MODULE III

Lesson Plan 3

Summary

Lesson title

Building a drip irrigation system from recycled materials

Duration	45 minutes
Proposed student's age range	10-12

Lesson summary

This session focuses on the importance of responsible water use, highlighting its crucial role in the current climate crisis, especially in agriculture. Students will learn about drip irrigation, an efficient method of water use, and then, in groups, will build their drip irrigation system using recycled bottles and materials.

Learning outcomes

Purpose/Learning Objective

- Understand the importance of responsible water use in the current context of the climate crisis.
- To know the main drip irrigation systems implemented in agriculture.
- Promote the use of drip irrigation systems.
- Promote the responsible use of water.

Intersecting objectives

- Encourage collaboration and teamwork.
- Promote environmental awareness and social responsibility.
- Raise awareness about the importance of respecting and caring for the environment.

Connection to SDGs

This theme is aligned with the following SDGs:
SDG 6 "Clean Water and Sanitation" - Target 6.4 by 2030, significantly increase the efficient use of water resources in all sectors and ensure the sustainability of freshwater withdrawals and supplies to address water scarcity and significantly reduce the number of people suffering from water scarcity.

SDG 12 "Responsible production and consumption" - Target 12.2. By 2030, achieve sustainable management and efficient use of natural resources.

SDG 13 "Climate Action" - Target 13.3. Improve education, awareness, and human and institutional capacity for climate change mitigation, adaptation, impact reduction, and early warning.

Implementation

Facilitation

- Making groups of 2 students to carry out this activity is recommended. The total number of students per group will depend on the material and tools available.
- Make sure all materials for making drip irrigation systems are available and organised.
- Use recyclable or recycled materials whenever possible.
- Double the total material required to avoid stock-outs.
- Provide clear examples and guidelines or videos for each step of the activity.
- Controls and guides the groups during the activity. Resolves all the doubts that the students may have.

Resources required

- Projector or screen.
- Plastic bottles with caps.
- Scissors.
- Nail or punch.
- Cotton swabs.
- Glue or silicone gun.

Ideas for follow-up

- From the system created, students can build a greenhouse or small agricultural garden where these drip irrigation systems are used.
- Research other methods of drip irrigation.

Source / Materials & class preparation

Video of construction of a drip irrigation system:
https://www.youtube.com/watch?v=J37YKp7IcVQ
Link with examples for the construction of different drip systems using bottles:
https://www.wikihow.com/Make-a-Drip-Irrigator-from-a-Plastic-Bottle
Other links or videos of interest:
https://www.youtube.com/watch?v=uGHk0CNS2Ys
https://www.youtube.com/watch?v=J37YKp7IcVQ
https://www.youtube.com/watch?v=ki58sNaDD-o

Lesson Outline

Timing	Instructions step-by-step
15 min.	Topic Introduction. Explains the importance of proper water management, the climate crisis, and how drip irrigation helps conserve water in agriculture.
10 min.	Presentation of the main drip irrigation methods, techniques, and systems used in agriculture.
5 min.	Explanation of the system to be built and establishment of the working groups.
10 min.	Construction of the drip system. Steps to follow: - Take the bottle and, with the help of scissors or an awl, make a small hole on one side at the bottom of the bottle.



Figure 3.3.1 Making a hole in one side of the bottom of the bottle. Source: Derouy Dora. YouTube channel. Link: https://www.youtube.com/watch?v=J37YKp7IcVQ

- Also, make a small hole in the centre of the bottle cap.

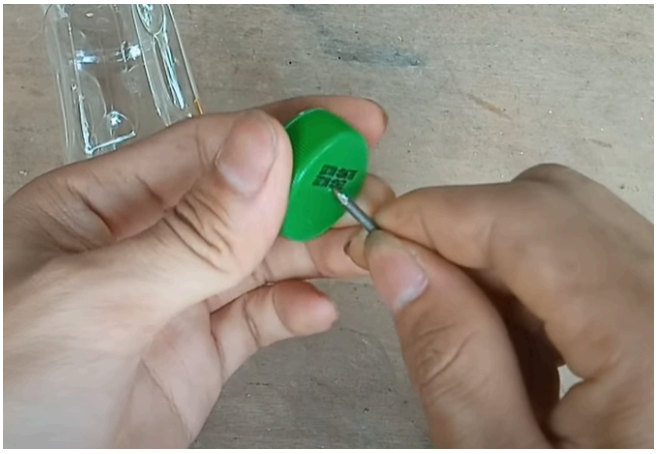


Figure 3.3.2 Making a hole in the bottle cap. Source: Derouy Dora. YouTube channel. Link: https://www.youtube.com/watch?v=J37YKp7IcVQ

- Take a cotton swab and cut it in half.



Figure 3.3.3 Cut the cotton swab in half. Source: Derouy Dora. YouTube channel. Link: https://www.youtube.com/watch?v=J37YKp7IcVQ

- Place one of the cotton swab halves into the hole in the stopper, ensuring the cotton end is outside the bottle. Use glue or silicone to attach the swab to the stopper so the joint is airtight. Although this step is not essential, it will help reduce water evaporation.



