

Citizen Science 2.0

65+ Minute Lesson

Suggested Grades 6-12

All seasons

Introduction to Citizen Science

Background

Citizen Science is the involvement of everyday people in making scientific observations of the world around us. These observations address real world problems and contribute to scientific research projects. Citizen Science initiatives provide opportunities for the public to collect data in the field and report findings to databases used by professional scientists. Amateur scientists have long been contributing meaningful observations to science. This growing area formalizes the collaborations between citizens and the scientific community. The SciStarter database contains over 1,200 projects in all areas of science. In this lesson, students will explore SciStarter to discover projects that interest them and consider how to adapt or reconstruct a project for Cuyahoga Valley National Park.

Essential questions

* What is Citizen Science?
* How is Citizen Science valuable to the scientific community?
* What Citizen Science projects can you implement in Cuyahoga Valley National Park?

Learning objectives

Students will:

* Understand the importance of everyday people contributing to science.
* Be able to discuss different Citizen Science projects occurring globally.

Materials

*For instructor:*

* Computer access

*For each student:*

* Computer access
* SciStarter Exploration handout
* Why Citizen Science for Water Quality? Handout
* Access to the article, “Why Citizen Science for water quality?” from NASA Terra
  + <https://terra.nasa.gov/citizen-science/water-quality>

Lesson overview

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| --- | --- |
| **Activity** | **Estimated duration** |
| Opening questions | 5 minutes |
| SciStarter exploration | 15 minutes |
| Presentation preparation | 20 minutes |
| Presentation | N/A minutes |
| Additional reading and handout: Why Citizen Science for Water Quality? | 25 minutes |
| Total | 65 minutes + presentations |

Key concepts and vocabulary

**Citizen Science** (from SciStarter: <https://scistarter.org>):

a collaboration between scientists and those of us who are just curious or concerned and motivated to make a difference. Also called “Community science”, “Amateur science”, “crowdsourced science”, “volunteer monitoring”, and “public participation in scientific research”. Four common features of citizen science practice:

* anyone can participate
* participants use the same protocol so data can be combined and be high quality
* data can help real scientists come to real conclusions
* a wide community of scientists and volunteers work together and share data to which the public, as well as scientists, have access

**Water quality** (from the United States Geological Survey (USGS)):

a measure of the suitability of water for a particular use (ex: drinking, recreation) based on selected physical, chemical, and biological characteristics.

**Watershed** (from the USGS):

an area of land that drains all the streams and rainfall to a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel.

Activities

**Opening questions (5 minutes)**

Ask students the following questions:

* What do you think Citizen Science is?
* What does it mean to be a scientist?

**SciStarter exploration (15 minutes)**

Provide each student with a copy of the Introduction to Citizen Science: SciStarter Exploration handout which contains the link to SciStarter, an online directory for Citizen Science projects. Have students read the SciStarter introduction to Citizen Science (follow link on handout) to learn more about the vast world of Citizen Science and to help them answer questions in the handout. Then go to the home page by selecting the logo in the upper left-hand corner of the page or by searching for SciStarter using a web browser. Have students select “Project Finder” in the top menu and browse through the projects to find one that interests them.

**Presentation preparation (20 minutes)**

Have each student prepare a one-minute presentation on a Citizen Science project of their choice. The seven bullet points at the bottom of the Introduction to Citizen Science: SciStarter Exploration handout serve as a template for the presentation content.

**Presentation (N/A minutes)**

Have students present their selected Citizen Science projects. Emphasize that students should consider how each project could be adapted to Cuyahoga Valley National Park.

**Additional reading and handout: Why Citizen Science for water quality? (25 minutes)**

Introduce the definition of a watershed. Assign the NASA Terra article titled, “Why Citizen Science for water quality?”. This article focuses specifically on the importance of Citizen Science in assessing water quality in watersheds. Students should read the article and answer the questions on the Introduction to Citizen Science: Why Citizen Science for Water Quality? handout.

Teaching objectives

* Understand the value of Citizen Science
* Introduce Citizen Science projects that excite students
* Adapt Citizen Science projects to Cuyahoga Valley National Park

Ohio’s Learning Standards

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| --- | --- | --- | --- |
| **Grade** | **Topic** | **Sub-Topic** | **Code** |
| 6 | Reading for Informational Text | Key Ideas and Details | RL.6.1 |
| 6 | Reading for Informational Text | Craft and Structure | RL.6.4 |
| 7 | Reading for Informational Text | Key Ideas and Details | RL.7.1 |
| 7 | Reading for Informational Text | Craft and Structure | RL.7.4 |
| 8 | Reading for Informational Text | Key Ideas and Details | RL.8.1 |
| 8 | Reading for Informational Text | Craft and Structure | RL.8.4 |
| 9-10 | Reading for Informational Text | Key Ideas and Details | RL.9-10.1 |
| 9-10 | Reading for Informational Text | Craft and Structure | RL.9-10.4 |
| 11-12 | Reading for Informational Text | Key Ideas and Details | RL.11-12.1 |
| 11-12 | Reading for Informational Text | Craft and Structure | RL.11-12.4 |
| 9-12 | Environmental Science | Earth’s Resources | ENV.ER.3 |
| 9-12 | Environmental Science | Global Environment Problems and Issues | ENV.GP.2 |

