For Students

How Scientists Observe

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Subject: Why is observing so important in science? Introduction into the basic methods of scientific work, observation and description

Grade level: 7

Curriculum content: You will observe different experiments and reflect your observations

Kind of activity: Group work and working at stations

Anticipated time: 2 lessons

Task description

Observe and describe – investigate your own environment

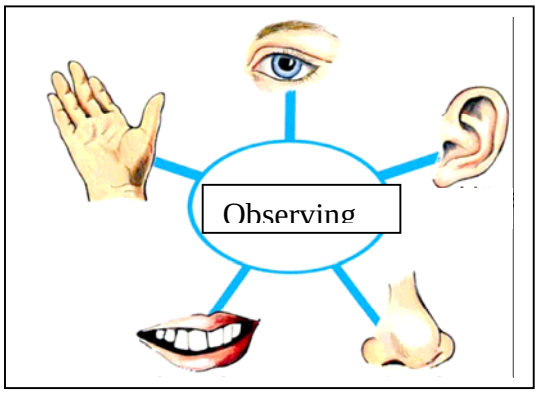
Task 1: Sit somewhere comfortably and close your eyes. Listen to what you hear: concentrate on your ears and take your time. When you listen long enough, you will hear more and more sounds that you didn't before. You may hear sounds you otherwise would never have noticed: birds singing, a horn, rustling paper or footsteps of an approaching person, even your breath.

Task 2: Open your eyes again but shut your ears closely. Take your time to look at what's happening around you. You might notice how empty the world seems to be without sound but how much of the world we percept with our eyes. Humans collect most of the information about their environment with the help of their eyes.

Task 3: There are further possibilities to percept the world. For example, if we want to find out how heat extends from a burning candle, we use our hands. We carefully get closer to the flame from different directions, and the closer we get, the warmer we feel. Above the flame, the heat is most intense.

These experiments show you that we use all of our senses to experience things. We use our eyes to see, our ears to hear, our nose to smell, our mouth to taste and our hands to feel. When you want to find out more about an appearance, you need to observe closely. In the physical world, appearances are called phenomena. In every science (biology, physics and chemistry), observing is an important basic method.

“Observing is the perception of scientific phenomena using all senses.”



Examples for observations in science:

- listening to sounds, tones and noises
- feeling warm and cold
- smelling scents (vanilla, peppermint, roses etc.)
- watching colours and events
- tasting sweet, sour, salty and bitter

But not only observing is important. To exchange with others about your experiences, you have to **describe** what you observed.

You might know a fragrance lamp like the one on this picture.
In the bottom part stands a candle. Above this candle is a small bowl with water. You can add any oil into the water, for example rose or vanilla oil. *Now light the candle and observe. Use all senses!*

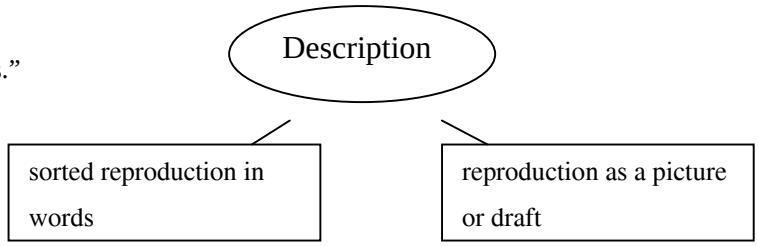
You already observed something with your hands in task 3. You probably came to the result that is shown on this drawing:

You can describe by creating a draft in which you concentrate on what is **essential** about your observations. Another possibility would be to put your conclusions in words, which could be oral or written.

Back to our fragrance lamp: there's more to see. After some time, you can notice blisters going up in the water and smell scents of the oil. People use this to fill a room with the desired scent.

Exchange your observations with your partner. Did you get different results?

"**Describing** is the sorted reproduction of your observations. It can be done in pictures or words."

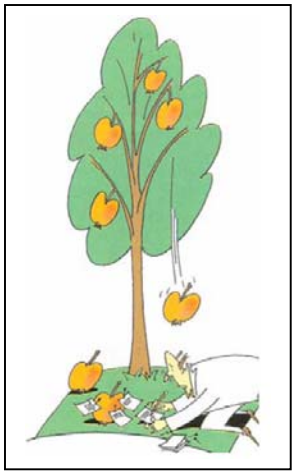


To answer questions scientifically, we observe and describe events, bodies and processes (phenomena). It is important for scientists to do this accurately in order to come to conclusions. Observation and description are scientific methods.

