Taking Time to Get it Right
Developing a Purposeful Plan for Transitioning to NGSS
Presenters

- Laura Ritter
  Troy School District
  LRitter2@troy.k12.mi.us

- Kristin Mayer
  Michigan State University
  mayerkri@msu.edu

- Jennifer Grivins
  Eaton Rapids School District
  jgrivins@erpsk12.org

Developed for the Introduction to the Next Generation Science Standards, Michigan State University, May 28, 2013
Objective:

Get to know standards by beginning to think of planning lessons based on the NGSS

Plan:
- Model lesson
- Plan own lesson

*If you have questions that are not addressed, please use the note cards on each table.
Key Questions

• Where are the students in their learning?
• What DCI(s) does this learning performance address?
• What CCC(s)?
• What Practice(s)?
• How does this learning performance help students move towards an understanding of the PE(s)?
• What would/could be the next step?
How do you know...
if an object or a system of objects
has energy?
1. Make a CLAIM based on the EVIDENCE from your observations.

2. What question do you have?
• Turn to

Next Generation Science Standards Tab
Topics View (green sheet)
High School Standards
p. 76

• or online at: http://www.nextgenscience.org/hspse-energy
HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields. [Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.]

HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. [Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other, including an explanation of how the change in energy of the objects is related to the change in energy of the field.] [Assessment Boundary: Assessment is limited to systems containing two objects.]

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

Science and Engineering Practices
Developing and Using Models
Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.
- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS3-2), (HS-PS3-5)

Disciplinary Core Ideas
PS3.A: Definitions of Energy
- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HS-PS3-1), (HS-PS3-2).
- These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as either motions of particles or energy stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space, (HS-PS3-2).

PS3.C: Relationship Between Energy and Forces
- When two objects interacting through a field change relative position, the energy stored in the field is changed. (HS-PS3-5)

Crosscutting Concepts
Cause and Effect
- Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system. (HS-PS3-5)

Energy and Matter
- Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems. (HS-PS3-2)
Key Questions

- Where are the students in their learning?
- What DCI(s) does this learning performance address?
- What CCC(s)?
- What Practice(s)?
- How does this learning performance help students move towards an understanding of the PE(s)?
- What would/could be the next step?
Select a few performance expectations that relate to something you teach and begin the process.

Use “Developing Understandings Expressed in NGSS Performance Expectations” (sheet just after the agenda in your binder)

Record your thoughts on your chart paper.

<table>
<thead>
<tr>
<th>Performance Expectation(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prior Knowledge</th>
<th>Pre-Conceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S&amp;E Practice</th>
<th>DC Idea</th>
<th>CC Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description of Learning Performance:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students....</td>
</tr>
<tr>
<td>Teacher....</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Formative Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
• Laura Ritter
  Troy School District
  LRitter2@troy.k12.mi.us

• Kristin Mayer
  Michigan State University
  mayerkri@msu.edu

• Jennifer Grivins
  Eaton Rapids School District
  jgrivins@erpsk12.org

Developed for the Introduction to the Next Generation Science Standards, Michigan State University, May 28, 2013