Outline for CLEAN Teleconference Presentation June 30, 2019

Atmospheric Molecule Model Demonstration

Suitable as a CLEAN Elementary School Level Resource?
Where in Use: Which of these popular forms of education are within the scope and scale of CLEAN?

Announcements

Introduction of Co-presenters.

Basic Description of the Atmospheric Molecule Level,
with example of elementary school level presentation

Where the demo is currently in use

K-12 schools across the US
Museums and science centers
Mass scale educational environments

Who is allowed to be a climate educator?
Specifically, can middle school student volunteers also be educators?

Example of a student produced video

Aligned with NGSS standards grades 1 through 5.
Importance of interactive, engaging, physical experiences and demonstrations

[Starting no later than :45 after the hour]

Discussion -- asking for feedback and thoughts

Q&A

Education Settings Where the Molecule Models are in use across the US

K-12 Schools

== In classrooms
== Remote learning (pandemic conditions)
== Assemblies and multi-class gatherings
== Service learning projects
== Green Teams, Climate Clubs, Environmental Science Teams
== Science night events

Universities, colleges and junior colleges

Field trip Hubs (with many schools visiting each day)

Mass scale informal ed. venues

(often well coordinated with local formal education.)

Museums, science centers, zoos and aquariums
Science Festivals (some also serving as field trip hubs)
AAAS Family Science Days
Youth Forums and Summits
National Park events
Community events
Street Festivals -- especially inner cities
Local and state park events -- especially inner cities
City sponsored events
Earth Day events
Girl Scout events
Boy Scout events

Teacher Professional Development

Rallies, student climate action events

Student Videos

Offices of elected officials; staff education events

Senators

Congressional representatives

Governors

Mayors

Conferences

Exhibit floor demonstrations

Sessions

Share-a-thons

Stage shows

Corporate events

Relevant Topic Arrangements of the NGSS -- Grades 1 to 5

1.Waves: Light and Sound

1.Structure, Function, and Information Processing

1.Space Systems: Patterns and Cycles

2.Interdependent Relationships in Ecosystems

2.Structure and Properties of Matter

2.Earth's Systems: Processes that Shape the Earth

3.Forces and Interactions

3.Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms

3.Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms

4.Energy

4.Waves

4.Structure, Function, and Information Processing

4.Earth's Systems: Processes that Shape the Earth

5.Structure and Properties of Matter

5.Matter and Energy in Organisms and Ecosystems

5.Earth's Systems

5.Space Systems: Stars and the Solar System

All 1-5 Engineering Design (Applying science towards solutions)

Atmospheric Molecule Model Demonstration Well Aligned to Multiple NGSS Standards --For Elementary Grade Levels (K-5).

Introducing science experience that is essential in understanding climate science in later grades.

4-PS3-1 Energy

Use evidence to construct an explanation relating the speed of an object to the energy of that object.
Performance Expectation
Grade:
3-5
4

4-PS4-1 Waves and Their Applications in Technologies for Information Transfer

Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
Performance Expectation
Grade:
3-5
4

4-PS3-2 Energy

Make observations to provide evidence that energy can be transferred from place to place by sound, **light, heat,** and electric currents.
Performance Expectation
Grade:
3-5
4

K-ESS3-3 Earth and Human Activity

Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*
Performance Expectation
Grade:
K-2
K

5-ESS2-1 Earth's Systems

Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or **atmosphere** interact.
Performance Expectation
Grade:
3-5
5

5-PS1-1 Matter and Its Interactions

Develop a model to describe that matter is made of particles too small to be seen.
Performance Expectation
Grade:
3-5
5

4-PS3-4 Energy

Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.*
Performance Expectation
Grade:
3-5
4

3-PS2-3 Motion and Stability: Forces and Interactions

Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
Performance Expectation
Grade:
3-5
3

1-PS4-3 Waves and Their Applications in Technologies for Information Transfer

Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.
Performance Expectation
Grade:
K-2
1

K-2-ETS1-2 Engineering Design

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
Performance Expectation
Grade:
K-2

4-PS3-3 Energy

Ask questions and predict outcomes about the changes in energy that occur when objects collide.
Performance Expectation
Grade: 3-5
4

1-ESS1-1 Earth's Place in the Universe

Use observations of the sun, moon, and stars to describe patterns that can be predicted.
Performance Expectation
Grade:
K-2
1

2-PS1-4 Matter and Its Interactions

Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
Performance Expectation
Grade:
K-2
2

2-PS1-1 Matter and Its Interactions

Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
Performance Expectation
Grade:
K-2
2