What you want to find out is of great importance when observing phenomena. Maybe you have already experienced the same situation totally different? For example, look at this picture. What do you see? A young woman or a saxophonist?

You look at the same picture, but when you concentrate, you can either recognise the woman and see her clearly or you can concentrate on the saxophonist and obviously see him. As you notice, depending on what you want to find out, your observation is completely different. Such pictures which allow multiple observations are called optical illusions.

Conclusion: When looking at the pictures on this page, you can get different results, depending on your approach. What do you see here, an Inuit or a native American? What did you see first?

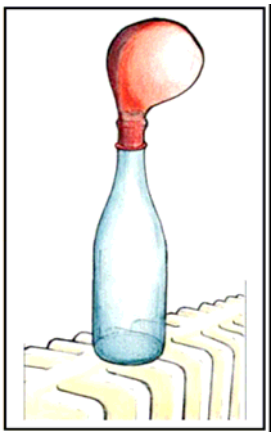


The approach plays an important role when observing scientifically. When we look at natural phenomena, we can do this by asking different questions. Therefore we can get to different descriptions of one and the same problem. Our questions are also important because we need to focus on what is essential for our observations and what is not. You have eventually seen how objects drop. Try to describe how an apple falls. Its colour and taste do not influence this, and therefore we can leave these attributes out of focus. We concentrate on essential qualities. Important is how long the apple takes until it hits the ground.

So what does a scientist when he describes phenomena? He deliberately concentrates on a single object or a single process, focusing on certain aspects. He chooses those aspects depending on his questions and his approach to the observation. That means sets priorities that are important to him and his finding.

What would happen if a scientist noted everything down that he observed? It wouldn't take long until he lost his orientation in all his findings. This holds the danger of losing focus on what is essential for his initial aim. That's why a straight question helps the scientist to find out and describe what is important.

"In science, we observe and describe phenomena with a certain approach. That means our observations are specific."



Tasks

1) Take an electric kettle and fill it with half a litre of cold water. Switch it on and note as precise as possible what you see (and hear) from now until it switches off!
2) Put a balloon onto a bottle and place the bottle on a radiator first and then into a refrigerator. What happens? Note down what you observe!
3) Fill a bottle with water halfway with water and blow slightly and then powerful over the opening. Try it again with less or more water in the bottle. Note down what you noticed in a table!
4) Imagine you were a meteorologist and asked about the weather. That means you need to observe the weather from different aspects several days.

a) Look at the weather for two days and find out whether and how long the sun shines. Write down your findings!
b) Look at the weather for seven days and find out whether and how much rain falls.
c) Think of another aspect to observe the weather for a week!

Observe and Describe - Stations

Station 1: Behind Glass
Move the object behind the glass in different directions and observe.
Don't move the glass.

Station 2: Warm or Cold?
Put one hand onto the plate and the other one on the Styrofoam. Observe!

Station 3: Smells Cute!
Open the can and observe what is under it.
Don't remove the cotton!

Station 4: Sweet or Sour or what?
Observe to find out what is in the water.
Use a different spoon for every liquid!

Station 5: Knock Knock!
Hold the funnels to your ears.
Your partner knocks the hose at different locations.
What do you Observe?

Observe and Describe - Worksheet

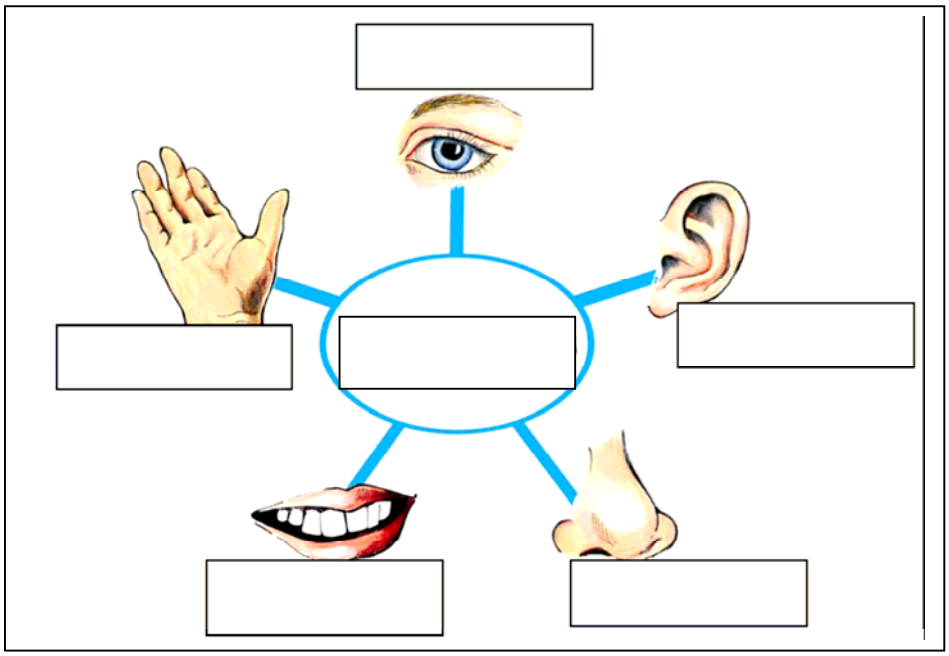
1. Fill in!

