Project WET: Blue Planet

* Activities are correlated as written. However, by using the extensions or adapting the activity using the grey-shaded text, additional correlations or parts of correlations are met.

** Gray shaded areas demonstrate additional connections that can be made/strengthened with a few minor additions and/or restructuring of activity.*

**Blue text represents the Extension section of the activity.*

Grade: 5	Earth's Systems	**Project WET Guide, Page #:** Guide 2.0, p. 125

Brief Lesson Description: Students estimate the percentage of Earth's surface that is covered by water and, by tossing an inflatable globe, take a simple probability sample to check their estimates.

Performance Expectation: 5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

Performance Expectation: 5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science & Engineering Practice(s)	Disciplinary Core Idea(s)	Crosscutting Concept(s)
Using Mathematics and Computational Thinking Describe and graph quantities such as area and volume to address scientific questions. (**5-ESS2-2**) • *Students use probability and statistics to determine proportions of beads in a container. (Warm Up)* • *Students compare direct count to probability and statistical estimate of beads in a container. (Warm-up)* • *Students estimate the percentage of Earth's surface that is covered by water.* • *Students use probability and statistics to determine proportions of water to land on the surface of the Earth.* • *Students draw a pie chart illustrating their estimate of the amount of water and land on Earth (Part I, step 12).* • *Students draw a pie chart representing 71 percent of Earth's surface as water and 29 percent as land and compare to their estimate (Part I, step 12).* • *Students investigate the statistical effects of different map projections on estimating Earth surface water supplies.* • *Students estimate how long water remains in locations such as rivers, lakes, ground water and the ocean and compare with other groups to determine best estimates (Part II, steps 1-6).* • *Students graph and compare the estimated volume of water in locations such as rivers, lakes, ground water and the ocean vs. graphs of estimated percentage and residence time of water in these locations.* • *Students graph and compare the estimated volume of water in locations such as rivers, lakes, ground water and the ocean.*	**ESS2.C: The Roles of Water in Earth's Surface Processes** Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (**5-ESS2-2**) • *Students estimate the percentage of Earth's surface that is covered by water.* • *Students use probability and statistics to determine proportions of water to land on the surface of the Earth.* • *Students draw a pie chart representing 71 percent of Earth's surface as water and 29 percent as land and compare to their estimate (Part I, step 12).* • *Students estimate how long water remains in locations such as rivers, lakes, ground water and the ocean and compare with other groups to determine best estimates (Part II, steps 1-6).* • *Students produce a digital slideshow of images reinforcing the idea of Earth as the blue planet (Part II, step 13).* • *Students graph and compare the estimated volume of water in locations such as rivers, lakes, ground water and the ocean vs. graphs of estimated percentage and residence time of water in these locations.* • *Students research Water Distribution and Availability maps and predict our water future. (Extension)* **ESS3.C: Human Impacts on Earth Systems** Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (**5-ESS3-1**) • *Students produce a digital slideshow of images reinforcing the idea of Earth as the blue planet*	**Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight and volume. (**5-ESS2-2**) • *Students use probability and statistics to determine proportions of beads in a container. (Warm Up)* • *Students compare direct count to probability and statistical estimate of beads in a container. (Warm-up)* • *Students use probability and statistics to determine proportions of water to land on the surface of the Earth.* • *Students draw a pie chart illustrating their estimate of the amount of water and land on Earth (Part l, step 12).* • *Students draw a pie chart representing 71 percent of Earth's surface as water and 29 percent as land and compare to their estimate (Part I, step 12).* • *Students graph and compare the estimated volume of water in locations such as rivers, lakes, ground water and the ocean vs. graphs of estimated percentage and residence time of water in these locations.* • *Students estimate how long water remains in locations such as rivers, lakes, ground water and the ocean and compare with other groups to determine best estimates (Part II, steps 1-6).* • *Students investigate the statistical effects of different map projections on estimating Earth surface water supplies.*

Obtaining, Evaluating, and Communicating Information Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (**5-ESS3-1**) • *Students produce a digital slideshow of images reinforcing the idea of Earth as the blue planet (Part ll, step 13).* • *Students investigate the statistical effects of different map projections on estimating Earth surface water supplies.* • *Students graph and compare the estimated volume of water in locations such as rivers, lakes, ground water and the ocean vs. graphs of estimated percentage and residence time of water in these locations.* • *Students research Water Distribution and Availability maps and predict our water future. (Extension)* • *Students investigate and present on ongoing research to provide plentiful, clean water for all people who need it, now and into the future. (Extension)*	*(Part ll, step 13).* • *Students research Water Distribution and Availability maps and predict our water future. (Extension)* • *Students investigate and present on ongoing research to provide plentiful, clean water for all people who need it, now and into the future. (Extension)*	**Systems and System Models** A system can be described in terms of its components and their interactions. **(5-ESS3-1)** • *Students estimate how long water remains in locations such as rivers, lakes, ground water and the ocean and compare with other groups to determine best estimates (Part II, steps 1-6).* • *Students graph and compare the estimated volume of water in locations such as rivers, lakes, ground water and the ocean vs. graphs of estimated percentage and residence time of water in these locations.* • *Students produce a digital slideshow of images reinforcing the idea of Earth as the blue planet (Part ll, step 13).* • *Students research Water Distribution and Availability maps and predict our water future. (Extension)*

