspots using thermochromic materials that change color with temperature.

Solar Cycle:

- Concept: The solar cycle is the periodic variation in the Sun's activity over an approximately 11-year cycle. It involves changes in the number of sunspots, solar flares, and other solar phenomena.
- Visual Aid: Graphs or diagrams showing the solar cycle and its various phases.

- Simulation: Interactive simulations demonstrating the progression of the solar cycle and its impact on solar activity.

- Hands-On Activity: Constructing a timeline of the solar cycle using images of the Sun taken over several years, marking periods of high and low activity.

By incorporating these visual aids, simulations, and hands-on activities, students can gain a deeper understanding of the Sun's physical nature and the various phenomena associated with it [4:9].

- Interdisciplinary Connections: Explore the interdisciplinary nature of solar science, connecting concepts from physics, chemistry, astronomy, and even biology (regarding the Sun's influence on life on Earth). This can help students appreciate how different fields of science contribute to our understanding of the Sun.
- Evidence-Based Learning: Encourage students to critically evaluate evidence supporting various theories about the Sun. Discuss how scientists use observations, experiments, and mathematical models to test hypotheses and refine our understanding of solar phenomena.
- Current Research: Introduce students to ongoing research in solar physics and recent discoveries about the Sun. This can include topics like solar weather, space weather's impact on technology and society, and efforts to understand the Sun's role in the broader context of the universe.
- Hands-On Exploration: Provide opportunities for students to engage in hands-on activities, such as building solar models, analyzing solar data from telescopes, or conducting simple experiments related to solar phenomena. This can help reinforce theoretical concepts and develop practical skills.
- Critical Thinking and Problem-Solving: Encourage students to think critically about the information presented, ask questions, and propose their own hypotheses about the Sun's physical nature. Foster a classroom environment where curiosity is encouraged, and students feel empowered to explore scientific ideas independently.
- Ethical and Societal Implications: Discuss the ethical and societal implications of solar research, such as environmental concerns, space exploration, and the potential for solar energy as a renewable resource. Encourage students to consider how scientific knowledge about the Sun can be applied to address real-world challenges [5:116].

By incorporating these elements into the teaching of "The Sun and its physical nature," educators can help students develop a scientific worldview characterized by curiosity, critical thinking, and an appreciation for the wonders of the natural world.

The integration of inquiry-based learning strategies into the teaching of "The Sun and its Physical Nature" offers numerous benefits beyond mere knowledge acquisition. By actively engaging students in the scientific process, educators empower them to think critically, evaluate evidence, and construct coherent explanations based on observable phenomena. Moreover, fostering a scientific worldview encourages students to approach complex issues with skepticism, curiosity, and a commitment to evidence-based reasoning [6:141].

Conclusions and Suggestions:

In conclusion, the teaching of "The Sun and its Physical Nature" provides a unique opportunity to cultivate a scientific worldview among students. By adopting inquiry-based learning strategies and leveraging multimedia resources, educators can inspire curiosity, promote critical thinking, and foster a lifelong appreciation for scientific inquiry. Moving forward, continued research and collaboration are essential to refining teaching methods and ensuring that all students have access to high-quality science education.

In light of these findings, educators are encouraged to prioritize active learning approaches and incorporate interdisciplinary connections to enhance students' understanding of the sun and its role in the broader context of astronomy and astrophysics. Additionally, ongoing professional development opportunities for educators can further support the implementation of effective teaching strategies and promote continuous improvement in science education.

By embracing innovative pedagogical methods and nurturing a spirit of scientific inquiry, educators can empower the next generation to explore the mysteries of the cosmos and contribute meaningfully to our collective understanding of the universe.

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REZYUME. Ushbu maqolada "Quyosh va uning fizik tabiati" mavzusini o’rgatish orqali talabalar o’rtasida ilmiy dunyoqarashni shakllantirishning ahamiyati ko’rib chiqiladi. Unda o’quvchilarning quyosh hodisalari haqidagi tushunchalarini chuqurlashtirish uchun tadqiqotga asoslangan o’rganish, tanqidiy fikrlash va amaliy tajribalarni birlashtirish muhimligi muhokama qilinadi. Mavjud adabiyotlarni, samarali o’qitish usullarini va ushbu usullarni qo’llash natijalarini tahlil qilib, ushbu maqola ma’lumotli shaxslar va bo’lajak olimlarni shakllantirishda ilmiy ta’limning muhim rolini ta’kidlaydi.

РЕЗЮМЕ. В этой статье рассматривается важность формирования научного мировоззрения у студентов посредством преподавания темы "Солнце и его физическая природа". В ней обсуждается важность интеграции обучения, основанного на исследовании, критического мышления и практических экспериментов, для углубления понимания учащимися солнечных явлений. Анализируя существующую литературу, методы эффективного преподавания и результаты применения этих методов, в этой статье подчеркивается важная роль научного образования в формировании информированных граждан и будущих ученых.

SUMMARY. This article explores the importance of cultivating a scientific worldview in students through the teaching of the topic "The Sun and its Physical Nature". It discusses the significance of integrating inquiry-based learning, critical thinking, and hands-on experimentation to deepen students' understanding of solar phenomena. By analyzing existing literature, methods for effective teaching, and the results of implementing these methods, this article highlights the essential role of science education in shaping informed citizens and future scientists.