



AGE : 12 - 14

Analysis of different terrarium

Project number: KA201-050529

Activity n°3

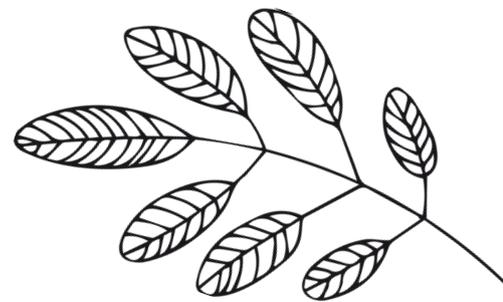
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Educator's guide





Calendar

Although this activity can be carried out throughout the year, it is better to start in February in order to start the data collection phase once the days start to have more hours of sunshine.

Duration

This activity will last about 6 months

The preparation will last five hours and the monitoring 3 months.

We have divided the activity or experiment into 4 phases:

1. Preparation phase (1 month) - 5 hours divided into different sessions.
2. Production phase (15 days)
3. Data collection phase (3 months)
4. Analysis and conclusion phase (1 month).

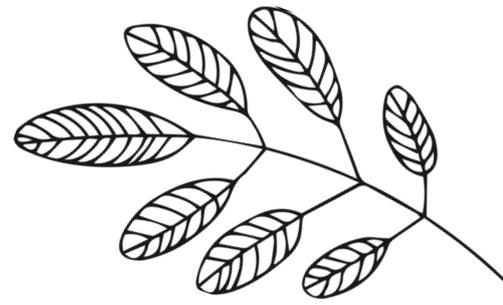
A gamification system based on insignia rewards that were obtained once the tasks and challenges were completed had been suggested in the presentation form. The rewards will not be for advancing the tasks but for acquiring knowledge and overcoming difficulties.

You can divide the experiment in 4 phases with 5 work steps:
After completing each phase, the group will receive the reward.

Phase 1: preparation

1. Prepare the terrarium:

- 1.1. Conduct research and decide which materials we will use (plastic bottles or glass jars).
- 1.2. Place the materials inside the terrarium: substrate, active carbon or gravel and study why do we use them.



Duration

2. Conduct research about botanical and physiology so as to answer the question “which kind of plants are we going to seed?” and decide different places / spaces for comparing the growing of the terrariums.

Phase 2: terrarium production

3. To plant the selected species and the moss.

Phase 3: data collection

4. Data collect:

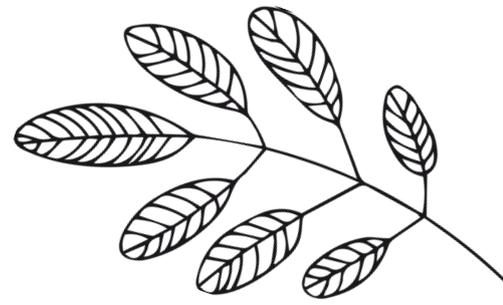
- 4.1. To prepare a data template for collecting the data measurements during all the experiment and
- 4.2. Monitoring our terrarium (measuring the length of the plants, the temperature and the humidity).

Phase 4: analysis and conclusions

5. Final conclusions:

- 5.1. Data analysis
- 5.2. Conclusions

In every step, once the students are able to solve the challenges and answer all the questions, they will receive the reward.



Preparation

- To get all the material except the container (plastic bottle or glass jar)
- To know some recommended species for our experiment
- To know the life cycles of these species
- To know the necessary physical variables (light and humidity) for the plants
- To know the effect of greenhouse effect
- To design how to collect systematic data

Challenges that will lead to the completion of the main task:

During the task, the students will face different challenges such as: searching the bibliography in accurate sources, learning to systematize data collection and being responsible for a living system.

Tips for successful facilitation, supervision and organizing:

We should take into account mainly three tips to ensure the success of the activity:

- To make sure that the size of the jar or bottle is adequate.
- To check that there are not too many plants in the terrariums.
- To check that the data collection is rigorous.

