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: MS	Earth's Systems	Project WET Guide, Page #: Guide 2.0, p. 125
Brief Lesson Description: By estimating and calculating the percentage of available fresh water on Earth, students understand that this resource must be used and managed carefully.		
Performance Expectation: MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.		
Performance Expectation: MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.		
Science & Engineering Practice(s)	**Disciplinary Core Idea(s)**	**Crosscutting Concept(s)**
Engaging in Argument from Evidence Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. **(MS-ESS3-4)** • *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 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)* **Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **(MS-ESS3-1)** • *Students use probability and statistics to determine proportions of water to land on the surface of the Earth.*	**ESS3.A: Natural Resources** Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. **(MS-ESS3-1)** • *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 produce a digital slideshow of images reinforcing the idea of Earth as the blue planet (Part ll, 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** Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. **(MS-ESS3-4)** • *Students research Water Distribution and Availability maps and predict our water future. (Extension)* • *Students investigate and present on ongoing research to provide plentiful,*	**Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. **(MS-ESS3-1), (MS-ESS3-4)** • *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)* ..... ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering, and Technology on Society and the Natural World** All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. **(MS-ESS3-1), (MS-ESS3-4)** • *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)* ..... ***Connections to Nature of Science*** **Science Addresses Questions About the Natural and Material World** Science knowledge can describe consequences of actions but does not necessarily prescribe the decisions that society takes. **(MS-ESS3-4)**

• *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 produce a digital slideshow of images reinforcing the idea of Earth as the blue planet (Part ll, 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)* • *Students investigate and present on ongoing research to provide plentiful, clean water for all people who need it, now and into the future. (Extension)*	*clean water for all people who need it, now and into the future. (Extension)*	• *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)*

NGSS Common Core Connections:

ELA/Literacy –

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1), (MS-ESS3-4)

WHST.6-8.1 Write arguments focused on discipline content. (MS-ESS3-4)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS3-1)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1), (MS-ESS3-4)

Mathematics –

Connections to other Common Core Standards at this Grade Level: SL.K-12.1; SL K-12.6; WHST.6-12.6; 6.NS.3; 6.RP.3d; 7.SP.1; 7.SP.2; 7.SP.6

Additional SEP Connections: Grades 6-8	

Asking questions (for science) and defining problems (for engineering)	Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.
	• Ask questions
	  • to identify and/or clarify evidence and/or the premise(s) of an argument.
	  • that require sufficient and appropriate empirical evidence to answer.
	  • that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.

Analyzing and interpreting data	Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships. • Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships. • Analyze and interpret data to provide evidence for phenomena.
Using mathematics and computational thinking	Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments. • Use mathematical representations to describe and/or support scientific conclusions and design solutions. • Apply mathematical concepts and/or processes (e.g., ratio, rate, percent, basic operations, simple algebra) to scientific and engineering questions and problems.

Constructing explanations (for science) and designing solutions (for engineering)	Constructing explanations and designing solutions in 6–8 builds on K– 5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. • Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena. • Construct an explanation using models or representations. • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. • Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real world phenomena, examples, or events.
Engaging in argument from evidence	Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). • Respectfully provide and receive critiques about one's explanations, procedures, models, and questions by citing relevant evidence and posing and responding to questions that elicit pertinent elaboration and detail. • Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.

Additional Crosscutting Concepts by Grade Level 6-8	
Patterns	Students recognize that macroscopic patterns are related to the nature of microscopic and atomic-level structure. They identify patterns in rates of change and other numerical relationships that provide information about natural and human designed systems. They use patterns to identify cause and effect relationships, and use graphs and charts to identify patterns in data.
Cause and Effect	Students classify relationships as causal or correlational, and recognize that correlation does not necessarily imply causation. They use cause and effect relationships to predict phenomena in natural or designed systems. They also understand that phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
Scale, Proportion, and Quantity	Students observe time, space, and energy phenomena at various scales using models to study systems that are too large or too small. They understand phenomena observed at one scale may not be observable at another scale, and the function of natural and designed systems may change with scale. They use proportional relationships (e.g., speed as the ratio of distance traveled to time taken) to gather information about the magnitude of properties and processes. They represent scientific relationships through the use of algebraic expressions and equations.
Systems and System Models	Students can understand that systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. They can use models to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. They can also learn that models are limited in that they only represent certain aspects of the system under study.
Stability and Change	Students explain stability and change in natural or designed systems by examining changes over time, and considering forces at different scales, including the atomic scale. Students learn changes in one part of a system might cause large changes in another part, systems in dynamic equilibrium are stable due to a balance of feedback mechanisms, and stability might be disturbed by either sudden events or gradual changes that accumulate over time.

Correlation Comments	**Correlator Initials:** DBB

Blue Planet does not correlate to either of the MS grade NGSS Performance Expectations MS-ESS3-1 and MS-ESS3-4 *as written*, but could connect and at least support building student knowledge and skills toward both PEs and the connecting CCSS if the currently listed extension suggestions and other suggested modifications in gray 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.