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The Key To Global Life,
Digital Change Of Nature



Total Duration: 3 weeks
(depends on the species of plants)



Student's Age: 12-18 Years



Application Area:

- Recycling / upcycling,
- Waste management,
- Biochemistry,
- Problem solving.



Keywords: Growth plant, coffee grounds, soil, circular economy, fertilizer, composting, agriculture, plant science, food.



W2 - Coffee for your plants?



Module

- Water and healthy food

W2 - Versión en español

Materials:

- Coffee grounds
- Soil
- Wood or other building materials (waste)
- Drills and screws
- Paints and brushes
- Plants and vegetables
- Water



Notes:

- Students work in teams to create a class garden,
- It is necessary to act in accordance with the learning approach: learning by doing!
- Students will have to set up a strategy to design and build planter boxes and use them to carry out scientific experiments to compare vegetable growth on different kinds of soils and measure/record plant growth consistently.



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Introduction



Picture 1. Coffee beans and ground

When a cup of coffee is made, less than 1% of the coffee grounds actually stays in the cup. Over 9 billion kilos of coffee are produced every year. After a large amount of energy spent producing and transporting coffee worldwide, all value is given to liquid extract and flavor/aroma. A cup of coffee is really great. But the problem is, the other 99% of the biomass of the coffee bean is going to waste (Picture 1).

Making compost with coffee is a great way to use something that takes up space in a dump. Composting the coffee helps you add nitrogen to your compost stack. Therefore, the benefit of using coffee as a fertilizer, in addition to adding nutrients, is to add organic material to the soil and in consequence to improve drainage, water

retention and ventilation in the soil. The coffee grounds used will also help develop microorganisms that are useful for plant growth and attracting worms.

In this activity students work in teams to create a class garden, bringing in coffee grounds and other compostable materials from the local coffee stores. They design and build a planter box.

In a second stage they design and carry out a science experiment by using coffee grounds on test plants and no coffee grounds on the control plants and compare the difference. They will have to set up a strategy to measure and to record plant growth consistently.

Considerations

- Students work in teams to create a class garden,
- It is necessary to act in accordance with the learning approach: learning by doing!
- Students will have to set up a strategy to design and build planter boxes and use them to carry out scientific experiments to compare vegetable growth on different kinds of soils and measure/record plant growth consistently.

Aim of the Activity

- To learn about scientific methods by conducting experiments,
- To improve the ability of spatial reasoning when designing plant boxes,
- To gain awareness of recycling concepts,
- To know about fertilization and compost preparation,
- To compare vegetable growth on different kinds of soils,
- To improve communication skills when collecting grounds from coffee shops and presenting the idea of using it as compost.

Activity Process

Before Activity

During the activity:

At this stage, the teacher asks the following research questions:

- Allowing students to work in teams
- Using recycled material,
- Improving usage of information materials for theoretical research,
- When conducting experiments, attention should be paid to the preparation, data collection and reporting.

Duration of activity:

At this stage, the teacher asks the following research questions:

- 1-3 hours to search for information in advance,
- 2 hours design challenge for educators (without collecting materials),
- 2 hours to design plant boxes,
- Time to collect coffee grounds from local cafeterias, bars, cafes...
- 1 hour to prepare soil mixtures,
- 1 hour to plant,
- Time for the plant growth watercress ,
- The time to collect growth data,
- 2 hours to data analyses,
- 1 hour of reporting and discussion of the findings with the class.

Let's Start

1 Research and material choice

1. Teacher lets students work in teams. Each student performs different tasks in different stages. It is important that students gain awareness of this at the introduction of the project.
2. Search for ways to find coffee grounds. Students can visit coffee shops, cafes and shopping malls. Talk about the activity and its benefits, and convince them to give coffee grounds (Picture 2).



Picture 2. Find coffee grounds



Picture 3. Investigation

3. To prevent foreign plants from damaging our plants, students are asked to learn about fertilizer use and pesticides use when mulching.
4. When growing plants, they are asked to investigate the use of coffee grounds. Ask the students for example "Does the coffee protect the soil from foreign plants?" Students prepare, organize and do the activity (Picture 3).