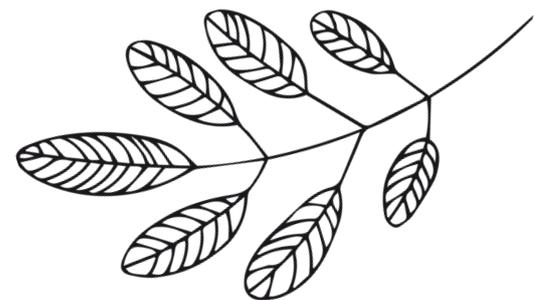
Debriefing outcomes & obtained competences:

Through the production of a terrarium, students will learn which are the variables that condition the development of plants and which are the best materials for their growth. Through observation and data collection, students will learn to analyse data, interpret and understand the results. Throughout the process it is very important that there is good teamwork and good communication.

Moment of formal education (optional)

Students may observe differences between the plants' growth. They should be able to apply the science knowledge to explain how different variables like light or humidity can affect directly a plant or a living system.

To develop conclusions, students will be able to discuss among themselves the results obtained and the comparisons that must be made to understand what happened during the experiment. A very important point for the debate is to analyse the strength and weakness of the experiment and suggest improvements for this same experiment.



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Students' worksheet



Related STE(A)M theory:

Biology is the science that studies the structure and the life process of all the organisms. In this activity we can go in depth in several study areas such as:

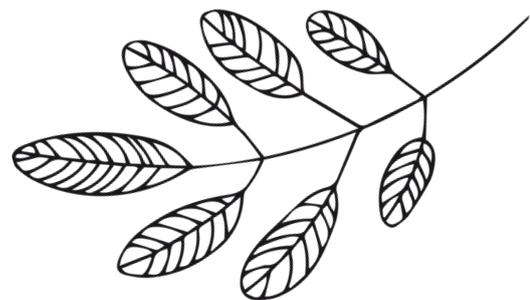
- Botanical (Science that studies the structure, characteristics, properties and relationships of plants and their life processes.)
- Physiology (Biology area that studies the organs of living beings and their functions e.g. growing)
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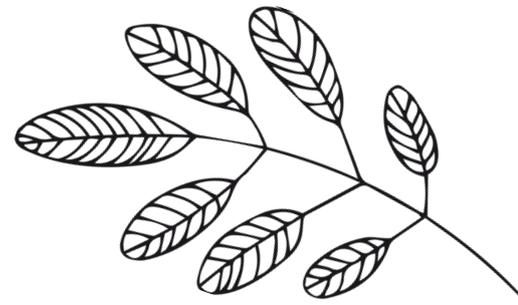
Apart from biology, we will work on chemistry and physics.

- Chemistry (Science that studies the composition and properties of matter and the transformations it undergoes, e.g. humidity)
- Physics (Science that studies the properties of matter and energy and establishes the laws that explain natural phenomena, e.g. temperature, light)

Key words

Biology, botanical, plants, terrarium, greenhouse





General aim

The main aim of this activity is to compare the growth rates between terrariums located in different spaces and learn how living organism system works and which are their needs according to environmental conditions.

Educational Objective(s)

- Acquire the responsibility of taking care of a living organism system
- Learn to distinguish the chosen plant species
- Know the basic vital needs of the selected plant species (e.g. humidity and temperature)
- Know the life cycles of selected plant species
- Understand why we use materials such as moss, gravel and active carbon as variables handlers (humidity)
- Learn how to collect data and make a systematic modelling of an experiment
- Be able to understand what is the greenhouse effect and its importance
- Think over on how human consumption can affect globally

Suggested Environmental Context

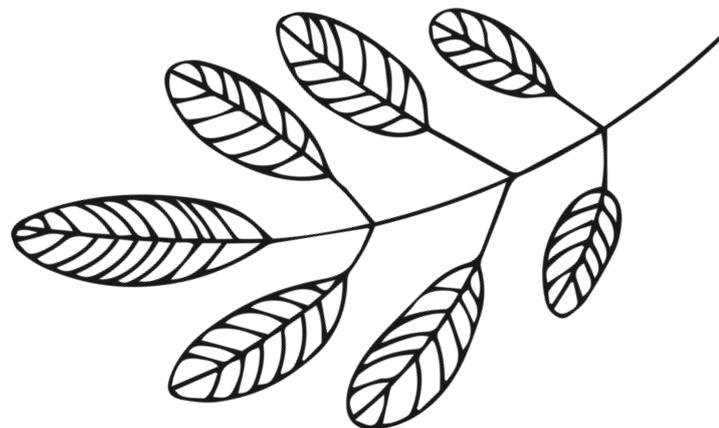
The aim of this experiment is to compare the growth of each terrarium, so it is advisable that they are the same type of plants or that they are of the same family to favour the comparative analysis. The main variable that will affect its growth is sunlight and, secondarily, humidity. We must place the terrariums in different places to check how light and humidity affect the development of plants during the activity.

