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FORMING STUDENTS' CONCEPTS ABOUT WATER WHEN TEACHING PHYSICS SUBJECTS

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Abstract: This article examines effective methods for developing students' scientific understanding of water while teaching relevant topics in physics. The article demonstrates ways to increase students' interest in and understanding of science by explaining topics such as the physical properties of water—density, pressure, surface tension, changes in state, and heat capacity – to students using real-life examples. The article emphasizes the need to reinforce concepts through experiential learning, observation, and problem solving. It also discusses the possibilities of developing students' environmental awareness by highlighting environmental issues related to water.
Keywords: physics education, physical properties of water, water pressure, surface tension, heat capacity, didactic approach, practical exercises, environmental education, concept formation, problem-based learning

Аннотация. В статье анализируются эффективные методы формирования научных представлений о воде у учащихся в ходе преподавания соответствующих тем по физике. В статье показаны способы повышения интереса учащихся к науке и понимания путем объяснения таких тем, как физические свойства воды — плотность, давление, поверхностное натяжение, изменения состояния и теплоемкость — учащимся на примерах из реальной жизни. В статье подчеркивается необходимость закрепления понятий посредством экспериментального обучения, наблюдения и решения проблем. Также в ней рассматриваются возможности формирования экологической культуры у учащихся путем выделения экологических проблем, связанных с водой.
Ключевые слова: физическое образование, физические свойства воды, давление воды, поверхностное натяжение, теплоемкость, дидактический подход, практические занятия, экологическое образование, формирование понятий, проблемное обучение.

Annotatsiya. Ushbu maqolada fizika fanidagi tegishli mavzularni o‘qitish jarayonida o‘quvchilarda suvga oid ilmiy tushunchalarni shakllantirishning samarali usullari tahlil qilingan. Suvning fizik xossalari — zichlik, bosim, sirt tarangligi, holat o‘zgarishlari, issiqlik sig‘imi kabi mavzularni o‘quvchilarga hayotiy misollar asosida tushuntirish orqali ularning fanga bo‘lgan qiziqishi va tushunish darajasini oshirish yo‘llari ko‘rsatilgan. Maqolada tajriba asosida o‘qitish, kuzatuv va muammoli vaziyatlar yaratish orqali tushunchalarni mustahkamlashga urg‘u berilgan. Shuningdek, suv bilan bog‘liq atrof-muhit muammolarini yoritish orqali o‘quvchilarda ekologik madaniyatni shakllantirish imkoniyatlari ham ko‘rib chiqilgan.
Kalit so‘zlar: fizika ta’limi, suvning fizik xossalari, suv bosimi, sirt tarangligi, issiqlik sig‘imi, didaktik yondashuv, amaliy mashg‘ulotlar, ekologik tarbiya, tushuncha shakllantirish, muammoli ta’lim.

The main goal of environmental protection education in schools is to develop students' proper understanding of nature, cultivate a conscious attitude toward it, encourage rational use of natural

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resources, protect and preserve nature, and raise future generations with a mindset of maintaining the natural environment.

To address this issue, students need to form correct perceptions of natural resources such as land, water, and air, as well as the phenomena that occur as a result of their interactions.

Basic scientific knowledge begins in the 6th grade of general education schools. From that stage onward, teachers should instill a sense of environmental responsibility in students. While explaining certain topics in the 6th-grade physics curriculum, the following ideas can be used to expand students' understanding of water.

“MOLECULES AND THEIR DIMENSIONS.” Water is a compound of hydrogen and oxygen atoms, expressed by the formula H_2O. Water is a divine blessing. It brings nature to life, initiates growth, and energizes the environment. Water comprises about 70–72% of Earth’s surface and the human body. The Earth breathes through water; it also experiences growth and development. In the mother's womb, the fetus develops in 97% water. In the hydrosphere, 97% of water is salty, and only 3% is fresh. Of this 3%, 2% is ice and 1% is drinkable fresh water. This 1% is the rarest mineral on Earth, and there is no substitute for it. Don’t waste it. Don’t throw garbage into canals.

While teaching the topic “ARCHIMEDES’ PRINCIPLE AND ITS APPLICATIONS,” the following ideas can help students deepen their understanding of water.

Today, water scarcity is becoming a pressing issue. One reason is pollution caused by humans. Water transport is one of the major contributors. Ships navigating seas and oceans release waste into the water. Sometimes, oil tankers are involved in accidents, spilling large quantities of oil. As a result, the surface of the water is covered with oil, disrupting physical processes between water and air, reducing oxygen levels, and leading to the death of marine life.

In the topic “WORK AND ENERGY. TYPES OF ENERGY. POWER,” we learn that dams are constructed on rivers. Water stored at a certain height has potential energy, which can be converted into electrical energy. This energy powers various sectors of the economy. The construction of reservoirs alters the local environment: humidity increases, wind directions shift, temperature drops, meadows grow, and recreational conditions improve. Reservoirs bring significant economic benefits: irrigation of new lands, fish farming, improved water transport, and energy generation. The environment becomes greener, and the climate changes. Recreational facilities are built.

However, reservoirs also have drawbacks. They negatively affect the environment, flood large areas, submerge settlements, forests, and other resources, and block the migration routes of spawning fish. Shores may erode and collapse. Reservoirs built in seismic zones are particularly dangerous to human life and activity. An earthquake could cause a dam to break, leading to widespread flooding and destruction. Therefore, precautionary measures must be taken when building reservoirs. If possible, natural dams should be used.

In the topic “MOLECULAR STRUCTURE OF SOLIDS, LIQUIDS, AND GASES,” the following concepts can be used to broaden students’ understanding of water.

Water is the only substance in nature that simultaneously exists in all three states: solid, liquid, and vapor. Water evaporates from the surface of oceans, seas, lakes, rivers, and plants, and rises into the atmosphere. As it ascends, it cools and forms dew, fog, and in the lower layers of the troposphere,

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clouds. These clouds produce snow, hail, or rain, which helps cleanse the atmosphere of toxic substances.

In winter, rivers and lakes freeze; in spring, snow and ice melt. This natural process supports the life cycle of organisms. However, human activity can disrupt this balance. An increase in temperature in certain areas can accelerate melting, causing floods that inflict severe damage. Sometimes, an abnormal rise in temperature causes plants to bloom early, and a subsequent cold snap destroys them.

Water, in all its states—solid, liquid, and vapor—performs vital functions: shaping the landscape, transporting rocks to lowlands, and delivering dissolved nutrients to plant roots. If water carries toxic substances along its path, it can poison various organisms. Therefore, water must be kept clean. No waste or harmful substances should be dumped into it.

The formation of concepts related to water in the process of teaching physics is important for developing students' scientific outlook and conscious attitude to the environment. Teaching the physical properties of water - such as pressure, density, surface tension, heat capacity - based on real-life examples, practical experiments and visual materials, forms students' deep understanding of the topic, thinking and application skills. In addition, by discussing environmental problems related to water, it is possible to develop a sense of responsibility towards nature, ecological culture and social activity in students. Therefore, the use of integrated and problem-based approaches in teaching water-related topics in physics lessons gives effective results.

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