Life Terra

SCIENTIX
The community for science education in Europe

Terra Mission MOOC
Teaching Sustainability for Action

Water means life

Martina Galić, Tihana Modrić

This course has been developed by Life Terra, co-financed by the European Commission through the LIFE Programme (LIFE19 CCM/NL/001200). The course is additionally supported by Scientix 4 (Grant agreement N. 101000063). Scientix has received funding from the European Union's H2020 research and innovation programme and is coordinated by European Schoolnet (EUN). The content of the document is the sole responsibility of the organizer and it does not represent the opinion of the European Commission (EC), and the EC is not responsible for any use that might be made of information contained.

Water means life

A Life Terra Learning Scenario

Author(s)

Martina Galić, Tihana Modrić

Summary

Water scarcity affects more than 40% of people worldwide. Global warming due to climate change increases this rate even more. One of the goals of Sustainable Development is that everyone has the right to access safe and accessible drinking water. Therefore, we must protect forests, mountains, wetlands and rivers.

In this learning scenario through a variety of activities, students will understand the importance of water, water circulation and how we can make the best use of water in our daily lives. Moreover, they will improve their language, creative and mathematical skills through meaningful and lasting experiences.

Key elements

Global warming, the importance of water for life, rational use of water, water circulation in nature, water pollution, the importance of water for life, rational use of water

Overview	
Subject	Mathematics (STEM) Natural Sciences (STEM) Geography (non – STEM) Art culture (non – STEM)
Topic	Mathematics: volume of a cube, units of measurement for volume and money Science: water, water circulation in nature, water pollution Geography: water, the importance of water for life, rational use of water Art culture: color, rhythm on the surface, stop animation
Age of students	12 – 13 years
Preparation time	3 hours
Teaching time	4 hours and 30 minutes (4 sessions)
Online teaching material	• Youtube - How to make good use of rainwater: https://youtu.be/Xyv5Wkkdpk0 • YouTube - IWRM Compost Toilet Educational Video https://youtu.be/rIfNs_PzmAg • YouTube - How Wetlands Work: https://youtu.be/OKggI7WkRp4 • Shutterstock: https://www.shutterstock.com/video/clip-29270107-big-h2o-water-molecule-isolated-on-white • Padlet: https://padlet.com/martinabanovac/8pv2xbda8lv9jiqf • Gynzy: https://www.gynzy.com/teach/en/board/fc518a62-b192-4de9-8a7e-d9b9ad8b7742 • iStock: https://bit.ly/3oyEVin

	• Canva/PosterMyWall: https://www.canva.com or https://www.postermywall.com • Stop motion studio: https://www.cateater.com/ • Kizoa: https://www.kizoa.com/
Offline teaching material	• tablet • a petri dish • table lamp (incandescent lamp) • water • clay • ice cubes • a large aquarium (covered with plastic wrap) or a plastic shoe box with a lid • watercolor accessories • scissors
Resources used	• https://youtu.be/Xyv5Wkkdpk0 • https://youtu.be/rIfNs_PzmAg • https://youtu.be/OKggI7WkRp4 • https://www.shutterstock.com/video/clip-29270107-big-h2o-water-molecule-isolated-on-white • https://padlet.com/martinabanovac/8pv2xbda8lv9jiqf • https://www.gynzy.com/teach/en/board/fc518a62-b192-4de9-8a7e-d9b9ad8b7742 • https://bit.ly/3oyEVin

License

Aim of the lesson

The students will understand evaporation, condensation and precipitation, as well as ways to save water through interactive and hands-on learning activities. They will also understand and learn the vocabulary related to capacity.

Trends

STEAM Learning: Increased focus on Science, Technology, Engineering, Mathematics subjects in the curriculum.

Collaborative Learning: a strong focus on group work.

Active Learning: students are actively engaged with the lessons through discussions, problem solving, experiments and other methods.

Peer learning: students learn from peers and give each other feedback.

21st century skills

- Information, Media and Technology Skills (Information, media and ICT Literacy)
- Social and Intercultural Skills (Awareness and community benefit)
- Learning and Innovation Skills (Critical Thinking and Problem Solving, Communication and Cooperation).