Necessary Equipment and Materials:

1. Material needed to create the terrarium: clear plastic bottles or containers (to apply concepts on environmentalism, consumption and zero waste) or glass containers that have been used and washed (for example, jars of jam, jars of legume...).
2. For the plantation we will need universal substrate, active carbon and a humidity meter. This sensor is easy to get, low-cost, reusable and useful throughout the activity. In addition, we will need gardening gloves, sprayers, a watering can and a small shovel.
3. Our recommendation is to choose small, resistant plants that need high humidity. Also is recommended plants with low demand of substrate for growing and develop.
4. The use of moss is recommended to control humidity and for beauty purpose.
5. Once the terrarium is created, it must be placed in an interior space with non-direct natural light. For comparing the growth rates between the terrariums they have to be settled in different zones.
6. For the monitoring we will need a data template where the students collect data about: humidity, temperature and growth (length).

Media and Resources

1. Internet access
2. Use of a digital camera to take pictures along the experiment
3. Botanical guides
4. Humidity sensor and thermometer



Tasks

The main aim of this activity or experiment is to compare the growth rates between the terrariums settled in different indoor zones. For this reason, we need to find different places with more or less sunlight.

First of all, students must create groups of 4 people. Every group will create a terrarium. The total of terrariums will depend on the total number of students in the group or classroom.

We can divide the experiment in 4 phases with different steps.

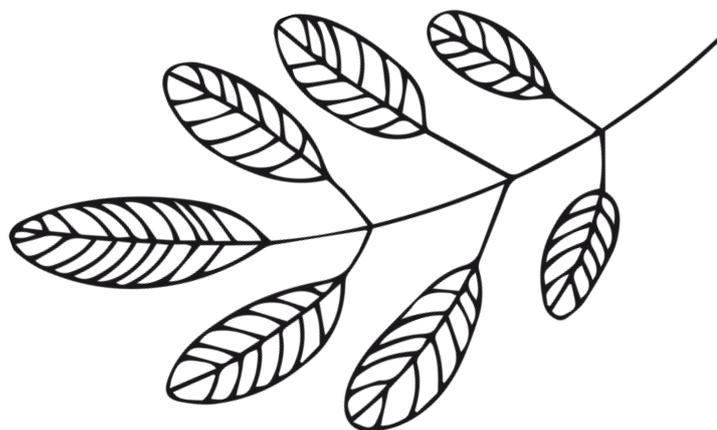
Phase 1: research and preparation of the materials (1 month)

1. Prepare the terrarium:

1.1. Make a research and decide which material we will use (plastic bottle or glass jar). We recommend to use a container with a wide opening for planting and watering. That's a great moment to introduce ecological topics such as consume, recycle and zero waste system.

1.2. Make a research about botanical and physiology to answer the question "which kind of plants are we going to seed?" and decide on different places to compare the growth of the terrariums.

Our recommendation is to choose small, resistant plants that need high humidity and plants with low demand of substrate for growth and development.



Tasks

Phase 2: terrarium production (about 15 days)

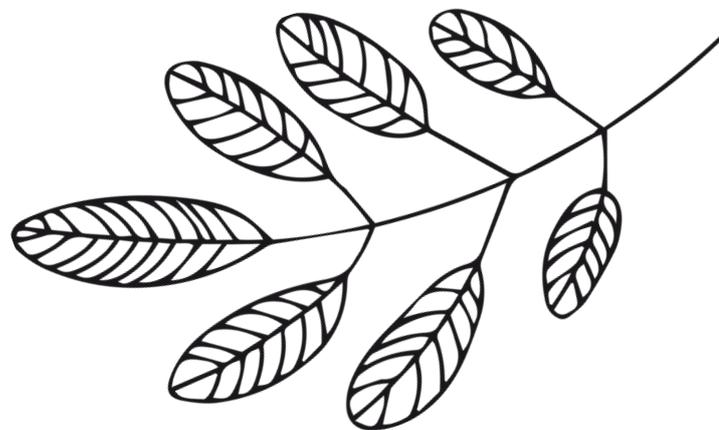
1.3. Place the materials inside the terrarium: substrate, active carbon or gravel and study why we use them.

