NGSS: Earth's Systems

Collaboration

Teacher Reflection

This is a brand new unit. We spent time developing this unit with science expert, Paul Anderson in April, 2017. Consider it to be a work in progress. Paul will visit again in October.

Unit Overview

PHENOMENON/HOOK: **ICEBERGS IN THE UNITED ARAB EMIRATES:**
http://gulfnews.com/news/uae/tourism/firm-to-tow-icebergs-from-antarctica-to-fujairah-1.2020868

Firm to tow icebergs from Antarctica to Fujairah

Stage 1: Desired Results

Standards & Benchmarks

NGSS: Science Performance Expectations(2013)

NGSS: Grade 5

5.Earth's Systems

Performance Expectations

- 5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- 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.
- 5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

NGSS Hub

Transfer Goals

Transfer Goals

AS Dubai: All Grades

Science

Philosophy: The American School of Dubai (ASD) offers a Kindergarten 1 through Grade 12 comprehensive, standards-based science program that challenges and inspires all students to be passionate learners who are scientifically literate, ethical contributors to a global society. The science program balances content and process using hands-on, inquiry-based discovery with a variety of performance-based opportunities and assessment strategies. ASD science students become critical thinkers and effective communicators who are collaborative, creative, adaptable participants in a rapidly changing world.

- 2. Make sense of natural and designed worlds by developing and using models.
- 5. Construct explanations and apply new knowledge to design ethical solutions for real-world problems.

Enduring Understandings

Students will understand that...

Concepts:

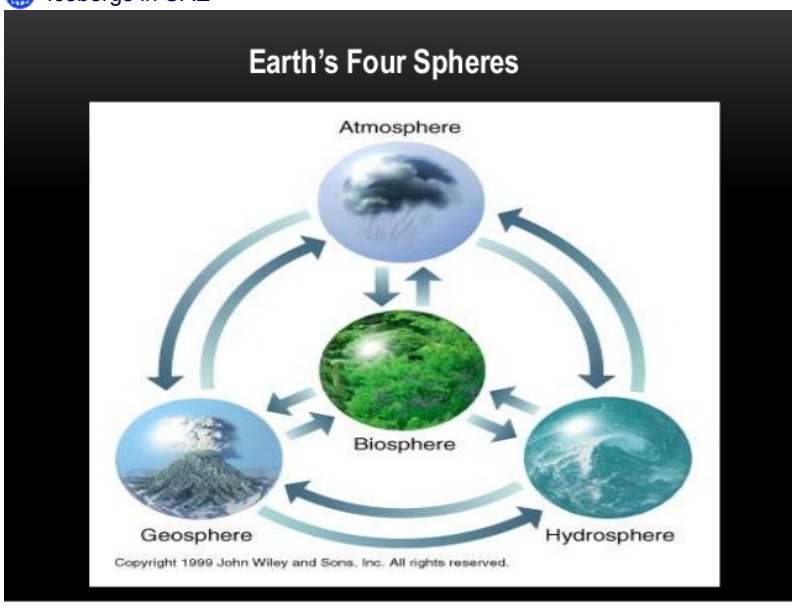
Essential Questions

Students will keep considering...

