

Title: Water or Ice

Topic: ice, water, melting process, time measurement, ordering, orientation in the plane, number line, basic counting	Time: three 45-minute lessons; not necessarily consecutive	Age: 5 years
Differentiation Some children can focus specifically on the activity. Some children can be distracted by side issues not crucial actions (eating jelly candies). Some children are very skilled at drawing accurate pictures of experiments and also at using appropriate “scientific” vocabulary and words for explanations of their investigations.	Guidelines, ICT support etc. <ul style="list-style-type: none"> • two teachers are recommended to guide children in their activities • using of applet is recommended 	
Equipment needed for this activity bowls, various containers, plastic cups, salt, string, oil, ice, candles Required knowledge No previous knowledge is required. Health and Safety Mind the manipulation with lighted candles.	Learning outcomes for this activity Pupils get the key information that ice melts and turns to water. Pupils understand that the melting rate of ice varies when in contact with different materials. They are able to conduct and interpret the experiments. Pupils are able to repeat the whole experiment by themselves. They can conduct and explain some of the performed experiments.	

Lessons description*Starter Activity*

It is necessary to engage the children's interest for inquiry and experimenting before the activity itself. Several experiments (maximum five) when the teacher acts as a magician are recommended. After the experiments s/he explains to children that these are not magic and can be explained. S/he performs experiments: turned container filled with water, lighting a candle without touching its wick, experiments with plasma lamp and light bulbs, pouring gasses.

*Main Activity***First Lesson**

In the first lesson we talk with children about ice. The activity starts with children drawing what they imagine when somebody says 'ice'. After children finish their drawings, each of them describes their picture and the teacher puts together their thoughts and words through the pictures related to ice.

In the end of the activity they should come with: the ice is cold, it can melt, it has smooth surface and therefore it can drop out of hands, it is slippery, you can skate on it, etc. Children will come up with many ideas, and the teacher has to mind that the ideas are related to ice.

In the end of the activity it is good to summarize what we came to know:

- **Ice is cold.**
Ice chills when touching skin or other matter (ice-cream in glass).
Experiment 1: Give children ice-cubes in their hands and they observe what is going on.
- **When the ice melts, it turns to water.**
Experiment 2: Demonstration of ice melting. Put some ice in the glass and heat it with candle placed under the glass.
- **Ice is smooth.**
Discussion about winter weather, when we try to walk on ice, we slip and skim (e. g. dropping ice out of hands). Ice-based sports, like ice hockey, figure skating, speed skating, curling.

Second Lesson

The second lesson should follow after some time. During the lesson three experiments performed by children themselves are recommended.

- **Ice and salt.**
Experiment 1. Take an ice-cube and sprinkle it with a pinch of salt. Put a string on the salt and after a while you find out that the string sticks to the ice-cube and it is possible to lift it up with the string. Children work by themselves.
- **Ice and oil.**

Experiment 2. In the glass half-filled with oil drop an ice-cube and observe what happens. Ice melts and water drops fall down through the oil to the bottom of glass.

- **Ice and various containers.**

Experiment 3. The same number of ice cubes is put into various containers – metal can, glass jar, and plastics cup. Children, touching the containers by hands, should find out which one of the containers is colder and in which the ice melts faster. Children work by themselves.

Third lesson

In the third lesson children perform independently the physical measurements ‘lab-work’.

1. **Explanation** what children are going to do and why. Children work in small groups.

Task 1. To find out on what material the ice melts the fastest. Each group chooses four different pads for which they will investigate how fast the ice melts on, e.g. wood, glass, brick, paper, polystyrene. The task for each group is to create the ‘Measurement Protocol’. The protocol will inform about the process and also about the results of the activity.

The role of the teacher is to encourage children to draw pictures about the equipment; task and conducted steps just after the samples and measurement tools are prepared.

Each group gets equally sized ice-cubes. Children will place the ice-cubes on prepared pads. It is necessary to put all the cubes on the pads at a time. Otherwise the children will argue on which material the ice-cube was put earlier.

2. **Observation** – children observe on which material the ice was completely melted the fastest. They will order the pads by the speed of melting, which was the first, which was the last.

3. **Discussion** deals about the results of their measurements. Recording the results into the protocol.

Plenary after each lesson

Discussion with children about the day, whether all of them participated in activities and feelings and emotions sharing.

Remarks for lector/teacher

It is recommended to divide children into small independent groups of maximum four in the beginning of the activity. The group of four children is the best size, because each child has the opportunity to get involved. It is advantageous to form groups containing a ‘manager’, ‘implementer’, ‘questioning person’ and ‘protocol person’.

1. **Drawings about ice** – it is important for the teacher not to provide children with too many examples of what could be in the pictures in order not to influence the children too much.

2. **Choice of experiments** – experiments when the children are involved as much as possible should be chosen to ensure the attention of the children for the whole time. The number of five experiments per lesson seems to be the most suitable for this age group in this topic. The experiment with ice and salt requires quite a lot of time.
3. **Discussion about drawings** – if the lector sees that the pictures are repeating and children are saying very similar things, it is time to finish the activity, otherwise they start to get bored.
4. **Experimenting in the second part** – it seems useful to vary experiments where children are active and passive. Before the experiment the teacher can ask children what they understand under the name of the experiment in order to open their minds. The teacher can ask children how they would perform the experiment. Afterwards they can discuss the obtained results. Discussion should be continued only when the teacher sees the interest of children; otherwise s/he can put children off the experimenting.
5. **Homework** – the teacher can assign homework for the children where they will involve other members of family, e. g. ‘Ice-art’: we prepare ice in a transparent container. After taking the ice out of the freezer we put the mixture of ice and colours (one or more) on the top and observe how the colours get mixed with salt.
6. **Measurement Protocol** – the most suitable mean for the protocol seems to be A1 poster on which children can draw. The lector can write titles – task, equipment, process and results. Children can express their own drawings under the particular title. Displaying the posters in the classroom and making them visible for parents was very motivating for children.
7. **Group-work** – each child of the group should perform some partial task, e. g. one member of the group observed a pad from different material. When the first cube is melted, s/he labels it with number 1 or puts it in the first place in a row.
8. **Discussion** – it is necessary that teachers discuss with children.
9. In the end of the three lessons the teacher can prepare the **final ‘exams’** for participating children to assess their obtained knowledge and skills. Children solved six different problems similar to experiments previously performed in the course at separated stages. Diplomas could be given to children as a reward for passing the exams successfully. Diplomas are received at the special **closing ceremony** of the course.