STEM Strategy Criteria

Elements and criteria	How is this criterion addressed in the learning scenario
Instruction	
Personalization of learning	This lesson is intended to address the different learning needs and interest of students.
Problem and project-based learning (PBL)	Students receive information about the problem of polluted water. Using data and your knowledge and experience shared their view on how to solve this problem.
Inquiry-Based Science Education (IBSE)	Problems and scenarios are presented to the students to solve them
Curriculum implementation	
Emphasis on STEM topics and competencies	Our curriculum emphasizes STEM key competences and STEM subjects.
Interdisciplinary instruction	
Contextualization of STEM teaching	
Assessment	
Continuous assessment	
Personalized assessment	Students receive feedback in different ways during the activities: peer review, team-work assessment
Professionalization of staff	
Highly qualified professionals	
Existence of supporting (pedagogical) staff	Staff is encouraged to support each other and work together, having the space and time to do so.
Professional development	We respect our colleagues' ideas; we share success and value each other's uniqueness
School leadership and culture	
School leadership	
High level of cooperation among staff	
Inclusive culture	
Connections	
With industry	
With parents/guardians	
With other schools and/or educational platforms	
With universities and/or research centers	
With local communities	

School infrastructure	
Access to technology and equipment	For some exercises the teacher can use tablets, laptops, and smartphones with internet connection.
High quality instruction classroom materials	School provides high quality instruction materials, and the staff is encouraged to create personalised resources for the students.

Lesson Plan

Describe here in detail all the activities during the lesson and the time they require.

Name of activity	Procedure	Duration
Mathematics		**1 hour**
Presentation of the topic	*Day (days) before : Divide the students into groups. On the day when you expect it to rain in the yard, place open models of cubes and squares. Put in as many models as you have group. Leave the models for 24 hours. The day before, ask students to ask their parents what their monthly household water consumption is and what the price of 1 m3 is. Talk to students about rainwater, do they know what rainwater is and how and why it is collected. Rainwater is water that originates from rain or other types of precipitation. Ask students how they would collect and use rainwater (for drinking, housekeeping, watering and irrigation, washing vehicles and equipment, pets or livestock…) and show them videos (https://youtu.be/Xyv5Wkkdpk0, https://youtu.be/rIfNs_PzmAg , https://youtu.be/OKggI7WkRp4).	20’
Group discussion	Students discuss the ideas looked at and present which of the ideas they could apply in their home.	15’
Learning about volume, units of measurement	The amount of rainwater is expressed in millimeters, and when it is said that 1 mm of rain has fallen, it means a layer of water 1 mm thick per 1 m2. Ask students to calculate how many liters of water it is. Have students measure how much water was pouring into the containers they left in the yard. After measuring, each group calculated how many mm of rain fell in the past 24 hours. Ask students to calculate how many days it should rain to be enough for their monthly household consumption when it would rain like that day (activity set the day before). Talk to students about the benefits of collecting rainwater. Explain	25’

	how we can collect rainwater and conserve it for household use, thus reducing tap water consumption. Emphasize that they are not only economic, but also ecological because by collecting rainwater we reduce the possibility of erosion and floods and save water from underground sources, but also social because we are more resistant to droughts and climate change.	
Natural Sciences		**1 hour 30 mintes**
Intro	Get students interested in the **Who Am I?** (https://www.shutterstock.com/video/clip-29270107-big-h2o-water-molecule-isolated-on-white)	5’
Investigation	Instruct students to monitor water circulation in nature by conducting experiments. Divide them into groups (3-5 students). Have each group set up the experiment according to the illustration.  It is necessary to prepare (per group): • a petri dish • table lamp (incandescent lamp) • water • clay • ice cubes • a large aquarium (covered with plastic wrap) or a plastic shoe box with a lid. **Instructions:** Put a mountain (made of clay) in a plastic box / aquarium and fill it with water (¼ mountain height) and cover. Place a petri dish with ice cubes and a lamp over the ocean on top of the mountain. Ask students to answer the questions in the first two columns of the Padlet (https://padlet.com/martinabanovac/8pv2xbda8lv9jiqf) that you have prepared in advance for each group before the experiment:	40’

