

6-8
years

pri-sci-net



inquire
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Science Content:

Life Sciences
(Biology, botany, gravitational biology)

Target Concepts/Skills:

Gravitropism

Target Age group:

6-8 years

Duration of activity:

2 complete lessons + 4 equivalent lesson times
spread across a period of 2 weeks

Summary:

Children investigate the effect of gravity on the direction of plant growth. The children are presented with a situation of a carrot and asked whether they think that the carrot will grow upside down, and if it grows, in what direction. The investigation carried out involves growing a carrot upside down and observing what happens over a period of one week. A second investigation involves doing the same experiments but placing it in a dark box to see in which direction the shoots grow.

Objective:

By the end of the activity children should be able to:

- Appreciate that plants are influenced by gravity and source of light;
- State that plants grow against gravity;
- State that plants grow towards light;
- Design an investigation to test how plants grow (towards or away from gravity);
- Design an investigation to test how plants grow (towards or away from light).

Resources:

- carrots (rather thick) with short leaves
- knife, melon baller (to scoop out the inner part of the carrot), wooden sticks (BBQ), glasses, box (e.g. shoe box, for second experiment with plant growing in the dark)
- digital camera (for documentation of observations made)

Which way do plants grow?

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Which way do plants grow?

1. Engage

Stimulus: Carrots with short leaves

Teacher: What is it? Where does it grow? Which part of the plant is it? How does it sit in the ground (which side up)? Why? (=> This part is used to elicit children's previous knowledge)

Inquiry 1

Teacher: What will happen if we plant the carrot upside down?

Children: formulate hypotheses and justify their ideas (share them and write them down = fill in worksheet 1)

2. Inquiry

Experiment 1

- children conduct an investigation to test hypotheses put forward by the children. Plants need to be prepared following the instructions on worksheet 2; group work (small groups of 3-4 children)

- Observation (about 1 week long): One will notice that the leaves grow "up" even though initially they were placed upside down
- Data collection: digital camera, annotated drawings, research protocol (worksheet 1) where children note their observations.

3. Evaluation (Evaluating evidence)

Experiment 1:

- comparison of different groups' experiments/methods and results; children will share their observations/results/conclusions, they will have to explain to the other children how they carried out their experiment and present the results
- plenary discussion of findings; referring back to hypotheses and predictions, based on research protocol (leaves grow "up", even if you plant the carrot upside down)

Inquiry 2

Teacher: How do plants "know" where to grow?

Children: formulate hypotheses (e.g. stimulus: sunlight) and plan experiments

Experiment 2

- Children conduct an investigation. Children can repeat the carrot experiment but this time the glass is placed inside a dark box (e.g. plant in the dark = grown in a box);
- Children write their own research protocol (following the example of worksheet 1).
- Observation (about 1 week long): leaves still grow "up"
- Data collection: digital camera, annotated drawings

Evaluation

- comparison of different groups' experiments/methods and results
- plenary discussion of findings
=> sunlight cannot be the only stimulus! It is not light which is showing plants in which direction to grow. Especially for plant parts sitting in the ground (=> roots, seeds) another force is important.
If children do not have any previous knowledge of the concept of gravity, they might be introduced to it by the teacher.
=> Gravitropism allows the plant to respond to gravity no matter what position the plant is in (roots grow towards centre of the earth, shoots will always grow away from it).

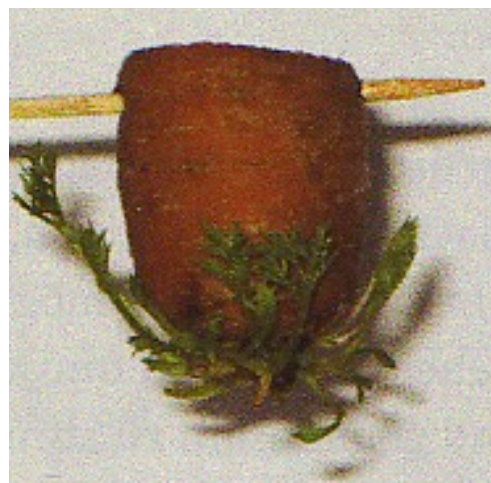
Extended activities (optional):

a) Explore gravity; e.g. plants grown in microgravity/space
b) Starch in carrots (iodine test) => energy source for plant growth in seeds and roots

Which way do plants grow?