- List the benefits of using coffee grounds you researched,
- Look which plants can use coffee grounds and decide which ones to plant at school,
- Design boxes to plant your plants and make them from waste materials.
- Prepare the soil to grow your plants (use the same soil for all but add different amounts of coffee grounds): prepare boxes with different percentages of coffee grounds-soil and 1 box without coffee-grounds (only the same soil). The last one will be used as a control to compare with the coffee-grounds boxes (Picture 4).



Picture 4. Preparing coffee soil

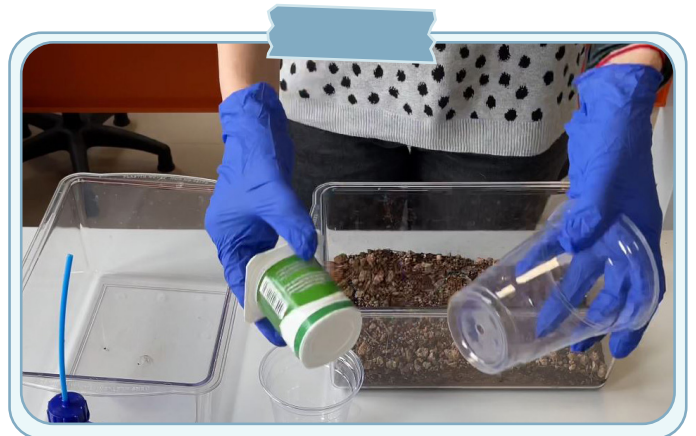
2

Design plant boxes, draft plant-labels.



Design a planter box.

Note: Should be portable and should be a prototype of the economic and ecological area, recycle materials should be used (Picture 5).



Picture 5. Choose reusable materials



Water of your plants (Picture 6)



Picture 6. Water your plants.



Please choose re-usable materials for your box. You can also design your box by wood. You can see the example below.



3 Observe the growth of the plants.

Example of a table to register the growth of plants and assess impact of the coffee grounds.

Weeks		Without coffee fertilizer				With coffee fertilizer			
		#1	#2	#3	#4	#5	#6	#7	#8
#1	Date: / /							
	Height of plant								
	Number of leaves								
	Notes:							
#2	Date: / /							
	Height of plant								
	Number of leaves								
	Notes:							
#3	Date: / /							
	Height of plant								
	Number of leaves								
	Notes:							
#4	Date: / /							
	Height of plant								
	Number of leaves								
	Notes:							

Closure

4 Questions.

Ask the students the following questions.

- What vegetables will be planted?
ex. watercress, sunflowers ,...
- What percentage of the coffee ground is good for plants?
- What materials will be needed?

Assesment

Students are asked to contact local stores again and invite them to watch their projects. A dashboard or poster is required to thank the place for the coffee.

Apps available for the poster:

- Piktochart (<https://piktochart.com/>)
- Canva (<https://www.canva.com/>)

Students report the results of the effects of coffee grounds on the plant's growth. It is asked to observe which ratio of coffee grounds/soil works best and to link the project to the concept of circularity and sustainability. They discuss whether it would be beneficial to reduce waste to invest more in the fertilizer made with the waste coffee.

The design of students can be displayed within the school. Different products can be created by diversifying waste materials used.

Evaluation

The design of students can be displayed within the school. Different products can be created by diversifying waste materials used.

Goals	Must be Improved (1)	Medium (2)	Good (3)	Very Good (4)
Express yourself	(.....)	(.....)	(.....)	(.....)
Present an idea	(.....)	(.....)	(.....)	(.....)
Supply materials	(.....)	(.....)	(.....)	(.....)
Getting required Safety Precautions	(.....)	(.....)	(.....)	(.....)
Design visualization	(.....)	(.....)	(.....)	(.....)
Total				

Links

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