

## Unit Plan Sample: Scientific Topics

		<b>Title of Unit Plan:</b>	Water (Hydrologic) Cycle
<b>Grade Level:</b>	6-8	<b>Subject Area:</b>	Earth Science/ Scientific Topics
<b>School Name:</b>		<b>Time Frame to Complete Lessons:</b>	Approximately 8-10 lessons

### Stage 1: Desired Results

#### Established Goals: (Standards)

**CS.DS1.** Display a sense of wonder and delight about the natural universe and its beauty.

**CS.DS2.** Share concern and care for the environment as a part of God's creation.

**CS.IS2.** Describe the relationship, elements, underlying order, harmony, and meaning in God's creation.

**MS-ESS2-4** Develop a model to describe the cycling of water through Earth's system driven by energy from the sun and the force of gravity.

#### Understandings:

- Students will understand the order, relationship, harmony and interrelatedness of all the elements involved in the water cycle.
- Students will understand how God manifests Himself through an ordered creation and how He provides for mankind.
- Students will delight in and appreciate the beauty and goodness of water as a resource to sustain life.

#### Essential Questions:

- Why do we find water beautiful and delightful?
- How does the water cycle sustain the earth?
- What are some possible effects of a damaged water cycle?
- Who is responsible for the environment?
- How can we be good stewards of God's ordered creation?

#### Students will know....

Students will be able to describe the order and relationship of all the elements of the water cycle and how this system is representative of God's orderliness and care of creation.

#### Students will be able to...

Students will be able to create a conceptual or physical model of the cycling of water through the earth's systems driven by the sun's energy and gravitational force.

Students will be able to share concern and care of the environment as a part of God's creation.

## Stage 2: Assessment Evidence

### Performance Task(s):

Students will be able to create a conceptual or physical model of the water cycle demonstrating how water changes its form when propelled by sunlight and gravity. Physical models may be constructed using found or recycled materials. Conceptual models must fully describe the process of water changing its state as it moves through the hydrologic cycle focusing on the effects of gravity and heat sources. Models may be constructed collaboratively by a small group or by an individual student.

Commitment, as a class, to The Water Project or other project to reduce waste and conserve water.

### Other Evidence:

Formative assessments: informal observation (pair/share activity); science journal entries with vocabulary and drawings. Quizzes. Exit slips. Completion of formative rubric for conceptual or physical model of water cycle.

### Summative:

Scoring rubric for conceptual for physical model of the water (hydrologic) cycle. Test (to include assessment of NGSS evidence for understanding of MS-ESS2-4: Connections.)

Writing activity with scoring rubric: Students will explain the necessity of the water cycle and clean water and how it relates to God's goodness and wisdom in His plan for humanity.

## Stage 3: Learning Plan

**Learning Activities: Selected (See NOTE at end of Stage 3: Learning Plan).**

### Day 1 - 2:

Discussion of the Care for Creation: Who is responsible for caring for creation? Has God simply left us as stewards or is He still involved? Why is care for our earth a requirement of the Catholic faith? How does caring for our environment show our care for God and our fellow man? How is man connected to his environment?

Students will have individual time to reflect on one (or all) of these questions and to answer them in their science journal prior to discussion.

### Resources:

USCCB. *Care for Creation*

<http://www.usccb.org/beliefs-and-teachings/what-we-believe/catholic-social-teaching/care-for-creation.cfm>.

United States Catholic Conference. (1994). *Catechism of the Catholic Church*. "God creates an ordered and good world", CCC# 299 through to "God carries out His plan: Divine providence", CCC #302 and CCC#306.

+++++

**Day 2:**

Continuation of discussion from Day 1: Why do we find water beautiful and delightful? Why are we attracted to it? Why do we like to feel it, hear it? Why do we find water good? Why do we associate water with purity? How has man's actions impacted the water cycle on a global level?

What can we do to help those who do not have access to clean drinking water?

Working with partners, students will perform a search and find using their tablets, computers, and/or dictionaries or art materials to design a poster, digital presentation, or the teacher might have students write an essay bringing awareness of ways that we can help to care for God's creation incorporating X(number) of vocabulary words.