NGSS Common Core Connections:

ELA/Literacy –

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5- ESS3-1)

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS2-2),(5-ESS3-1)

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-1)

RST.6-12.7

SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS2-2)

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS2-2),(5-ESS3-1)

W.5.9.a,b Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1)

Mathematics –

MP.2 Reason abstractly and quantitatively. (5-ESS2-2),(5-ESS3-1)

MP.4 Model with mathematics. (5-ESS2-2),(5-ESS3-1)

Connections to other Common Core Standards at this Grade Level: SL.K-12.1; SL K-12.6; 5.NBT.5

Additional SEP Connections: Grades 3-5	
Asking questions (for science) and defining problems (for engineering)	Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships. • Ask questions about what would happen if a variable is changed. • Identify scientific (testable) and non-scientific (non-testable) questions. • Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. • Use prior knowledge to describe problems that can be solved.
Developing and using models	Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Identify limitations of models. • Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events. • Develop and/or use models to describe and/or predict phenomena. • Develop a diagram or simple physical prototype to convey a proposed object, tool, or process. • Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.

Planning and carrying out investigations	Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K– 2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. • Evaluate appropriate methods and/or tools for collecting data. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. • Make predictions about what would happen if a variable changes. • Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success
Analyzing and interpreting data	Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. • Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. • Analyze data to refine a problem statement or the design of a proposed object, tool, or process. • Use data to evaluate and refine design solutions.
Using mathematics and computational thinking	Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. • Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success. • Organize simple data sets to reveal patterns that suggest relationships. • Describe, measure, estimate, and/or graph quantities (e.g., area, volume, weight, time) to address scientific and engineering questions and problems.
Constructing explanations (for science) and designing solutions (for engineering)	Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard). • Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem. • Identify the evidence that supports particular points in an explanation. • Apply scientific ideas to solve design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.
Engaging in argument from evidence	Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Compare and refine arguments based on an evaluation of the evidence presented. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. • Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. • Construct and/or support an argument with evidence, data, and/or a model. • Use data to evaluate claims about cause and effect. • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Additional Crosscutting Concepts by Grade Level 3-5	
Patterns	Students identify similarities and differences in order to sort and classify natural objects and designed products. They identify patterns related to time, including simple rates of change and cycles, and to use these patterns to make predictions.
Cause and Effect	Students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause and effect relationship.

Scale, Proportion, and Quantity	Students recognize natural objects and observable phenomena exist from the very small to the immensely large. They use standard units to measure and describe physical quantities such as weight, time, temperature, and volume.
Systems and System Models	Students understand that a system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. They can also describe a system in terms of its components and their interactions.
Energy and Matter	Students learn matter is made of particles and energy can be transferred in various ways and between objects. Students observe the conservation of matter by tracking matter flows and cycles before and after processes and recognizing the total weight of substances does not change.
Stability and Change	Students measure change in terms of differences over time, and observe that change may occur at different rates. Students learn some systems appear stable, but over long periods of time they will eventually change.

Correlation Comments	**Correlator Initials:** DBB

Blue Planet correlates to 5th grade NGSS Performance Expectations 5-ESS2-2 and 5-ESS3-1 *as written*, but does not connect as well to the connecting CCSS for language arts, unless the currently listed extension suggestions are incorporated into the activity.

Also highly suggest adding directions to have students develop a probability test to run on different map projections of the Earth and compare the results – i.e., does the map projection matter? This question has come up several times using the globe and has led a study of map projections in history classes, which is consistent with content in 5th – MS history. This element is connected to many of the CCSS, SEP and CCC elements shaded in gray and would strengthen several NGSS dimensions – Suggest adding it either at the end of the globe toss component of the activity or as a recommended Extension noted at the end of this portion of the activity.

Suggested adding the existing extensions – research water availability and changing students *discussing* to *investigating and presenting* on ongoing research around the world to provide plentiful, clean water – as a Part III: ActionEducation element. These actions would also reinforce connections to many of the areas shaded in gray above.

Would love to see the existing Pre K-2 Option integrated into a revision of the existing Warm – Up to create a differentiated flow and help these teachers not feeling like an afterthought in our activities, but didn't see a quick and easy way to do this. Suggest running this by the ECE group on the P & P WET team and others with expertise at these grade levels.