2-PS1-3 Matter and Its Interactions

Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
Performance Expectation
Grade:
K-2
2

5-LS1-1 From Molecules to Organisms: Structures and Processes

Support an argument that plants get the materials they need for growth chiefly from air and water.
Performance Expectation
Grade:
3-5
5

4-PS3-3 Energy

Ask questions and predict outcomes about the changes in energy that occur when objects collide.
Performance Expectation
Grade:
3-5
4

K-2-ETS1-2 Engineering Design

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
Performance Expectation
Grade:
K-2

3-PS2-1 Motion and Stability: Forces and Interactions

Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
Performance Expectation
Grade:
3-5
3

3-PS2-2 Motion and Stability: Forces and Interactions

Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
Performance Expectation
Grade:
3-5
3

3-ESS2-2 Earth's Systems

Obtain and combine information to describe climates in different regions of the world.
Performance Expectation
Grade:
3-5
3

4-PS4-2 Waves and Their Applications in Technologies for Information Transfer

Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
Performance Expectation

Grade:
3-5
4

2-PS1-1 Matter and Its Interactions

Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
Performance Expectation
Grade:
K-2
2

K-LS1-1 From Molecules to Organisms: Structures and Processes

Use observations to describe patterns of what plants and animals (including humans) need to survive.
Performance Expectation
Grade:
K-2
K

1-LS1-1 From Molecules to Organisms: Structures and Processes

Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*
Performance Expectation

Grade:
K-2

Molecule Model Demonstration as seen through NGSS Filters for Grades 1-5

Disciplines

PS, ESS, Engineering Technology and Applications, (LS)

Cross cutting concepts

Cause and effect
Scale Proportion and Quantity
Systems and System Models
Energy and Matter
Structure and Function
Interdependence of Science, Engineering, and Technology

Disciplinary Core Idea

Ess3c Human Impacts on Earth Systems
ESS1c History of Planet Earth
ESS1b Earth and Solar System
Ess2a earth materials and systems
PS4b electromagnetic radiation
PS4A wave properties
Ps1a structure and properties of matter
Ps2a forces and motion
Ps2a types of interactions
Ps3a Definitions of energy
Ps3b energy transfer
Ets1b developing possible solutions
Ets1c optimizing the design solution
Influence of engineering, technology, and science on society and the natural world

Practice

Developing and **Using Models**
Asking questions and defining problems
Obtaining, evaluating and **communicating information**

Individual understandings, perceptions, and engagement with climate change: insights from in-depth studies across the world

Johanna Wolf[1]* and Susanne C. Moser[2,3]

Public understandings and perceptions of, as well as engagement with, climate change have garnered the interest of research and policy for almost three decades. A portion of this growing body of literature examines such perceptions in-depth, using largely qualitative methodologies, such as personal interviews, limited sample size surveys, focus groups, and case studies. This area of research has been conducted on different continents, with individuals of different cultural backgrounds and ethnic groups, and a variety of demographic characteristics. It has examined various aspects of the communication process, such as audience differences, influence of framing, messages and messengers, information processing, etc.). This paper focuses on this subset of the climate change literature, highlighting similarities and differences across cultural, social, and geographical landscapes. Apart from demographic and regional differences, this literature also offers more detailed insights into the effectiveness of different communication strategies and into the cognitive and psychological processes that underlie public opinions. These insights are generally not obtained through large-scale opinion surveys. Our review highlights great variation and sometimes direct contradiction between these pieces of research. This not only points to a need for further refinement in our knowledge of public understanding and engagement, but also simply to accept that no one theory will explain the variation in human experience of climate change and action in response to it. *WIREs Clim Change* 2011 DOI: 10.1002/wcc.120

MS-ESS2-6 Earth's Systems

Students who demonstrate understanding can:

MS-ESS2-6. **Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.** [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] [*Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.*]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop and use a model to describe phenomena.	**ESS2.C: The Roles of Water in Earth's Surface Processes** • Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. **ESS2.D: Weather and Climate** • Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. • The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.	**Systems and System Models** • Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems.

Connections to other DCIs in this grade band:

MS.PS2.A ; **MS.PS3.B** ; **MS.PS4.B**

Viewing Options

- Hide Popup
- Black and White
- Practices and Core Ideas
- Practices and Crosscutting Concepts

Use browser zoom to increase text size (ctrl + on PC, command + on Mac)

Related Evidence Statements

MS-ESS2-6 Evidence Statements

How to Read the Standards

The standards integrate three dimensions within each standard and have intentional connections across standards. More