Define vocabulary words for the unit and record them in a science journal. Use Pair/Share for each student to state the word and then the definition.

**Resource suggestions:**

*Educating to Truth, Beauty, and Goodness.* Use some of the questions provided under the headings to develop focused questions about water and its nature.

<https://cardinalnewmansociety.org/catholic-curriculum-standards/appendix-a/>

*The Water Cycle for Schools* <https://water.usgs.gov/edu/watercycle-kids.html> Interactive

Water Cycle Resource: <https://water.usgs.gov/edu/watercycle-kids-adv.html>

+++++

**Day 3-4:**

Teacher will demonstrate examples of ways that water can be purified (boiling, creating a purifying filter system, activated carbon filters, iodine, straining). Students will research and identify an area on the globe that has limited access to clean water and examine the climate and its impact on the water cycle.

Teacher will perform **The Rainmaker** experiment to show evaporation, condensation, water vapor, humidity, and precipitation asking students questions such as what causes each of these things. Can they work out of order? Why not?

The students will transfer this process to the earth's natural process using vocabulary from word list and discussing the inter-relationship between each process.

How does this process reveal God's graciousness, presence, and transcendence?

How does this water cycle fulfill all that God foresaw for man?

Students will begin a writing assignment explaining the necessity of clean water and how it fulfills one way that God, in His graciousness and wisdom, provides for mankind.

**The Rainmaker**

<https://thewaterproject.org/resources/lesson-plans/rainmaker-experiment>

+++++

**Day 5:**

Introduce *The Water Project, Inc.* or some other organization that assists with providing clean water, whether locally or globally. Review 10 ways clean water can change the world.

Inspire students to initiate a commitment to reduce their waste of water (e.g. eliminating long showers, identifying and stopping running toilets, using a nozzle on a hose, and so forth). Have students write a paragraph on how they can be good stewards of God's creation.

**Suggested Resources:**

To find charities involved in water conservation: The Charity Navigator  
[https://www.charitynavigator.org/index.cfm?keyword\\_list=water&bay=search.results](https://www.charitynavigator.org/index.cfm?keyword_list=water&bay=search.results)  
The Water Project  
<https://thewaterproject.org/why-water/10-ways-clean-water-changes-the-world>

+++++

**Day 6:**

Watch *The Blue Planet* <https://www.youtube.com/watch?v=WBRXJvDk4dQ> or similar video discussing the necessity of water for life on the earth.

**Students will design a mini water cycle with gathered materials such as large bowls, tin cans, water, and plastic wrap.**

Hypothesize how the moisture in a cloud finally falls to the ground as precipitation. How does the water cycle process bring water to different parts of the earth? What happens if we use Kool-Aid for water?

How do the three phases of water (liquid, gaseous, and frozen) tie together with the Earth's climate system effecting clouds, oceans, vegetation, snow pack and glaciers?

Hypothesize what would happen to the water cycle in the absence of the sun and/or gravity. Analyze how changes in the water cycle effect weather and climate.

Student research questions:

What effect does smoke from factories and exhaust from cars have on water vapor and air?

Discussion of Acid Rain. Can the earth filter some of the toxins?

Review discussion on how pollution destroys the delight and joy we feel at the beauty of water. How does the lack of fresh water affect us?

Make a Mini water cycle

<https://thewaterproject.org/resources/lesson-plans/create-a-mini-water-cycle>

+++++

**Day 7-9 (or as needed)**

In groups, students will create a conceptual or physical model of the water cycle showing the relationships and connections between the different phases of the cycle, the Earth's surface, and the atmosphere (See rubrics below). (*Presentation of projects can be added to include speaking and listening standards.*)

**Additional Lesson plans and student Resources:**

NASA <https://pmm.nasa.gov/education/subtopics/hydrologic-cycle>

USGS <https://water.usgs.gov/edu/waterproperties.html>

NOAA <http://www.noaa.gov/resource-collections/water-cycle>

The Water Project [https://thewaterproject.org/resources/the\\_water\\_cycle](https://thewaterproject.org/resources/the_water_cycle)