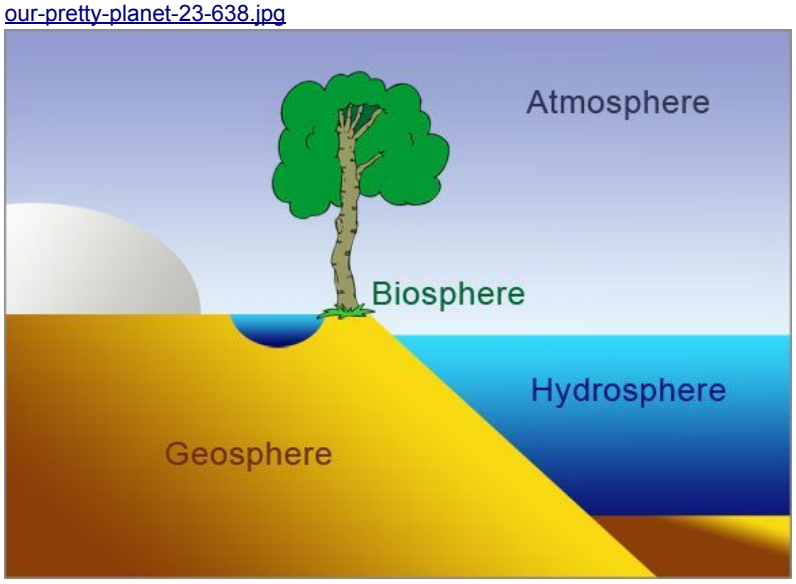
ESS2.A: Earth Materials and Systems

- Science can be used for the protection of resources
- Communities and the Environment Resources and the interplay between them
- Freshwater, as a resource, is limited
- There are water reservoirs of fresh and salt water: Oceans, lakes, rivers, groundwater, glaciers & icecaps
- There are interactions between Earth's four spheres: Geosphere, Hydrosphere, Biosphere, and Atmosphere

Icebergs in UAE



our-pretty-planet-23-638.jpg



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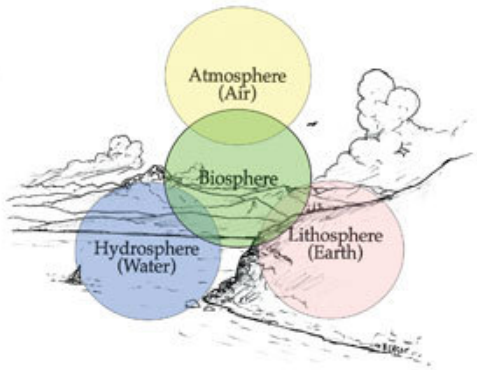

fig2_24_biosphere_flat.jpg

- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)

- **How do earth's systems affect one another?**
- **Why should we care about all of the earth's water?**
- **How can I use science ideas to protect the earth?**

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Knowledge

Students will know...

- Earth's systems influence each other
- the geosphere, hydrosphere, atmosphere, and biosphere are each a system
- the distribution of water on Earth
- individual communities use science ideas to protect the Earth's resources and environment

Skills

Students will be able to...

- draw diagrams/models
- interpret and explain diagrams/models
- make claims, provide evidence, and give reasoning
- graph
- extract information from NF text

Stage 2: Formative and Summative Assessment Evidence

Assessments

Earth's Systems
Assessment of Learning / summative: Performance Task/written

STEM Gauge

Earth Systems STEM Gauge Assessment.pdf

STEM Gauge_ELEM_G5_Earth Systems_Item Set.pdf
Earth Systems STEM Summative Scoring Notes and Rubrics.pdf

Stage 3: Learning Plan

Linking to a Google Doc in Atlas

Learning Experiences

LP1: Students will ask questions about the effect of a freshwater phenomenon (towing iceberg to UAE).

- (Article of iceberg in UAE) http://gulfnews.com/news/uae/tourism/firm-to-tow-icebergs-from-antarctica-to-fujairah-1.2020868
- QFT: Question Formation Technique: Students brainstorm many questions, changing Closed questions to Open questions. Then, they choose one personal and put it on the Wonder wall (wall of questions) for the whole unit.
- Students will observe a simulation of an iceberg melting over time (**maybe move this after LP2**)
    - (Large chunk of ice in a transparent bucket of water. Form it in large ziplock bags.)
    - (salt water and fresh water buckets)
    - Dye in the salt water

LP2: Students will develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. 5-ESS2-1

- inquiry and creating: https://betterlesson.com/lesson/634345/the-earth-s-systems
- Individual -> Group -> Class posters.

LP3: Students work in groups to research one of the Earth's systems and then become the experts in that area to teach their peers.

- https://betterlesson.com/lesson/638120/overview-of-earth-s-systems

- Big Universe (The Earth's Atmosphere) Can't find the other spheres on Big Universe
- Library Resources
- Formative Assessment (See links below)

LP4: Students will observe a simulation of an iceberg melting over time.

- (Large chunk of ice in a transparent bucket of water. Form it in large ziplock bags.)
- (salt water and fresh water buckets)
- Dye in the salt water

LP5: Students will analyze and interpret patterns in freshwater distribution on the planet.