	1. What do you think will happen? **2.** Why do you think that? What evidence do you have? Have students carefully observe during the experiment and record in notebooks any changes they see and answers to questions you have previously prepared for each group. What does water represent in the experiment? Which part of the setup simulates evaporation / condensation / clouds / energy source? How could we include transpiration in this experiment? Why is water considered a renewable resource? Which parts of the water cycle are not present in the experiment? After the experiment, have them fill in the third column in the Padlet: **3.** What really happened? What did we prove by that? What processes allow water to circulate in nature?	
Discussion and explanation	The group compare their predictions from the beginning of the activity and the actual results after the end of the experiment. Have a few students present the conclusions to the whole class using their notes, and then discuss their accuracy. Take a look with the students https://www.gynzy.com/teach/en/board/fc518a62-b192-4de9-8a7e-d9b9ad8b7742 and explain what happened in the experiment.i	45’
Geography		**1 hour**
Watching pictures and discussion	Ask students what the importance of drinking water is and whether they use it rationally. Show them pictures showing polluted water (https://bit.ly/3oyEVin) and ask them what would happen to the living world if the water was not drinkable. Focus the conversation from the illness and death of certain animals and the inability to grow certain plants, through the consequences it has on other plants and animals and the balance of the ecosystem, to the consequences it has on human health and well-being in those areas, and what would happen with peace , migration, etc.	20’
Investigation	Divide students into four teams. Let them share within the team and explore the answers to the following questions online: • How do I pollute and irrationally consume water in my daily life? • How does building large projects affect water? • How do other human activities affect water? • How to protect water resources? Students in teams discuss the questions and answers they have found, working on a poster using the online graphic editor https://www.canva.com or https://www.postermywall.com , choosing observations and answers to use in presenting common answers to questions. Each team then presents their answers. Team members can complement each other.	40’

	After presenting all the teams, encourage the students to orally present the similarities and differences of the teams' observations and answers, and to single out the best answers to the given questions and present a common solution.	
Art		**1 hour**
Intro	We verbally explain to the students the process of making stop animation and say that by making stop animation they will tell the story of the obtained topic.	15’
Learning products	Randomly select teams of 3 to 4 students. Prepare pieces of paper in advance with topics related to the path of water that students will need to present. 1. rainfall and collection, storage and use of rainwater 2. change of aggregate water conditions and water circulation through nature 3. water pollution by industry, waste and in households Have each team pull out a piece of paper. Instruct students to prepare watercolor accessories and scissors. Watercolor paper that will serve as a background when shooting stop animation. Once students have defined all the segments they want to show through their story and determined the static and dynamic parts and color palette, have them create and then start animating. Using a mobile phone or tablet, have students gradually photograph the water journey through the background, and then link the photos into the animation using the digital tool https://www.cateater.com/. Instruct the teams to give you their short animations, which you will use in the tool https://www.kizoa.com/ to connect into one whole and thus create a scenario that chronologically shows the water journey and the connection between the appearance and color of water depending on the environment through which it passes.	45’

Assessment

Students will be evaluated through activities conducted during different sessions:

- Working in groups exploring the process of water circulation in nature

- Participation in collaborative walls and discussions.

- Posters with review and creativity for their design.

- Creating stop animation.

- Active participation in all activities.

Student feedback

Students leave their feedback on the attached slip.

They write their name on it, and next to each of the subjects they indicate whether they fully understood, well understood or they need additional help.

Example:

Name:			
	I understand everything perfect	I understand everithing good	I need help, I have difficulties with this topic
Math			
Natural Sciences			
Geography			
Art			

Teacher's remarks

If students do not manage to do some of the activities, feel free to allow them to finish their work at home and return to class.

The scenario is better spent during rainy days due to the first activity.

About Life Terra

Life Terra is one of Europe's largest climate action initiatives. It seeks to bring people together to plant 500 million trees in 5 years, prepare future generations, drive greener policies across the board and generate investment and growth in green jobs. The main objectives are to:

- Engage a record number of individual citizens and stakeholders to take action towards climate change mitigation by facilitating the planting of 500 million trees in Europe by 2025.
- Connect these participants through an innovative and comprehensive Web platform and app that organizes and streamlines the planting process for scaling up.
- Innovate in the latest monitoring and satellite technologies to provide citizens and specialists alike with precise and transparent data on trees planted.

Inspire the next generation of EU citizens to thrive in the face of climate change challenges, through a unique STEM-based sustainability education program.

Annex (if needed)