Next Generation Science Standards

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| --- | --- | --- | --- |
| **Grade** | **Topic** | **Sub-Topic** | **Code** |
| 6-8 | Earth and Space Sciences | Earth and Human Activity | MS-ESS3-3 |

**Teacher Copy**

**Introduction to Citizen Science:** SciStarter Exploration

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Go to the SciStarter website at <https://scistarter.org/citizen-science> to learn more about Citizen Science. Please read the article and answer the following questions.

1. What are the four common features of all Citizen Science projects?

1. Anyone can participate
2. Participants use the same protocol so data can be combined and be high quality
3. Data can help real scientists come to real conclusions
4. A wide community of scientists and volunteers work together and share data to which the public, as well as scientist, have access

2. What is the benefit of citizens contributing to science?

* Bridges gaps by connecting motivated people to projects that benefit from their time and dedication
* Helps scientists collect large samples which may not otherwise be possible
* Increased public participation may lead to policy changes after people take stake in the world around them

3. Is it necessary for someone to be a student or have a science background to participate?

* Absolutely not!

**Teacher Copy**

**Introduction to Citizen Science:** Why Citizen Science for Water Quality?

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Read the NASA Terra article, “Why Citizen Science for Water Quality?” (<https://terra.nasa.gov/citizen-science/water-quality>) and answer the following questions.

1. Why is water quality an important issue?

Water quality affects humans as well as biological communities. We need healthy water that is safe for human consumption and recreation and that supports biological communities.

1. What is one way that water quality can be evaluated?

Water quality can be evaluated through different tests such as color, odor, temperature, acidity, bacteria present, biological diversity, and more.

1. What are some of the substances carried by runoff that can decrease water quality?

Some substances include nutrients like nitrogen and phosphorus from fertilizer and sewage.

1. What happens when nutrient concentrations exceed their normal levels in a waterway?

Algal blooms occur

1. Describe the process by which Chesapeake Bay developed a dead zone.

Excess nutrients lead to algal blooms. Algae decomposition depletes oxygen in the water which can create dead zones.

1. Why is it important to monitor water quality on a regular basis?

Monitoring water quality regularly is a proactive approach that that seeks to avoid major issues and identify potential pollutants and other hazards as they arise.

1. Why is Citizen Science critical to water quality monitoring throughout a watershed?

Monitoring water quality across an entire watershed is beyond the capacity of the agencies that currently collect data. Having citizens contribute observations increases the amount of data collected throughout the watershed.

1. What role do satellites play in monitoring water quality?

Satellites can be used to monitor chlorophyll levels in bodies of water to see if there are correlations between water quality data and observed algal blooms.

**Introduction to Citizen Science:** SciStarter Exploration

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Go to the SciStarter website at <https://scistarter.org/citizen-science> to learn more about Citizen Science. Please read the article and answer the following questions.

1. What are the four common features of all Citizen Science projects?

2. What is the benefit of citizens contributing to science?

3. Is it necessary for someone to be a student or have a science background to participate?

After completing the introductory questions, travel to the SciStarter homepage by clicking the SciStarter logo in the left-hand corner. Next, select the “Project Finder” tab located in the menu at the top of the homepage. Use the search feature to browse the available Citizen Science projects. When you find a project that interests you, prepare a mini presentation of your findings. Your presentation should contain the following information:

* What Citizen Science project did you choose?
* A general description of the project
* In what locations are the data being collected?
* Who can collect data for the project?
* What is the goal of the project?
* How could this project be adapted to Cuyahoga Valley National Park?
* Include a picture that relates to the Citizen Science project

Finally, share your results with your classmates to learn about the variety of projects happening across the planet.

**Introduction to Citizen Science:** Why Citizen Science for Water Quality?

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Read the NASA Terra article, “Why Citizen Science for Water Quality?” (<https://terra.nasa.gov/citizen-science/water-quality>) and answer the following questions.

Why is water quality an important issue?

What is one way water quality can be evaluated?

3. What are some of the substances carried by runoff that can decrease water quality?

4. What happens when nutrient concentrations exceed their normal levels in a waterway?

5. Describe the process by which Chesapeake Bay developed a dead zone.

6. Why is it important to monitor water quality on a regular basis?

7. Why is Citizen Science critical to water quality monitoring throughout a watershed?

8. What role do satellites play in monitoring water quality?