

How to take advantage of frost? - winter research games

1	Overall aims: <ul style="list-style-type: none"> • Expanding knowledge about the weather in winter (its properties); • Enriching knowledge about temperature measurement and how to record it; • Developing manual skills while conducting experiments; • Developing communication skills; • Creating opportunities to express emotions.
2	Vocabulary - keywords <ul style="list-style-type: none"> • Frost, freezing process, experiment, play, winter
3	Sustainable abilities developed <ul style="list-style-type: none"> • Anticipatory competency • Critical thinking competency • Self-awareness competency
4	Pillars of sustainability included <ul style="list-style-type: none"> • socio-cultural; • ecological
5	STEAM domains S, T, M, A



6

Teaching methodologies/activity outline

Introduction

Problem question:

- What does harsh winter mean?
- What does heavy frost mean?

Together with the children, the teacher explains the meaning of the phraseological relationships: "severe winter", "hard frost". He then informs the children that they will go to the preschool garden together to conduct two short experiments. They will not play in the garden for a long time due to the weather conditions - the occurrence of frost.

Main part - experiments

After going outside, the teacher draws the children's attention to the weather (frost):

- How is it outside? What are you feeling?
- What happens when we breathe? Try to breathe the air in front of you.

The teacher informs the children that today they will use these conditions (frost) to carry out two experiments.

Note for the teacher: if the frost is very high, the experiments can be carried out separately on consecutive days.

Experiment 1 - Boiling water in the cold

This interesting and spectacular experiment for children is carried out outdoors at temperatures below minus 10 degrees Celsius. Prepare cold water and boiling water, e.g., in a thermos flask.

Question:

How will cold and boiling water behave when we throw it, for example, from a cup upwards?

Children formulate hypotheses that try to justify. Then, with the help of an adult, the children throw up the cold water and watch what happens. Then, the adult "tosses" the boiling water upwards, and the children observe the reaction. Click the link below to see how to pour boiling water so you don't get burned:

<https://www.youtube.com/watch?v=9Hk30yoEZJg>

Children check their assumptions, discuss and formulate conclusions.

Conclusion: boiling water freezes instantly in the cold, creating amazing effects.



Explanation for the teacher: With a temperature difference of up to one hundred degrees Celsius, the spilled water leaves behind streaks that look like a cloud or falling snow. When the outside air temperature is low, the humidity of the air is also reduced. As a result, the air is very dry and retains little water vapor.

Pouring boiling water in the cold leads to the evaporation of broken water droplets, and in the end we can admire the phenomenal cloud of steam, smoke or falling snow. Under certain conditions, hot water freezes faster than cold water - this phenomenon is called the Mpemba effect.

Experiment 2 - Frozen soap bubbles

This experiment is performed outdoors with air temperatures below minus 10 degrees Celsius. Prepare a soap bubble liquid (warm water with washing-up liquid and a few drops of glycerin) or use ready-made liquid from the store.

Question:

What will happen to the bubbles if we make them on a plate on a frosty day?

Children formulate hypotheses that they try to justify. Then pour some liquid on the plate and leave it outside for about a minute, waiting for it to cool. After this time, the children use the straw to make bubbles on the plate and watch what is happening. The result of the experiment can be viewed here: <https://www.youtube.com/watch?v=M19ac5cUs2g>
Children check their assumptions, discuss and formulate conclusions.

Conclusion: a frost bubble freezes creating patterns on the walls.

Explanation:

When they come into contact with snow or ground, soap bubbles freeze within seconds. Ice paintings form on their walls.

Summary (after returning to kindergarten or in the afternoon):

Questions:

- How often can we afford such games in the cold?
- What's the weather like in winter?
- Does it often snow?

The teacher talks to the children, informs that we are dealing with warm winters now. What does it mean? He encourages children to "sentimental journey into the past" - conversations with older people (grandmother, grandfather) about what winter was like, when they were in preschool age. He asks the children to talk to representatives of the older generation about strange weather phenomena, anomalies, differences in weather between then and today.



	<p><u>Additional activity:</u> Offer the children daily temperature measurements at the same time (e.g. before morning schooling). Think about how long the temperature will be measured and how you will record its results.</p> <p>Note to the teacher - Before this suggestion, do the thermometer and measurement classes, as well as how to save the data (bar graphs).</p> <p>After the measurements have been carried out, analyze the measurements:</p> <ul style="list-style-type: none"> • What was the lowest and what was the highest temperature during the measurement period? • What was the difference between the lowest and highest values measured? (this difference is called amplitude). • Did you record the same temperature during the measurements? • Was it possible to observe an upward / downward trend during the measurements (the temperature was rising or falling day by day)? <p>Find on the Internet historical meteorological data for your town or the nearest city. Compare the temperature from years ago and your own measurements. Have there been any changes?</p>
7	<p>Expected learning outcomes</p> <p>The child will be able to:</p> <ul style="list-style-type: none"> • Name the characteristic features of the weather in winter; • Conduct experiments in frost; • Measure and record the air temperature; • Communicate in a way that is understandable to the listener; • Explain the differences between the previous winter (information from the elderly) and the current one;
8	<p>Assessment</p> <p>Comparative artwork on: Winter in my grandparents and winter in my surroundings / environment</p>
9	<p>Equipment and materials to be used in learning unit (tools, ingredients etc)</p> <p>A kettle, glasses, hot and cold water, a plate, bubble fluid, straws for releasing bubbles (or for drinks), a thermometer, cards, writing utensils, a computer with Internet access.</p>



10	Kind of setting - lab, kitchen, outdoor etc. Outdoor, classroom
11	References - source: <ul style="list-style-type: none">• https://mojedziecikreatywnie.pl/2021/01/wrzatek-na-mrozie/• https://www.youtube.com/watch?v=9Hk30yoEZJg• https://www.youtube.com/watch?v=VdqmuWBulEc• https://www.youtube.com/watch?v=M19ac5cUs2g• Krämer M., Matematyka na zielono, Warszawa 2022.• https://www.youtube.com/watch?v=zatcpQt6nmA

