



Graphic Organizer to Develop NGSS Aligned Lessons

Selected Performance Expectation:

Students who demonstrate understanding can:

MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*

Describe what you want to see on the final product.

- Students brainstorm or are presented with scenarios where people may need devices that cool or warm them (Ex. hypothermia, heat stroke, etc.). Students can also brainstorm ideas about products that are meant to be cold or warm, but do not stay cool or warm (Ex. drinks, food, etc.).
- Students will present a device which they constructed (or a prototype designed on a poster) which correctly uses a chemical process to warm or cool itself.

What should an “A” work look like?

1. In groups (2-3 students), students must complete the design process of a device that uses the students' choice of chemicals to heat or cool itself.
2. Students must present the device (actual device or completely labeled poster) to class by explaining:
 - What will your device be used for? Why is it needed? What problem does your device solve?
 - How did you choose the chemicals to be used? What was your process? (Include data from experiments)
 - What materials did you use to build your device and why?
 - What problems might still need to be worked out before a device like this might actually be used?
 - What type of other invention might your device lead to in the future?
 - What was most challenging about the design process?

Which **Common Core State Standard**(s) is (are) addressed in student's final work? Explain.

What would the student response look like to show you that the student met this criteria?

Common Core State Standards Connections:

ELA/Literacy -

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS1-6)

Student response will be the presentation of the device, and the evidence from experiments carried out to justify choices made during the design process.

Which **Crosscutting Concept** is addressed in student's final work? Explain

What would the student response look like to show you that the student understood the underlying crosscutting concept?

Energy and Matter

The transfer of energy can be tracked as energy flows through a designed or natural system.

Students' device shows understanding of exo/endothemic reactions, and uses data as evidence to justify choice.



Which **Scientific Practice(s)** and **Engineering Practice(s)** are addressed in student's final work? Explain. What would the student response look like to show you that the student thinks like a scientist?

Constructing Explanations and Designing Solutions

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 knowledge, principles, and theories.

Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.

Sequence of lesson to be field tested including estimated instructional time.

- 1) Intro to Atom
- 2) Atomic Configuration
- 3) Modeling atoms
- 4) Atoms forming compounds
- 5) Compounds and their properties
- 6) Physical and Chemical Changes
- 7) Chemical changes and temperature change
- 8) Intro to Conservation of mass
- 9) Modeling compounds (subscripts and coefficients)
- 10) Modeling Conservation of mass
- 11) Design procedure for experiments to inform chemical choice for culminating activity
- 12) Perform/evaluate chemical experiments for final choice (type and amounts) of chemicals
- 13) Design/Construct a self-warming/cooling device

Artifacts (students' work)

- Each lesson has handouts, and assessment pieces to be reviewed
- Final product: Self-warming/cooling device presented and justified with experimental evidence



Which Performance Expectations fit into and don't fit into our current Chemistry Unit?

What are the Performance Expectation?

What is the content to be taught?

What content is current? What content will be new?

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List any current state standards that are not addressed by the NGSS.
