



# DO PLANTS NEED SOIL TO GROW?

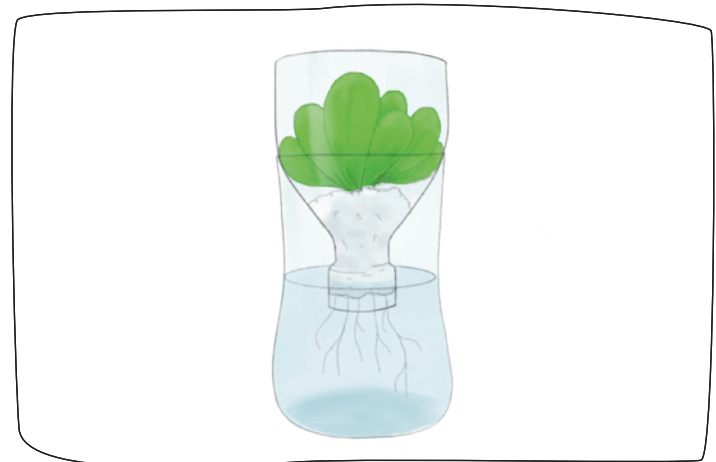
Plants can grow with water and minerals even without soil. This is called hydroponic. In this unit, the children will grow lettuce or garden cress in a plastic bottle and observe the growth.

## SUBJECT ANALYSIS

In the garden, the house and in agriculture, plants usually grow in the ground. They absorb water and minerals through their roots. The soil also gives them support. But plants can also grow without soil. In special greenhouses, plants grow **hydroponically**. They are irrigated with mineral-rich water. The roots grow, for example, in a substrate or simply hang in the air and are sprayed from below. The advantage of hydroponic cultivation is that fertilizer is applied in a very controlled manner as required. Excess water can be collected and fed back into the system, and washing also requires less water. Weed killers and pesticides can be largely dispensed with. If the plants are located in or near the city, there are no long transport routes. **Hydroponics** can therefore be a resource-saving cultivation method and is also being tested for longer space missions. Plants can be grown hydroponically via simple means.

## COMPETENCIES

- The students will recognize the conditions plants need for growth.
- They will learn to work independently by conducting experiments.



## COURSE OF INSTRUCTION AND METHODOLOGICAL NOTES

### ● **Entry/Activation**

In general: what do plants need to grow? Suggestions will be collected. If soil has not been mentioned, the question follows: do plants need dirt to grow?

### ● **Work phase**

Each child prepares a salad in a bottle according to building instructions. Afterwards, they think together about ways to check the assumptions and list them on the blackboard. For example, they could check whether plants really need **water** by pouring the water out of some bottles. Whether plants need **light** could be checked by covering a few bottles with an opaque bucket or cardboard. Whether plants need fertilizer (**minerals**) can be checked by not adding fertilizer to the water for some of the plants. For other plants, the cotton balls could be replaced with potting soil.

### ● **Closing**

Theories are collected as to which plants will grow best and which may not grow at all. The children will observe and document the growth of the plants over the next few weeks. In the joint final discussion, not only the size of the plants should be compared, but also how healthy they look (plants can sometimes grow in harsh conditions but may look pale and unhealthy). One could also arrange a collective breakfast where the plants would be eaten.

## ADDITIONAL MATERIAL

- Idea card as PDF
- Building instruction



<https://www.genius-community.com/geniusbox-gs>

## MATERIAL LIST

- 1 PET bottle (per child)
- Scissors
- Aluminium foil or cardboard
- Cling wrap
- Elastic bands
- Cotton balls
- Plant seeds (e.g. cress, lettuce)
- Plant fertilizer (for hydroponic cultures)

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## BUILDING INSTRUCTION FOR PLANTING A SALAD IN A BOTTLE

**Preparation:** the bottles must be completely empty, dry and without lids. The teacher will cut the bottles in the middle of the side.

1. Cut the bottle completely crosswise in the middle with handicraft scissors.
2. Wrap the lower half with aluminium foil or cardboard.
3. Pull some cling wrap over the mouth of the bottle (upper half) and fasten it with a rubber band around the threaded part. With a pin, poke a few holes in the plastic.
4. Now insert the upper part of the bottle into the lower part with the mouth pointing down.
5. Pour in enough water so that the water just reaches the mouth.
6. Now put some cotton balls into the mouth of the bottle to soak up the water.
7. Place a few seeds on the cotton balls. Ready.

**Important:** The water must be enriched with fertilizer. If it sinks, it must be re-added to the cotton balls or roots.