**NOTE: It is recommended that one or two of the lessons be discussion days where all participants are invited to focus on the value and nature of water and its cycle so as to develop deeper appreciation for the essence and gift of this system to mankind (See Day 1 and Day 2).**



Theology – Excerpts from *Laudato Si!*  
Writing  
Speaking and Listening

## Water Cycle Vocabulary Worksheet\*

1. Water (Hydrologic) Cycle:
2. Ground water
3. Runoff
4. Water vapor
5. Humidity
6. Evaporation
7. Condensation
8. Precipitation
9. Transpiration
10. Hydrosphere
11. Atmosphere
12. Gravity
13. Pollution
14. Acid Rain

# Performance Checklist for Water (Hydrologic) Cycle Model (formative)

Performance Criteria	Self	Teacher	Comments
1. Written plans/diagrams of the model were developed, reviewed, and revised before constructing the actual physical model.			
2. A written narrative accompanies the model to 1) present an overview of the model and 2) to explain the <b>relationships*</b> (see below) between each stage and 3) how the cycle exemplifies God's orderliness.			
3. All parts of the water cycle are properly labeled.			
4. Vocabulary words used.			
5. The model has been constructed with care and attention to detail.			
6. Features are added to enhance the model - color, texture, additional components, etc.			

## \*Relationships (from NGSS MS-ESS2-4 Evidence Statement)<sup>1</sup>

- Energy transfer from the sun warms the Earth, which can evaporate into the atmosphere.
- Water vapor in the atmosphere forms clouds, which can cool and condense to produce precipitation that falls to the surface of Earth.
- Gravity causes water on land to move downhill (e.g., rivers and glaciers) and much of it eventually flows into oceans.
- Some liquid and solid water remains on land in the form of bodies of water and ice sheets.
- Some water remains in the tissues of plants and other living organisms, and this water is released when the tissues decompose.

<sup>1</sup> [https://nextgenscience.org/sites/default/files/evidence\\_statement/black\\_white/MS-ESS2-4%20Evidence%20Statements%20June%202015%20asterisks.pdf](https://nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-ESS2-4%20Evidence%20Statements%20June%202015%20asterisks.pdf)

## Grading Rubric for Water (Hydrologic) Cycle Model (summative)

Performance Criteria	Achieved	Developing	Beginning
1. Written plans/diagrams of the model were developed, reviewed, and revised before constructing the actual physical model.	Detailed written plans/diagrams were created of the model with several renditions indicating improvements. 8 - 10 pts.	Written plans/diagrams were created of the model with minor changes for improvement. 5 - 7 pts.	Sketch plans/diagrams were created of the model with little modification to original design. 0 - 4pts.
2. A written narrative accompanies the model to explain what the model represents.	Detailed written narrative provides 1) an overview of the water cycle, 2) addresses the interdependency of each stage and 3) how the cycle exemplifies God's orderliness of creation.  20 - 25 pts.	Written narrative provides basic explanation of overview, addresses most interdependency of water cycle and includes a limited explanation of how the cycle exemplifies God's orderliness of creation 15 - 19 pts.	Written narrative lacks complete detail of water cycle or lacks complete explanation of interdependency of water cycle, or lacks reasonable explanation of God's orderliness of creation. One, or more of the three components is/are missing.  0 - 14 pts.
3. All parts of the water cycle are properly labeled.	All parts of the water cycle are labeled correctly and provide brief definitions. 18 - 20 pts.	All parts of the water cycle are labeled.  15 - 17 pts.	Most parts of the water cycle are labeled with a few missing components. 0 - 14 pts.
4. Vocabulary words used.	All vocabulary words used.  4-5 pts.	All but one or two vocabulary words used. 2-3 pts.	Three or more missing vocabulary words. 0-1 pt.
5. The model has been constructed with care and attention to detail.	No stray marks are visible. All components adhere properly. All coloring is complete.  18 - 20 pts.	A few stray markings or unattached components. All coloring is essentially complete. 15 - 17 pts.	Model is falling apart, or appears created at the last minute.  0 - 14 pts.
6. Features are added to enhance the model - color, texture, additional components, etc.	Numerous additional features are added to the water cycle beyond those presented in the vocabulary word list. Originality is	All features of water cycle are present with one or two additional features added to enhance the model beyond the vocabulary word list. Some stray	No additional features are included to enhance the model. Basic components are missing or not aligned properly. Numerous stray markings, lacks color and/or no originality.

