

Note: These "Next Generation Science Standards" adopted by many US states, that apply to the HBiE lesson.

ESS= Earth Space System ETS= Engineering Technology and Applications of Science PS= Physical Science MS= Middle school

MS-ESS1-1: Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

MS-ESS1-3: Analyze and interpret data to determine scale properties of objects in the solar system.

Science and Engineering Practices:

Developing and Using Models:

Modeling in grades 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.(MS-ESS1-2), (MS-ESS1-2)

Analyzing and Interpreting Data:

Analyzing data in grades 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.

- Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)

Crosscutting Concepts:

Patterns:

- Patterns can be used to identify cause and effect relationships. (MS-ESS1-1)

Scale, Proportion, and Quantity:

- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-1-3)

Systems and System Models:

- Models can be used to represent systems and their interactions. (MS-ESS1-2)

MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of a problem.

MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Science and Engineering Practices:

Developing and Using Models:

Modeling in grades 6-8 builds on K-5 experiences and progresses to specifying relationships between variables, clarify arguments and models.

- Define a design problem that can be solved through development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge, that may limit possible solutions. (MS-ETS1-1)

Engaging in Argument from Evidence:

Engaging in argument from evidence in grades 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.

- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.

MS-PS3- Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

Science and Engineering Practices:

Developing and Using Models:

Modeling in grades 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 a model to describe unobservable mechanisms (MS-PS3-2)

Planning and Carrying Out Investigations:

Planning and carrying out investigations to answer questions or test solutions to problems in grades 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

- Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS3-4)

Constructing Explanations and Designing Solutions:

Constructing explanations and designing solutions in grades 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.

- Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process, or system. (MS-PS3-3)

Crosscutting Concepts:

Scale, Proportion, and Quantity

- Proportional relationships among different types of quantities provide information about the magnitude of properties and processes. (MS-PS3-1),(MS-PS3-4)