

6-8
years

pri-sci-net



inquire
investigate
evaluate
connect

Science Content:

Life Science, Botany

Target Concepts/Skills:

Germination of seeds, seeds' ability to absorb water

Target Age group:

6-8 years

Duration of activity:

2 lessons + 1 lesson the next day

Summary:

In this activity children realise that seeds require water to germinate by observing the effect of the uptake of water by seeds (swelling and seed coat rupture). Two different investigations are proposed. In the first one a bottle is filled up with dried peas and then warm water is poured into the bottle. In the second investigation, children fill up a yogurt cup with dried peas, add water and then seal the cover with plaster of Paris. In both cases the container breaks because the seeds absorb water and swell up, taking up more space and break the container as they exert pressure on it.

Objective:

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

- Realise that seeds require water to germinate;
- Identify that when seeds absorb water they swell up;
- Understand that when seeds which are packed up in a container absorb water, they exert a pressure on a container, at times large enough to break it.
- Design an investigation to see what happens when seeds are placed in water.

Resources:

- Magnifying glass;
- Dried peas from the supermarket (beans like kidney beans can also be used)
- Glass bottle, plastic yogurt cups
- Plaster of Paris and mixing container;
- Water.

Swelling pressure of plant seeds

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Swelling pressure of plant seeds

1. Engage (Forming hypotheses)

Stimulus: Dried peas from the supermarket

What is it?

=> Children are invited to observe the seeds closely (identify seed coat, embryonic root/shoot). They can do this by using a magnifying glass.

Why don't they grow into plants while they are in the bag?

What do the seeds need to germinate? (=> previous knowledge?)

Research question: What will happen to the seeds when they take up water?

- Let the children formulate hypotheses. Ask them to justify their ideas.

2. Inquiry (Designing and running experiments and observations)

Investigate water uptake and swelling

Plan and conduct investigation to test hypotheses:

- Before starting the experiments, ask the children to write down the research question and their hypotheses.
- Let them measure and weigh (a definite amount of) peas and write results down if you have a small digital scales.
- Tell them to report their observations during the experiments using a digital camera and/or annotated drawings. They will need this data to present the findings afterwards (e.g. with a poster).
- Two different experiments are conducted in small groups (3-4 pupils each). More experiments can be planned and conducted by the children themselves if they are already capable to do so (otherwise as extended activity, see below).
- Children take roles / responsibility to encourage positive interdependence, interaction, and group processing. Possible roles could be "Leader/Facilitator", "Recorder/Reporter", "Materials Manager", "Spokesperson/Presenter" (the last would be ready to summarize the group's progress and findings to other groups or to present a poster).

Inquiry 1) What happens when water is poured in a glass bottle filled with dried peas?

Hints for conducting the experiment:

Bottle filled with seeds, bottle neck stays empty.

Sand can be added to fill the space between the seeds and thereby accelerate the cracking of the bottle.

Warm (!) water accelerates swelling.

Control group without water.

Bottle will crack, not explode.

If children mark on the bottle the original filling level, they will be able to observe the volume increase.

Inquiry 2) Peas in plaster

Hints for conducting the experiment:

- Mix water and Plaster of Paris according to product instruction.
- Put some peas in yoghurt pots and cover them with plaster.
- Put the pot in a warm dry place.
- Control group without water.

Observation/Results (next day): peas get bigger / swell

=> A) bottle cracks, B) plaster cracks

=> seed coat ruptures

Ask children to observe the swollen seeds carefully to discover the seed coat rupture and to measure the swollen seeds (compare the results to the original data from before the experiment) as well as to document changes (e.g. pictures of seeds before and after the experiment). They can also weigh the seeds again after they have swollen up.

Presentation of the individual groups' results: one possibility to present the results is to ask them to illustrate their experiment and findings on a poster (depending on the previous knowledge, the teacher proposes a definite structure; e.g. 1) Title/Research question, 2) Hypotheses, 3) Materials used, 4) Experiment/Methods, 5) Results).

Swelling pressure of plant seeds

3. Evaluation (Evaluating evidence)

1) Comparison of different groups' experiments/methods and results (e.g. poster presentations or "Market place/exhibition" where the different groups present their results using the original material that they display to explain the "visitors" what they did as well as their observations and results).

2) Plenary (oral) discussion of findings relating back to hypotheses: Did you expect these results? Are they in accordance with your hypotheses?

What role do these findings play related to germination and our original question (= Why do seeds not grow into plants when they are in the bag?)?

Can you think of other experiments to verify your hypotheses?

3) Documentation of the discussion results, e.g. by adding them on the poster or by using a creative writing activity ("Ask the expert", see worksheet)

Extended activities (optional):

- Investigation: What happens to the seeds after swelling? (Germination process)
- Ask the children to design their own additional experiments using other plant seeds and other material to be destroyed by the pressure.



Materials in attachment:

- Worksheet "Ask the expert"

Note:

The plant embryo inside the seed needs water to get its metabolism activated to start the embryo growing. Water is taken up by a process called imbibition and is also needed for breaking the seed coat by making the seed swell.