	evident. No stray markings. Has professional appearance. 18 - 20 pts.	markings and/or incomplete parts, but overall exemplifies the water cycle. 15 - 17 pts.	0 - 14 pts.
<b>Totals</b>			

**Checklist for Science Journal or Discussion Points – Formative Assessment<sup>2</sup>**

<b>Student Name:</b>	
Care of Creation: Who is responsible for caring for creation? Has God simply left us as stewards or is He still involved? <b>Use checks or tally marks to indicate understanding.</b>	<b>Discussion Points (list below)</b>
	God does not abandon His people. He is always present to them.
	God holds all things in existence.
	God is greater than His works. First Cause.
	God cooperates with His creatures.
	God grants dignity to His creatures.
	God places man above all creation.
	Other points
Why is care of our earth a requirement of the Catholic faith? How does caring for our environment show our care for God and our fellow man? How is man connected to his environment? <b>Use checks or tally marks to indicate understanding.</b>	<b>Discussion Points (list below)</b>
	Everything is connected. Symbiotic relationships.
	All creation is from God.
	All creation is God’s gift to all mankind.
	What we do now to the environment effects future generations.
	Man’s consumeristic mentality. Need for replenishment and rest.
	Need for discipline of ecological transformation of earth’s resources.
	Other points
Why do we find water beautiful and delightful? Why are we attracted to it? Why do we like to feel it, hear it? Why do we find water good? Why do we associate water with purity? What is the value, purpose, and nature of water? <b>Use checks or tally marks to indicate understanding.</b>	<b>Discussion Points</b>

<sup>2</sup> Please see D. Donohue’s article in the [Catholic Curriculum Standards](#) (2016), Appendix B for a discussion on assessing non-cognitive standards.

	The Earth is made up of water. (71% of the earth's surface is water.)
	Man is composed of water. (50 – 75% depending on age.)
	Water is soothing on the skin. It cleans as it flows.
	The sound of water is acceptable to the ear (e.g., trickling water, flowing water, rushing water).
	Water has no taste and is absorbed well into our digestive system.
	Water has a radiance, brilliance. It attracts the eye.
	Water is essential for our life and the lives of all living things. It has tremendous value.
	Other points
How have man's actions impacted the water cycle on a global level? What can we do to help those who do not have access to clean water? <b>Use checks or tally marks to indicate understanding.</b>	<b>Discussion Points (list below)</b>
	Man-made pollutants entering the air, water, or earth, if left unfiltered, harms all living things.
	Be mindful of toxins let out into the environment.
	Not waste water unnecessarily.
	Give water to the thirsty. (Individually or through organizations, projects.)
	Other points

# Summative Test (to include)

## MS-ESS2-4 Connections<sup>3</sup>

Students use the model to account for both energy from light and the force of gravity driving water cycling between oceans, the atmosphere, and land, including that:

- Energy from the sun drives the movement of water from the Earth (e.g., oceans, landforms, plants) into the atmosphere through transpiration and evaporation.
- Water vapor in the atmosphere can cool and condense to form rain or crystallize to form snow or ice, which returns to Earth when pulled down by gravity.
- Some rain falls back into the ocean, and some rain falls on land, Water that falls on land can:
  1. Be pulled down by gravity to form surface waters such as rivers, which join together and generally flow back into the ocean.
  2. Evaporate back into the atmosphere.
  3. Be taken up by plants, which release it through transpiration and also eventually through decomposition.
  4. Be taken up by animals, which release it through respiration and also eventually through decomposition.
  5. Freeze (crystallize) and/or collect in frozen form, in some cases forming glaciers or ice sheets.
  6. Be stored on land in bodies of water or below ground in aquifers.