Materials in attachment:

a) Worksheet 1: Build your own “carrot cup”; b) Worksheet 2: Research Protocol



References:

- Scheersoi, A. (2011): Kinder als Pflanzenforscher. Der naturwissenschaftliche Weg der Erkenntnisgewinnung. In: Weltwissen Sachunterricht 2/2011, p.26-31.
- Van Saan, A. (2008): 101 Experimente mit Pflanzen. Moses-Verlag, p.97.

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Plants' responses to changes in orientation (6-8 years): Worksheet 1

Our question: In which direction will the carrot leaves (shoot) grow?

1. What do you think: in which direction will the shoot grow? Justify your ideas!

I think that:

2. Observe the shoot growing during one week and keep records.

Write down what you see and / or use drawings to document any changes.

If you have got a camera, you can also take pictures.

3. Compare and discuss your findings with your class mates.

Was your hypothesis correct?

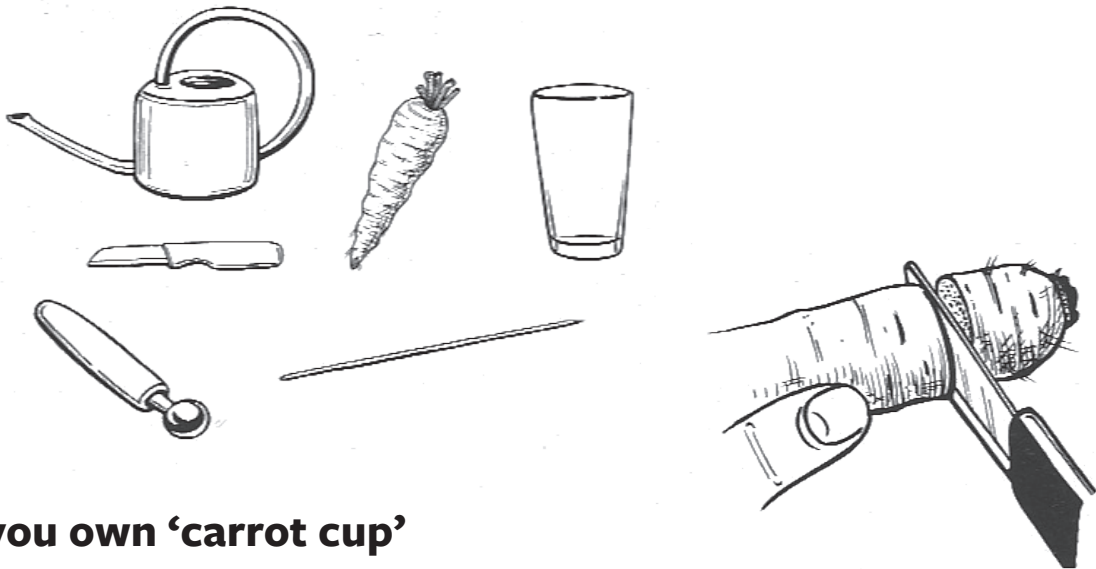
Are you able to answer your question now?

Which way do plants grow?

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Build you own 'carrot cup'

What you need:

- 1 thick carrot with short leaves
- 1 knife
- 1 melon baller
- 1 wooden stick (BBQ stick)
- 1 glass
- water

How to prepare the carrot for your investigation:

1. Cut off the round part of the carrot (approx. 5 cm length).
2. Scoop it out carefully using the knife and/or the melon baller and taking care not to damage the skin (you might want to ask an adult to assist you).
3. Carefully insert the wooden stick through the top of the carrot cup (approx. 1 cm below the edge).
4. Put the carrot cup with the stick onto the glass and place it on a window bench (but not into the direct sunlight).
5. Plants need water to grow! Put some water into the carrot cup and keep it filled up during the whole length of the experiment.

