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USING THE THOUGHTS OF CENTRAL ASIAN THINKERS IN TEACHING THE TOPIC OF "SOUND AND LIGHT PHENOMENA" IN PHYSICS

Sattorova Dilshoda Yuldashevna
Kokand State University, Lecturer,
Department of Physics and Astronomy
sattorovadilshoda1978@gmail.com

Abstract. The article highlights the possibilities of effective use of scientific views of Central Asian thinkers in teaching the topic of "Sound and Light Phenomena" in physics. The views of such great scientists as Ibn Sina, Al-Beruni on sound and light phenomena are analyzed, and the didactic significance of their use in the modern educational process is shown.
Key words: physical education, sound education, world education, thinkers of the Middle Ages, Ibn Sina, Al-Beruni, historical and consequential approach, scientific approach, integrated education, didactic approach.

Аннотация. В статье освещаются возможности эффективного использования научных взглядов мыслителей Центральной Азии при преподавании темы «Звуковые и световые явления» в физике. Анализируются взгляды таких великих ученых, как Ибн Сина, Аль-Беруни на звуковые и световые явления, а также показывается дидактическая значимость их использования в современном образовательном процессе.

Ключевые слова: физическое образование, звуковое явление, световое явление, мыслители Средней Азии, Ибн Сина, Аль-Беруни, историко-наследственный подход, научные взгляды, интегрированное образование, дидактический подход.

Annotatsiya. Ushbu maqolada fizika fanining “Tovush va yorug‘lik hodisalari” mavzusini o‘qitishda O‘rta Osiyo mutafakkirlarining ilmiy qarashlaridan samarali foydalanish imkoniyatlari yoritilgan. Ibn Sino, Al-Beruniy kabi buyuk allomalar tomonidan tovush va yorug‘lik hodisalari yuzasidan bildirilgan fikrlar tahlil qilinib, ularni zamonaviy ta’lim jarayonida qo‘llashning didaktik ahamiyati ko‘rsatib berilgan.
Kalit so‘zlar: fizika ta’limi, tovush hodisasi, yorug‘lik hodisasi, O‘rta Osiyo mutafakkirlari, Ibn Sino, Al-Beruniy, tarixiy-merosiy yondashuv, ilmiy qarashlar, integratsiyalashgan ta’lim, didaktik yondashuv.

As we know, education is closely tied to upbringing. A teacher must not only provide education but also instill proper moral values in students. Based on the content of the topic, special attention should be paid to the educational goals of the lesson. Specifically, as physics explores natural phenomena and the rules governing them, the teacher should educate students about protecting nature during the lesson explanation process.

Basic knowledge of science begins in the 6th grade of general education schools. From this point onward, when explaining the concept of sound phenomena, the teacher should also speak about sound and sound waves, as well as the works of our great ancestor Abu Nasr Farabi, the founder of music theory.

Farabi (known as the 'Second Teacher' after Aristotle) defined sound as follows: 'When we speak, our tongue vibrates. This vibration causes the air to vibrate, and the air vibrations, in turn, make the

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eardrums vibrate. As a result, we hear and sense the sound through our auditory organs.' Farabi also noted that the speed of sound waves differs in different environments, identified the frequency of sound waves, and calculated the wavelength of sound. He also invented musical notes and instruments.

Ibn Sina explained sound phenomena in the following way: 'Regarding hearing, undoubtedly no object can produce sound by itself. Sound is heard only through the ear. When two objects collide, the air moves and creates vibrations that generate sound. Sound waves spread very quickly. When air vibrations pass through objects with force, they spread even faster. Once they reach the ear, they affect the auditory nerves.'

In his book 'Monuments from Ancient Peoples' (written when he was about 25–26 years old), Al-Biruni described these issues as follows:

Much has been said about sunlight. Some believed that sunlight consists of fire-like particles emitted by the sun itself, while others thought that objects heat up when exposed to the sun just like air heats up when facing fire.

Al-Biruni's thoughts on the nature of light are especially noteworthy. He stated: 'The body (particles) of the sun and its rays are among the primary causes of temperature (heat) on Earth.'

Al-Biruni asked Ibn Sina the following question: 'If heat (light) spreads from a center, then why does light reach us from the sun? Is light a substance?'

Ibn Sina rejected the idea that heat (light) spreads from a center and supported Aristotle's theory about sunlight.

Al-Biruni advocated for the central role of the sun in emitting light and referred to geometric theories.

Al-Biruni explained the causes of solar and lunar eclipses as follows: 'The lunar eclipse occurs when the moon enters the Earth’s shadow. A solar eclipse happens when the moon moves between the sun and the Earth, blocking the sunlight from reaching us.'

Another question Al-Biruni asked Ibn Sina: 'If a clear glass sphere is filled with transparent water, it can concentrate sunlight and burn objects like a magnifying lens. But if the sphere is emptied and filled with air instead, it no longer burns or focuses the sun's rays. Why is this so? How does the water-filled glass sphere concentrate sunlight and generate heat?'

Ibn Sina answered: 'Certainly, water is a dense, heavy, and clear substance that contains color in its essence. Light is reflected (refracted) in such materials. That’s why light refracts in a water-filled glass sphere, concentrating the rays to create heat. However, light does not refract as strongly in air because air is thin and clear. If the glass sphere is filled with air, strong refraction does not occur, and sunlight does not concentrate as effectively.'

Al-Biruni also asked Ibn Sina about the nature of sight and visibility: 'How do we perceive things through vision? Why can we see objects beneath clear water?'

Answer: 'According to Aristotle, vision is not caused by light emitted from the eye, as Plato believed. When combining Aristotle’s and Plato’s views, there is no real contradiction. Ibn Sina explained vision as follows: light rays coming from objects enter the eye, pass through the eye’s lens, and are refracted, forming an image on the retina, which results in visual perception.'

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In conclusion, the use of the scientific heritage of Central Asian thinkers in teaching the topic of "Sound and Light Phenomena" in physics not only enriches the content of the lesson, but also helps students form historical and philosophical thinking, deeply understand the interrelationships between disciplines, and instill a sense of appreciation for national identity. If the ideas and observations put forward by such great scholars as Ibn Sina, Al-Beruni, and Al-Farghani are interpreted in harmony with today's modern scientific knowledge, the effectiveness of physics education will increase. Also, such an approach serves to develop independent thinking, interest, and analytical thinking in students. Therefore, the development of teaching methods in physics lessons based on historical sources and the views of thinkers is of important scientific and practical importance.

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