Figure 3.3.4 Attachment of the swab to the bottle cap. Source: Derouy Dora. YouTube channel. Link: https://www.youtube.com/watch?v=J37YKp7IcVQ

- Insert the other half of the cotton swab into the hole at the base of the bottle so that the cotton end is facing out. Use glue or silicone to seal the joint and prevent water from spilling.



Figure 3.3.5 Glue one of the swab halves to the bottom of the bottle. Source: Derouy Dora. YouTube channel. Link: https://www.youtube.com/watch?v=J37YKp7IcVQ

- Fill the bottle with water and place it near the stem of a plant. Make sure the cotton swab at the base of the bottle is as close to the stem as possible.



Figure 3.3.6 Final result of the drip irrigation system. Source: Derouy Dora. YouTube channel. Link: https://www.youtube.com/watch?v=J37YKp7IcVQ

- Finally, check that the water drips slowly through the swab.

**It is important to note that this system is not the only one that can be manufactured. In the Sources and Materials section and the Annexes section, there are different links and images with other proposals (Figures 3.3.7 and 3.3.8).

5 min.	Check the operation of the system.

Formative assessment

- Participation and collaboration in the groups will be evaluated throughout the activity.

- The construction of drip irrigation systems and their functionality will be evaluated, and their design, functionality, and originality will be assessed.
- It is also proposed as a method of evaluation that students answer the following questions:

Evaluation questionnaire:

1. Explain how the drip irrigation system you built in class helps conserve water compared to other irrigation methods.
2. Describe the steps you followed with your team to design and build the drip irrigation system. What challenges did you face and how did you solve them?
3. Why is responsible water use important in agriculture, and how do you think drip irrigation can contribute to solving problems related to the climate crisis?
4. Reflect on applying what you learned about drip irrigation and responsible water use in your home or community. What changes would you suggest to improve water use in your environment?

Feedback

Net Promoter Score (NPS) is a widely used metric to gauge the loyalty and satisfaction of customers or, in an educational context, students. It measures the likelihood of the students recommending the lesson or course to others. Here is how you can describe and implement NPS:

Develop the NPS Question:

- Primary Question: "On a scale of 0 to 10, how likely are you to recommend this lesson to other students?"
- Follow-up Questions: "Why did you choose that score?" and "How can we improve this lesson?"

Collecting Responses:

A template for collecting feedback using paper surveys is shown in the Annexes.

- Digital Surveys: Use online tools like Google Forms, SurveyMonkey, or Typeform to distribute the NPS questions to students.
- Paper Surveys: Hand out paper questionnaires at the end of the lesson for students to fill out.
- Interactive Applications: Utilize interactive apps like Quizziz, Mentimeter, or Kahoot! to gather real-time responses.

Classifying Responses:

- Promoters (Score 9-10): Students who are highly satisfied and likely to recommend the lesson.
- Passives (Score 7-8): Students who are satisfied but not enthusiastic can switch their opinions easily.

- Detractors (Score 0-6): Students who are dissatisfied and unlikely to recommend the lesson; may provide constructive criticism.

Calculating the NPS:

- Formula: NPS = % of Promoters - % of Detractors.
- Interpreting the Score: NPS ranges from -100 to +100. A positive score (above 0) is generally good, and a score above 50 is excellent.

Analysing and Using Feedback:

- Review additional comments to understand the reasons behind the scores.
- Identify patterns and specific areas for improvement from detractors and passives.
- Use positive feedback from promoters to reinforce successful aspects of the lesson.

Annexes

Examples of drip irrigation systems with bottles:

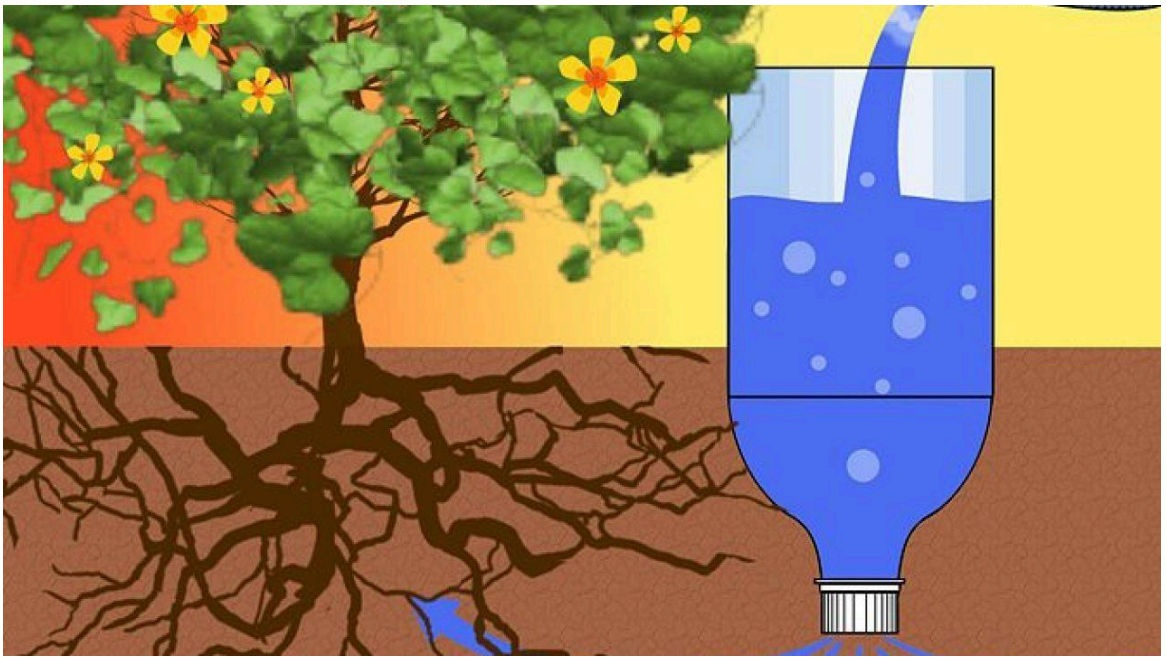


Figure 3.3.7 Example 1 of a drip irrigation system. Source: Homemade-furniture.com. Link: https://homemade-furniture.com/square-foot-planter/bottle-irrigation/

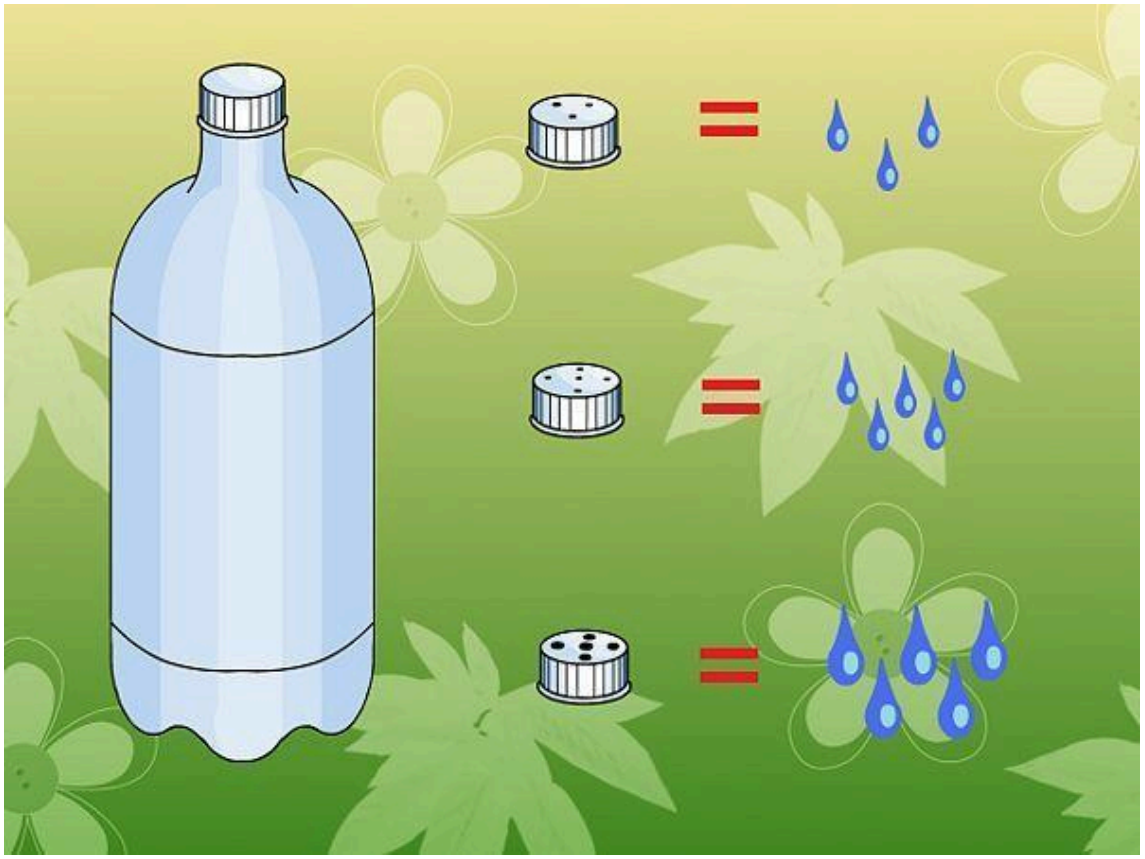


Figure 3.3.8 Example 2 of a drip irrigation system. Source: Pinterest. WikiHow. Link: https://ca.pinterest.com/pin/3-ways-to-make-a-drip-irrigator-from-a-plastic-bottle-wikihow--555631672747741173/

QUESTIONNAIRE TO COLLECT FEEDBACK ON THE LESSON

On a scale of 0 to 10, how likely are you to recommend this lesson to other students?

0	1	2	3	4	5	6	7	8	9	10

Not likely at all Extremely likely

Why did you choose that score?

How can we improve this lesson?