Water and its properties - simple experiments with water

1 Overall aims:

- developing ecological interests
- allowing children to observe water activities
- developing the ability to listen to and follow the teacher's instructions;
- developing observation and anticipation skills;
- developing teamwork skills
- enriching children's knowledge about the properties of water

2 Vocabulary - keywords

water, qualities of water (color, weight, density), molecule of water H2O, density, diffusion

3 Sustainable abilities developed

- Anticipatory competency
- Normative competency
- Collaboration competency
- Integrated problem solving competency

4 Pillars of sustainability included

- sociocultural

5 STEAM domains

S, A, M

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6 Teaching methodologies/activity outline

Introduction

Conversation: Where can we find water? The teacher writes down children's answers in one column

Verification of children's statements - watching the short movie: "Water not only in the tap" - educational animation of the Polish Humanitarian Organization (PAH): https://www.youtube.com/watch?v=AB0RFjndmWU

Teacher writes down the new observations in the second column.

Answering the question: What surprised you the most?

Main part

1. Conversation about water qualities: Each child receives a cup of water and observes:

- What it the color of water?
- What is the taste and smell?
- Who knows how the molecule of water is built?

2. Artistic representation of water molecule: Building a model of a water molecule. Presentation of the water molecule model and its joint analysis, combined with a conversation. Independent reproduction of the model (children make balls of blue and red plasticine and connect them with toothpicks).

3. Physical game: children receive gymnastic bags in two colors (red means oxygen, blue hydrogen). Children run freely and at a given sign (e.g. bell), they connect, creating a model of a water molecule - oxygen catches two hydrogens)

4. Experiment 1: Warm and Cold

Teacher prepares 3 bowls of water: one large bowl filled with water of average temperature at 19.3 and 2 small bowls: blue balloons are placed in a bowl with cold water (3.5 Celsius degrees) and red balloons filled with hot water are placed in a bowl with a temperature of 38.6 degrees). Children measure the temperature of all balloons using a non-contact thermometer:

- **Research problem:** what happens when we put hot and cold water balloons in a bowl of water?
- **Making hypotheses** by children
- **Verification - conducting experiment:** children put balloons in the water and observe: What happened? Why do cold water balloons sink to the bottom and hot water balloons float?

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- **Explanation for the teacher:** Water changes density depending on the temperature. So much so that cold water would not mix with hot water if placed carefully in one vessel. Molecules in hot water are energized and move faster. So when they bump into each other, they bounce further, leaving large gaps. This means that now the same volume of water has fewer molecules and weighs less. The opposite happens with cold water, which makes its density slightly higher.

5. Experiment 2: Ink diffusion in water

- Children pour cold water into one glass, and the teacher pours hot water into the other.
- **Research Question:** What happens when we pour ink into these glasses?
- **Making hypotheses** by children
- Verification: the children use a syringe to drop the same amount of ink into the cold and hot water. They observe the changes in the glasses and answer the question: What happened? Why does the ink disappear in warm water? Why the ink in the cold water did not disappear?
- **Introducing the concept of diffusion (explanation for the teacher):** The phenomenon of spreading one substance into another is called diffusion. In liquids, particles move at high speeds, constantly colliding with each other. Hence, the molecules of one liquid penetrate between the molecules of the other component. At higher temperatures, the liquid molecules move faster and therefore diffusion occurs much faster. Interestingly, the dye in the ink in hot water loses its color. Therefore, it seems that we have added less ink to the hot water. The color returns when the solution is cooled.

Summary

Conversation: What have we learned about water today: What properties does water have? Where can we find water? How can we save water?

7 Expected learning outcomes

The child will be able to:

- Follows the instructions of the experiment;
- Recognizes the properties of water;
- Observes and predicts the results of the experiment;
- Cooperates in small teams

8 Assessment

Children can name the properties of water, explain with their own words the concept of water density and diffusion

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9	**Equipment and materials to be used in learning unit (tools, ingredients etc)** Red and blue plasticine, toothpicks Large bowl with water (19.3 degrees Celsius), two smaller bowls of water, non-contact thermometer, red and blue balloons with hot water (38.6 degrees) and cold water (3.5 degrees). Two glasses for each group, hot and cold water, inks, syringes
10	**Kind of setting - lab, kitchen, outdoor etc.** Classroom or preschool garden
11	**References - source:** https://www.youtube.com/watch?v=AB0RFjndmWU https://www.youtube.com/watch?v=MnPPDaPaKEo https://www.youtube.com/watch?v=b0Z48JK7OkE
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