DEVELOPING STUDENTS' NATURAL SCIENCE LITERACY THROUGH THE PISA INTERNATIONAL ASSESSMENT PROGRAM

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Annotation: This article focuses on the development of students' natural literacy based on PISA assignments. Samples from PISA assignments are provided.

Keywords: PISA assignments, natural science literacy, context, competence, literacy model.

It is known that in accordance with the agreement signed between the State Inspectorate for Quality Control in Education and the OECD and IEA, Uzbekistan has started to participate in the International Student Assessment PISA-2022 (formerly PISA-2021). The Republic of Uzbekistan is set to become one of the top 30 developed countries in the world by 2030 in the ranking of the international PISA program. The PISA International Assessment Program aims to assess the reading, math, and science literacy levels of students over the age of 15.

Natural literacy plays an important role in a person's life. Literacy in the natural sciences means that an individual knows the ideas of the natural sciences and, as an active citizen, is able to solve problems related to the natural sciences. A person who is literate in the natural sciences can participate in the discussion of problems related to the natural sciences and technology on the basis of scientific evidence, that is, he can independently solve tasks that reflect the problems of life. This type of assignment is called the context on which the PISA assignment is based. Contexts come in three levels: personal, local, national, and global[1].

A person who is literate in the natural sciences has the following competencies[2].

Competence in the scientific explanation of phenomena - knowledge, suggestion and evaluation of technologies, explanations of natural phenomena and processes; *Competence in designing and evaluating scientific research* - to describe and evaluate scientific research and to suggest ways to solve problems on a scientific basis;

Competence in the scientific interpretation of data and evidence - the ability to analyze and evaluate various types of scientific data, evidence, and draw appropriate conclusions.

Demonstration of students' natural science literacy competencies in natural sciences depends on three types of scientific knowledge[3].

Types of scientific knowledge include:

- knowledge of physical systems (physics and chemistry), living systems (biology), earth and space systems (geography, geology, astronomy), i.e. *knowledge of the content* of science;
- *methodological knowledge* of the various methods used to obtain scientific information (knowledge), as well as standard research processes;
- *epistemic knowledge* is the result of our understanding of the possibilities of scientific research methods, as well as the essence of concepts such as hypothesis, hypothesis observation.

It should be noted that PISA assignments are structured in such a way that they do not necessarily correspond to a specific discipline or topic.

However, in some cases it may or may not be relevant to a particular subject. It is important to activate the basic knowledge of a particular task while studying them.

Based on the natural science literacy model and competencies, the following are some PISA assignments:

[1] U.N.Tashkenbayeva "Bulletin for preparing students for international research" Tashkent, 2020, p. 65

[2] U.N.Tashkenbayeva "Bulletin 1 for preparing students for international research" Tashkent, 2020, p. 64

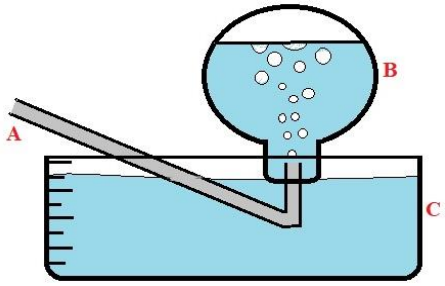
[3] U.N.Tashkenbayeva "Bulletin for preparing students for international research" Tashkent, 2020, p. 65

Task 1.

Some chemical reactions release gas. Chemists had to determine the amount of gas released under normal conditions.

Question. Suggest a device that chemists can use to determine the amount of gas.

The answer to the question. One of the device options is shown in Figure 1. The gas passes through tube **A** to vessel **B**, which is filled with a liquid that does not mix with the gas and overturned on an open vessel **C**, which is divided into degrees. The gas **B** fills the vessel and pushes the water into vessel **C**. The volume of gas can be determined by changing the water level in the tank.



Picture 1.