- Mystery Science Question ideas: https://mysteryscience.com/earth/mystery-1/water-on-earth-s-surface/122?r=7264342#slide-id-2503
- Inquiry and graphing (hands on lab; exciting for kids) https://betterlesson.com/lesson/634350/hydrosphere-water-distribution-on-earth
- Students to create their own Water Distribution Graphs and Models
- Link to NOAA Tables of Water Distribution
- https://piktochart.com/

LP6: Students will 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 (5-ESS2-2).

- Students creating actual models of water distribution of water on the planet.
- Mystery Science Question ideas: https://mysteryscience.com/earth/mystery-1/water-on-earth-s-surface/122?r=7264342#slide-id-2503
- Inquiry and graphing (hands on lab; exciting for kids) https://betterlesson.com/lesson/634350/hydrosphere-water-distribution-on-earth
- Distribution of Earth's water: https://water.usgs.gov/edu/earthwherewater.html
- https://piktochart.com/

LP7: Students will investigate patterns of freshwater use in personal (home) or public arenas (school, municipal, UAE).

- Student Action Plan
- Table (shows activity, time, volume) Key= For most uses
- Water Use Table: http://www.threeactionsproject.org/Actions/Track-Your-Daily-Water-Use.php (ex; how much water used when taking a 5 minute shower)

LP8: Students will analyze data to construct explanations as to how they impact the consumption of freshwater resources.

- CER: Claim, Evidence, Reasoning

LP9: Students will use the evidence collected to engage in argumentation on the impact of human consumption of freshwater resources.

- Big Question: How much water does the ASD ES consume in one day.

LP10: Students will obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. 5-ESS3-1

- Research water conservation techniques - global footprint

LP11: Students will communicate their information and propose a solution to minimize water loss

- PSA (public service announcement)

LP12: Students will develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. 5-ESS2-1

- See the Performance Expectations below.

Our conversation/brainstorm:

- consider regional issues that related to local geosphere, biosphere, atmosphere, hydrosphere.

- Human interaction and its effects: desalination, local building

- slow moving changes - erosion, ice-caps/cracking

- fast moving changes - mudslides, wind blowing palm trees up, tsunami, earthquake, floods,

- natural disasters

- consider investigations that connect salinity to plant adaptation and growth.

- test the water that we drink (bottles) and compare/investigate with other water sources; include fresh and salt samples; have students doing the testing, analyzing, graphing, evaluating

- this unit could be well aligned with service learning. It lends itself to an engineering component that helps to solve an issue. It might be good to consider

Stem Gauge Rubrics might benefit from some items from the back of the cards. For instance, the modeling assessment rubric could have "Identify components of the model; Identify relationships between components; Use connections to describe, explain and predict"

Start with a phenomenon:

- erosion of rivers - use timelapse

- beach moving, blowing sand (the trucks transporting sand away after a schmal/sandstorm in Dubai)

Performance Expectation 1 Formative.pdf
Performance Expectation 2 Formative.pdf
Performance Expectation 3 Formative.pdf
Mystery Science: Watery Planet
Open & Closed Questions
A Freshwater Story: National Geographic
Google Earth Timelapse: Dubai
Frozen! National Geographic Extreme Explorer (Icebergs)
LP2 LP3 - Lab: Water Distribution & Graphing
LP2 LP3 - Hooks: Planet Water Distribution

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Organization, Pacing and Sequencing

Resources

Materials:

Petri Dishes

Water testing supplies (what would that be?)

Erosion test kits

Big Universe found in ASD electronic resources in our ES library. Username: asdubai Password: falcons. Great books on topics such as: Climate Change: Water and Ice, Social Solutions...

- Intro to earth's systems (NASA)
- Could desalination solve California's water problem?
- Newsela: What Is the Biosphere?
- Website: A Big Ball of Life
- LP9 - Hydrosphere vs Geosphere.pdf
- LP9 - Geosphere vs Atmosphere.pdf
- LP9 - Geosphere vs Hydrosphere.pdf
- LP4 - Track your water
- LP3 - Distribution of Earth's Water
- Iceberg to UAE

Service Learning