Students use the model to describe that the transfer of energy between water and its environment drives the phase changes that drive water cycling through evaporation, transpiration, condensation, crystallization, and precipitation.

Students use the model to describe how gravity interacts with water in different phases and locations to drive water cycling between the Earth's surface and the atmosphere.

---

<sup>3</sup> [https://nextgenscience.org/sites/default/files/evidence\\_statement/black\\_white/MS-ESS2-4%20Evidence%20Statements%20June%202015%20asterisks.pdf](https://nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-ESS2-4%20Evidence%20Statements%20June%202015%20asterisks.pdf)

<b>Rubric for Paper</b>				
	4	3	2	1
<b>INTRODUCTION</b> Background/History Thesis Statement  <b>CONCLUSION</b>	Well-developed introduction engages the reader and creates interest. Contains background information. Thesis clearly states a significant and compelling position or belief. Conclusion effectively wraps up and goes beyond restating the thesis. 18 – 20pts	Introduction creates interest. Sufficient background information is provided. Thesis clearly states the position or belief. Conclusion effectively summarizes topics. 14 – 17pts	Introduction adequately explains the background, but may lack detail. Thesis states the position or belief. Conclusion is recognizable and ties up almost all loose ends. 10 – 13pts	Background details are a random collection of information, unclear, or not related to the topic. Thesis is vague or unclear. Conclusion does not summarize main points. 6 – 9pts
<b>MAIN POINTS</b> Body Paragraphs	Each paragraph has a main idea or a thesis statement clearly defined. There may be more than one key point. Appropriate relevant information and details are shared from a variety of sources. Supporting details are accurate, relevant, and helpful in clarifying the main idea(s). 18 – 20pts	The main idea of each paragraph can be identified. The writer shares relevant information, facts and experiences. Supporting details are relevant and explain the main idea 14 – 17pts	The main idea can be identified. The writer shares some information, facts and experiences, but may show problems going from general observations to specifics. Stronger support and greater attention to details would strengthen this paper. 10 – 13pts	More than one of the following problems may be evident: The main idea is not identifiable. The writer shares some information, but it is limited or unclear. Details are missing or repetitious. 6 – 9pts
<b>CONTENT</b>	The paper contains and synthesizes well all points required using additional outside resources. 35 – 40pts	The paper lacks only 1-2 of the required points. Several outside sources were used. 30-34pts	The paper lacks 3 or 4 main points. Sources are from those provided. 25 – 29pts	The paper lacks more than 4 main points and is underdeveloped and/or no outside sources are used. 20 – 24pts
<b>ORGANIZATION</b> Structure Transitions	The body clearly follows the structure and order of the paper's thesis statement. Logical progression of ideas with a clear structure that enhances the thesis. Transitions are mature and graceful. 8 - 10pts	The body follows from the paper's thesis. Logical progression of ideas. Transitions are present equally throughout essay. 5 – 7pts	Organization is clear. Transitions are attempted. 3 – 4 pts	No discernable organization. Transitions are not present. Connections between ideas seem confusing or incomplete. 1 – 2pts
<b>MECHANICS</b> Spelling, punctuation, capitalization	Punctuation, spelling, capitalization and grammar are correct with little to no errors. 8 – 10pts	Punctuation, spelling, capitalization and grammar are generally correct, with few errors. 5 – 7pts	Errors in punctuation, spelling, capitalization and grammar are distracting. 3 – 4pts	Numerous errors in punctuation, spelling, capitalization and grammar making paper difficult to read. 1-2pts

Acknowledgements: Thank you to Samantha Barry, Celeste Donner, Celeste Jay, Angela Johnson, Jenna Schafer and Darlene Turner from the Diocese of Joliet for their initial lesson/unit plan and to Mary Ann Draudt – Diocese of Joliet, IL; Therese Edwards – Diocese of Lansing, MI and Vicki Parks - Diocese of Venice for reviewing and offering suggestions on the final unit plan.