Once upon a time there were rivers full of water

Secondary: (ages 11 – 14)	Science

This activity lays out the big question of our global water problem. Students often have difficulty truly visualizing water scarcity. Students will first analyse the use of water in daily life and then experience the effects of water scarcity. In addition, they will visualize the importance of water to humans and brainstorm ways that they can reduce their own water usage. Through critical and creative thinking and problem solving, students will create novel solutions and illustrate their ideas.

Time allocation	1-2 lesson periods
Subject content	Understand importance of water and problem of water scarcity Understand how human actions modify the physical environment Understand how physical systems affect human systems
Creativity and critical thinking	This unit has a **creativity** and **critical thinking** focus: • Make connections between water shortage and own life • Consider different perspectives on water shortage • Generate and play with unusual ideas to propose methods of managing problem of water shortage
Other skills	Collaboration
Key words	water; shortage; climate change; conservation; scarcity; drought

Products and processes to assess

A discussion of challenges related to water scarcity enables learners to transfer scientific skills to a variety of contexts and everyday situations. Their work aims to display a good scientific understanding of the reasons for water scarcity and its effects, as well as methods of water conservation. The students' rationale for their choices should be well-developed and supported, with novel ideas or perspectives being introduced into their discussions, pamphlets, and writing. At the highest level of achievement, students communicate a deep understanding of the complexity of the issue, generate interesting ideas for addressing it, state their opinion clearly and support it with several good reasons from reliable sources.

Teaching and Learning plan

This plan suggests potential steps for implementing the activity. Teachers can introduce as many modifications as they see fit to adapt the activity to their teaching context.

Step	Duration	Teacher and student roles	Subject content	Creativity and critical thinking
1	Lesson plan 1	Teacher writes the word WATER on the board and discusses with students what water is used for and why it is so important. Questions can be posed such as: a) Why do we need water? b) What types of activities is water used for? c) Where and when do you use water the most? d) Where do you think the water that you use comes from? e) What is the difference between fresh and salt water? f) What are the properties of water that make it so important?	Describing the importance of water in daily life activities Learning about properties of water	Identifying and questioning their own assumptions about the importance of water
		As appropriate and time permitting, students could also be asked to undertake some independent inquiry on these questions or additional questions about water that they come up with themselves.		Making interesting connections between water and their own life and lifestyle
		Teacher prompts students to work in groups to find and approximate the amount of water used in a day.	Identifying rough daily water consumption	
		Teacher facilitates discussion on: Do you think it is possible to run out of water? What would happen if our city had a huge shortage of water? What could we do to protect ourselves from the consequences?	Analysing the elements of the problem and interpreting them	
2		Teacher asks students to watch the following video carefully. https://www.youtube.com/watch?v=NEyxW73F5Fc (If time permits, this video can also be shown https://www.youtube.com/watch?v=fLMn2P5q1ho) After watching the videos discuss the following: • Have you ever wondered why there is such an incredible shortage of drinking water around the world? • Is drinking water dependent on the climate and weather of an area? • Are humans responsible for the shortage of water?		Considering several perspectives on the problem of water shortage
		As appropriate teacher may introduce the idea of the water cycle and/or falling water tables here or ask students to engage in some independent inquiry.	Building knowledge of the water cycle and falling water tables	
		Divide students into groups of four. Ask them to imagine themselves in a place with water scarcity. Ask them to discuss in groups and write the problems that would arise in their notebooks. They should also cover the reasons for the shortage, the ways they can	Highlighting the problems and reasons for water shortage and steps taken to overcome shortage	Generating and playing with unusual ideas to propose methods of managing the problem of water shortage

		conserve water and avoid the conditions that can lead to a shortage of water, how water can be used more efficiently. If desired, students can be prompted to problem-solve creatively as appropriate e.g. How would you prioritize your use of water? How would you wash your clothes/dishes/self if you had very little access to water? Ask them to share the points discussed in the individual groups with the class. Provide clarifications on scientific and technical issues and encourage students to examine their assumptions (e.g. so you're assuming the river water is clean enough? Etc.) Discuss with the students: What measures can be taken by them on an individual level to stop wastage of water? What measures can the government take to stop wastage of water and help people to survive in areas with a shortage of water? Introduce the term 'rainwater harvesting' and ask them to reflect on the strengths and limitations of the ideas that have been presented	Understanding of water use and management issues from a scientific and technical perspective	Reflecting on the implications on other domains of different potential measures to overcome water shortage Explaining the strengths and limitations of a scientific solution
3	Lesson 1-2	*Create a Pamphlet: Group activity* People all over the world need to learn about conservation. One method used to teach people is pamphlets with lots of pictures. Create a pamphlet that can be used anywhere in the world to show people how to use water judiciously. Students can be challenged, as appropriate, to create something that really stands out as a new and interesting way to persuade people of the importance of water conservation. Homework can be assigned to students: Make a case study of a place which has shortage of water, highlighting the problems and reasons for the shortage of water and the steps taken to overcome the shortage. Students can also list the ways in which they can conserve water in their own homes, and think of ways to share what they learned with their family.	Synthetizing and presenting scientific information about water conservation in a clear manner, including in visual form Learning about particular areas with water shortage	Envisioning and producing a meaningful and novel pamphlet on water conservation (as appropriate to level of student's experience)
4	Lesson 1-2	Tell students they have been assigned the role of a Task Force Chairman and it is their responsibility to introduce policies and measures to conserve water and make their zone water proficient. Ask students to read about water shortage in Cape Town. Inform students that there is a similar situation in their country and it is foreseen that their country will run dry very soon and ask that they analyse the water situation in their locality and make connections. Tell them to write and justify ideas for how to make their zone water proficient.	Developing an understanding of complexity of issue by investigating and synthesizing information from different viewpoints	Making connections between their own locality and water conservation Reflecting on chosen solutions relative to possible alternatives

Resources and examples for inspiration

Web and print
➢ Water shortage videos (links given above)
Other
➢ Notebooks
Opportunities to adapt, extend, and enrich
➢ A variety of lesson plans and teaching tools on water scarcity can be found at https://thewaterproject.org/resources/ ➢ Students can be set various water challenges. See, for example, https://www.studentsrebuild.org/sites/default/files/files/Water%20Challenge%20Curriculum_FNL.pdf

Creativity and critical thinking rubric for science

- Mapping of the different steps of the lesson plan against the OECD rubric to identify the creative and/or critical thinking skills the different parts of the lesson aim to develop

	CREATIVITY Coming up with new ideas and solutions	Steps	CRITICAL THINKING Questioning and evaluating ideas and solutions	Steps
INQUIRING	Make connections to other scientific concepts or conceptual ideas in other disciplines	1,2,4	Identify and question assumptions and generally accepted ideas of a scientific explanation or approach to a problem	1-4
IMAGINING	Generate and play with unusual and radical ideas when approaching or solving a scientific problem	2-4	Consider several perspectives on a scientific problem	2
DOING	Pose and propose how to solve a scientific problem in a personally novel way	1-4	Explain both strengths and limitations of a scientific solution based on logical and possibly other criteria (practical, ethical, etc.)	2