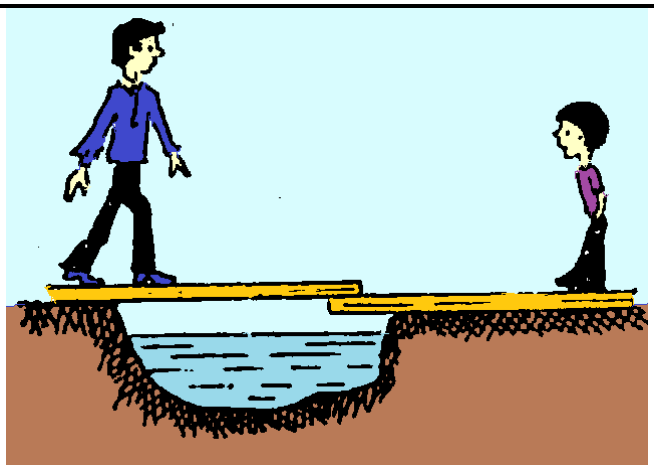
Task 2.

In the villages of Kashkadarya region, there are many overflowing streams. Bridges were built across these rivers to cross this side.

However, bridges are mostly built where people need them most. In some areas, no bridges have been built over the rivers. In one of these streams, Uncle Botir and his grandson's classmate Zokir have to cross from one bank of the river to the other every day, one from the left bank to the right bank and the other from the right bank to the left bank. There is one plank on each bank of the canal, but the length of the planks is less than the distance between the banks. Uncle Botir and Zokir move from one bank of the river to the other every day.

Question. Explain how they move from one side of the river to the other every day.

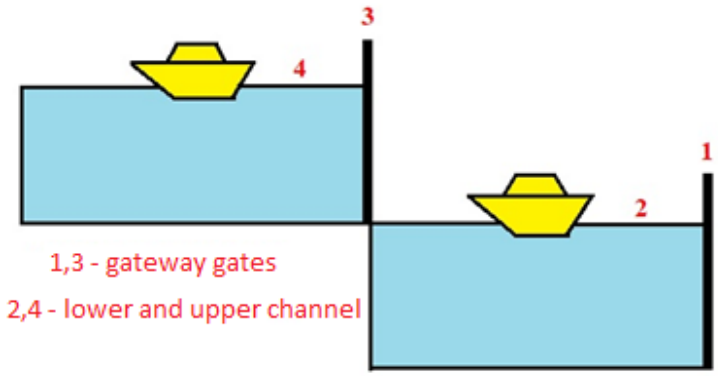
Answer. The fact is that Uncle Botir and Zakir put the two boards in the position shown in the picture. After that, Zakir stands on one end of the boards and Uncle Botir passes. In the same way, Uncle Botir presses one end of the board and Zakir passes. This process is studied in the department of statics in physics.



Picture 2.

Task 3.
A sluice is a hydraulic structure designed to move vessels from one water level to another in a river or canal. The sluice consists of a chamber separated by walls and gates

Question. One of the canals in Tajikistan has sluices: once the ship enters it, the sluice gate (1) closes, the pumps pump water into the sluice (2), raises the water level with the ship, and the ship passes through the second gate (3) to the top of the canal (4). If the surface of the water is 1500 m^2 and the mass of the ship is 5000 t, how much water (m^3) must be driven to lift it by 8 m?



Answer. The ship moved from position 1 to position 2. The sinking depth of the ship did not change, only the water level rose to a height *h*. This means that the volume of water released by the pumps to raise the water level to h is equal to $V = S \cdot h$. In this case, $V = 1500 \cdot 8\ m^3 = 12000\ m^3$.

It is important that teachers make extensive use of assignments such as the above to reinforce and review lessons. This is important for the development of students' natural literacy. In addition, the presentation of PISA assignments in extracurricular activities will increase students' interest in the basics of science.

In conclusion, PISA assignments develop students' ability to apply what they have learned. In other words, as a result of regular work on solving these tasks, students develop the ability to solve problems independently in difficult situations throughout their lives.

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