

# Designing and Building a Simple Hydroponic System

## Introduction for the Teacher:

In the previous lesson, we were introduced to hydroponic systems. We learned how these systems are able to provide plants their basic needs, even without soil.

In this lesson, the students will experience technological-creative thinking. They will work as a team and design a simple hydroponic system. This will be followed by each student building a personal system. In it, he will plant a plant and track its growth. Will the systems we build be able to provide the plants' basic needs?

## Goals:

- The students will design and plan a simple hydroponic system from readily-available materials as a solution for soilless plant cultivation.
- The students will explain how their system supplies the plant's basic needs.



## Recommended duration

90 minutes



## Key terminology

Fertilizer, conductivity measurement, pH (acidity) measurement



## Acquired skills

Problem solving, creativity, teamwork, presentation

## Prepare in advance

Accompanying presentation

A computer, linked to a projector

**For each team:** some empty cheese or yoghurt containers, empty plastic bottles, 0.5 or 1.5 liters with a bottle top and scissors. (We recommend you ask the students to bring the equipment).

**For each class:** thick cotton string (macrame string) or shoelaces, a hot glue gun, disposable cups of various kinds, wide masking tape.

### Recommended:

An inert growth medium (coconut fibers, hydroton or perlite)

A seedling, for example - lettuce, for each team or for each student.

## A Simple Hydroponic System

In our previous lesson, we learned that a hydroponic system is in fact a technological solution enabling the supply of a plant's basic needs without any soil (soilless). We saw that there are various kinds of hydroponic systems and a variety of commercially-available, very different-looking hydroponic systems. In most commercial systems, there are air pumps or water pumps, and therefore they are dependent on a regular supply of electricity.

However, in order to grow a plant soillessly, there is no need to buy a complicated commercial system. By searching images in Google using the terms: "hydroponic bottle" and "hydroponic jar", we will see many possibilities for simple hydroponic systems which are made of readily-available, and even recycled, materials.

In the following activity, we will experience technological-creative thinking: designing a soilless growth system, capable of supplying the plant's basic needs.

## Team Activity - Designing and Building A Simple Hydroponic System

The activity will be in groups of 2-3 students.

The equipment detailed On the previous page must be prepared in advance.

### Step 1 - Designing A Simple Hydroponic System

- Each group will **design and draw** a simple hydroponic system in which at least one plant can be grown.
- The system must supply the plant with as many of its basic needs as possible.
- The system can include water and a neutral growth medium. It cannot include soil.
- The equipment used to build the system is the equipment the students have brought or received and other readily-available equipment (recycled materials are preferred).
- Electrically-powered equipment cannot be used.
- Inspiration and ideas for the design can be taken from pictures of sample systems shown in the presentation, or from Google Search results.
- When the design is completed, it must be shown to the teacher, who will approve advancing to the next step.

## Step 2 - Building A Personal Hydroponic System

- It is recommended that each one of the students build the system that was designed in their group.
- While building the system, safety must be kept in mind - particularly when punching holes in the plastic containers.
- We recommend that each student be given a small seedling of an edible leaf vegetable like lettuce, to plant in the system he builds.
- If the seedling has roots in soil, gently wash away the soil before planting.
- We recommend that all systems, with their seedlings, be placed in a well-lit area, where the students can monitor the plants' growth and the changes taking place in each system - for about two weeks.
- We recommend that the plant development be documented by using photography or by writing a description of the growth process.
- It might be necessary to add water in some of the systems.

## Step 3 - Presentation

- Each group will make a presentation to the class about the systems they designed and built.
- The members of the group need to explain how their systems enable the supply of the plant's basic needs.

## Summary and Discussion

- Do the systems that were built enable the plant to obtain each one of its basic needs: light, water, air (including to the roots), nutrients, anchorage, protection against pests and proper temperature?
- What improvements can be made to the various systems to increase the efficiency of plant growth?