Observing is _____.

2. Small experiments to observe. Use your senses and complete the table!

Experiment	Sense	Sensual organ	Observation
Behind Glass			Behind the Glass…
Warm or Cold?			The plate…
Smells Cute!			Under the cotton is…
Sweet or Sour or what?			The water is mixed with…
Knock Knock!			When knocking the hose…

3. Assign the following terms: Feel, See, Smell, Hear, Taste



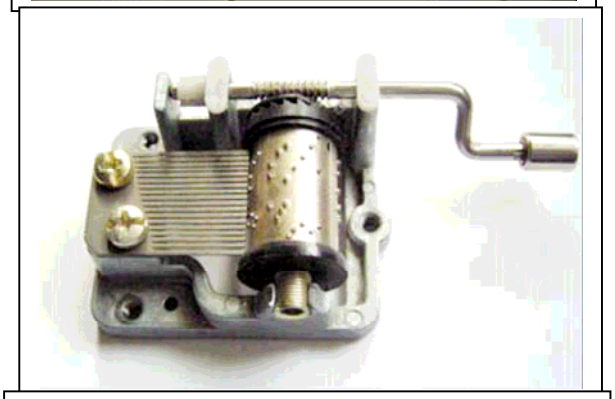
Specific Observation and Description

Into the Water

- Task: fill every tumbler with the same amount of water. Let objects fall into the water from the edge of the glass.
- Observe the water as well as the object about 30 seconds after its immersion.
- Describe your observation

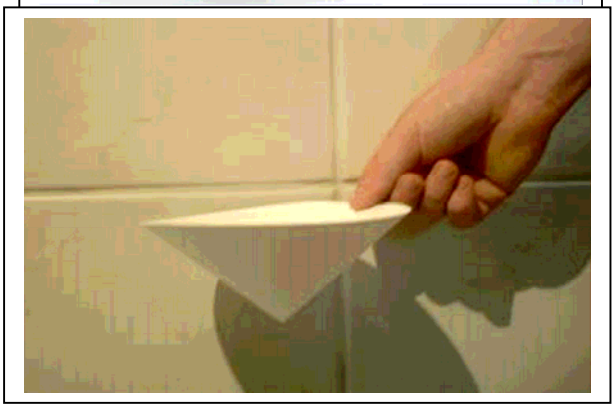
Music box

- Task: turn the crank slowly clockwise.
- Observe closely what happens.
- Describe your observation.



Drop experiment

- Task: let every object drop from the same height onto the plate.
- Observe each object while it falls and when it hits the plate.
- Describe your observation.



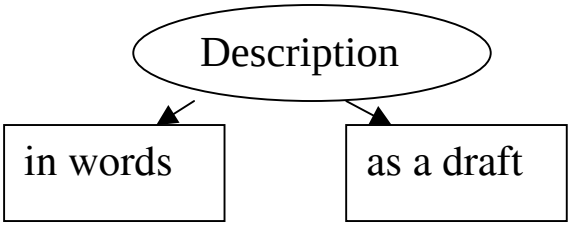
Salty

- Task: distribute the ice cubes evenly into both tumblers. Add salt to one of them.
- Observe for approximately two minutes both glasses.
- Describe you Observation.

Specific Observing and Describing

In science, we try to think of what we want to focus on before the experiment (**planning**).

After the experiment, we reproduce what we observed (**description**).



Experiment	Observation
Into the water Fill every tumbler with the same amount of water. Let objects fall into the water from the edge of the glass.	
Music Box Turn the crank slowly clockwise.	
Drop experiment Let every object drop from the same height onto the plate.	
Salty Distribute the ice cubes evenly into both tumblers. Add salt to one of them.	