1.3.1. Lay about 2 centimetres of active carbon (or gravel) in the bottom of the container to promote drainage and prevent water from accumulating.

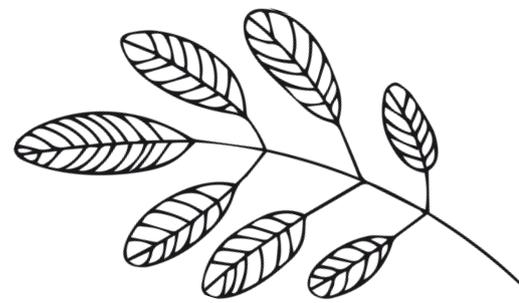
1.3.2. Lay the substrate up to half the container and mix it a little with the carbon active or the gravel.

1.3.3. Plant the seeds and leave a little space between them so they can grow. The number of plants will depend on the dimensions of the terrarium.

1.3.4. Optional: We will cover the visible substrate with moss to delay water evaporation and for beauty purposes.



Tasks



Phase 3: data collection (3 months)

2. Data collection:

2.1. Prepare a data template to collect the data measurements during the whole experiment

This data template design is recommended:

Number	T° inside	T° outside	Humidity	Watering (mL)	Lenght 1 (cm)	Lenght 2 (cm)	Observations

In the first column, we have to write the number of the terrarium and the date of data collection. The measurement has to always be the same moment of the same day or week.

Using a thermometer, we can measure the temperature (T°) inside and outside the terrarium and see in situ the greenhouse effect.

Humidity can be measured using a sensor or three different levels using the moss as an indicator (high, medium, low).

In the watering column, we have to write the mL of used water.

We can choose how many plants we measure in order to know the length of growth in cm. We can take measures using a ruler or a measuring tape.

Finally, we have to take a picture of our terrarium for the monitoring.

2.2. Monitoring our terrarium and collecting data in the template (measuring the length of the plants, the temperature and the humidity).

Tasks

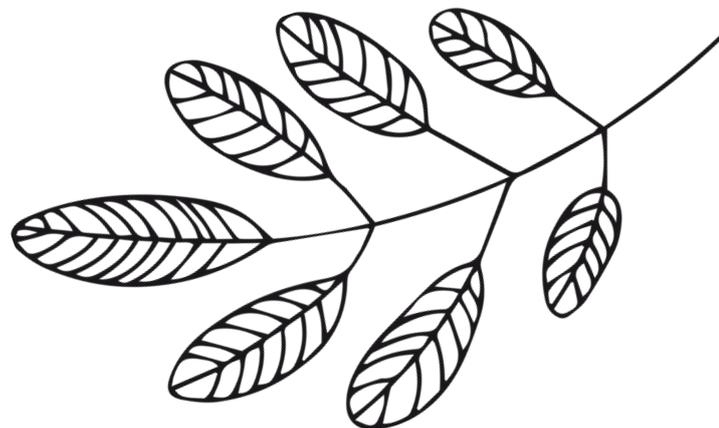
Phase 4: data analysis and conclusions (1 month)

3. Final conclusions:

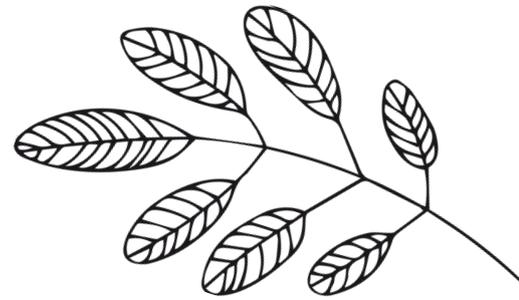
- 3.1. Data analysis: students will compare the collected data. Representing the results graphically is a really useful system.
- 3.2. Conclusions of the experiment: the students have to compare the data of all the terrariums and explain the differences between them.
- 3.3. Explanation: every group have to prepare an oral explanation for the rest of the class about the conclusions

Safe and security checklist

In this task there are no activities that could be dangerous.



Project's partners



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