Rural Science Teaching Project
Role of Forest in Energy Dynamics:
Light and Energy

*Day One*

- Introductions and Goals
- Light and Energy: Self Assessment
- Learning Progressions for Light and Energy
- Content-Area Literacy Connection: Analysis and Interpretation
- Light and Energy Activity I
- Lunch
- Content-Area Literacy Connection: Vocabulary
- Light and Energy Activity II
- Content-Area Literacy Connection: Writing
Explorations: Role of Forests in Earth Energy Dynamics

Next Generation Science Standards (NGSS):
- LS1: From Molecules to Organisms: Structures and Processes
- LS2: Ecosystems, Interactions, Energy, and Dynamics

Common Core State Standards for English Language Arts & Literacy (CCSS-ELA):
- RST1: Textual evidence
- RST2: Central ideas or conclusions
- RST4: Meaning of domain-specific words
- WHST1: Discipline-focused arguments
- WHST2: Informative/explanatory texts

Content-Area Literacy:
- Analysis and Interpretation to comprehend scientific texts and materials
- Vocabulary knowledge and academic language across scientific reading and writing demands
- Writing to Learn (WTL) strategies for understanding science content and developing academic writing skills

Connections to Practice and Student Learning Impact:
- NGSS Crosscutting Concepts: Patterns, cause and effect, energy and matter, stability and change
- NGSS Science and Engineering Practices: Developing and using models, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence
- Literacy Strategies for understanding science: Asking questions to monitor comprehension, word knowledge skills, understanding text features for reading and writing, developing writing fluency and genre knowledge
- Integration of NGSS and CCSS with curriculum and activities, increased understanding of Smarter Balanced assessments
Rural Science Teaching Project Goals

**RSTP participants will:**

1. Engage in an exploration of environmental science inquiry to deepen knowledge of Next Generation Science Standards (NGSS) content and process

2. Examine content-area literacy skills and instructional strategies (reading, vocabulary, writing) embedded in environmental science work

3. Establish connections between NGSS, science content, content-area literacy skills and strategies, and the CCSS-ELA RST and WHST standards
Carbon Cycle and Forests: Light and Energy

Please complete the concept map for light and energy as it relates to photosynthesis and the carbon cycle, thinking about how you would teach this content to students at your grade level.
• See the learning progressions task card
• Study the three varieties of leaves/needles you have before you. Make careful observations of their structure. *Be sure to describe what you see, not what you know.*
• Examine the sample learning progressions and the progressions template
• Consider the following questions *for the grade level you teach:*
  1. What prerequisite skills and knowledge do students need to know to study photosynthesis in leaves?
  2. What is the “big idea” they are exploring by studying leaves?
  3. What skills and knowledge (Learning Targets) build sequentially toward mastering the big idea?
  4. How can students demonstrate they learned necessary skills and knowledge (success criteria)?
  5. How can you most effectively assess their progress (formative assessment) in mastering the big idea?
1. What was the big idea you identified?
2. What did students come in with? Prerequisite knowledge and skills?
3. Successful attainment of the final learning target in the progression
Content-Area Literacy Connection: Analysis and Interpretation

Overview of *Photosynthesis*

Read the short article and discuss:

• What do you notice?
• What is the important information in this piece?
• How would you use this short reading with students?
Content-Area Literacy Connection: Analysis and Interpretation: *Overview of Photosynthesis*

**Thinking aloud I:** Comparing text to diagram
- **How smart readers think:** Practice with a partner on the second paragraph

**Thinking aloud II:** INSERT (Interactive Notation System for Effective Reading and Thinking): Coding the text

✔ Confirms what you thought
X Contradicts what you thought
? Puzzles you
?? Confuses you
* Strikes you as very important
➢ Is new or interesting to you

**CCSS Connections:**

*RST7: Integrate/translate technical information in text with that expressed visually*

*RST2: Determine central ideas in a text*
Light and Energy Activity I

Design a field investigation to measure variable light intensity in a forest

- **Objective**: to compare light intensity at several exact locations in a forest under existing weather conditions
- In designing field measurements, consider factors such as elevation of the, positioning of the meter, angle of the light source, and practices to ensure accuracy and reliability
- Document your plans for field study in written procedures that would enable others to replicate your measurements at a future time.
Content-Area Literacy Connection: Vocabulary

*Leaf Shapes and Strategies*

**Moore & Moore method:**

1. List 6-8 new and 4-6 familiar words

leaf  absorb  **metabolic process**  photosynthesis
sugar  chlorophyll  **carbon dioxide**  stomatae
lobes  edges  **photosynthetic organs**  oxygen
atmosphere  canopy  **metabolic cost**
absorptive surface area  mono-layer  multi-layer

2. Define or explain these words/phrases and then create sentences using two or more of them—on the topic suggested by the article title above

3. Read the article, then revisit the sentences and discuss
Content-Area Literacy Connection: Vocabulary
*Leaf Shapes and Strategies*

**CCSS-ELA Connections:**

- **RST4** Determine the meaning of domain-specific words and phrases as used in scientific or technical context.
- **WHST 2d** Use precise language and domain-specific vocabulary to manage the complexity of the topic.
Light and Energy Activity II

Proceed to the park beyond the Grays Harbor/hospital campus.

1. Select several locations to make comparative measurements of light intensity, with special attention to places where deciduous trees or bushes may leaf out in the next two months.

2. Record your measurements, making special effort to compare measurements of group members to ensure accuracy and reliability.

3. Return to the classroom, record measures of light intensity in table form, and prepare a short written report summarizing findings.
Light and Energy Activity II

**Written Products**

1. Finalized summary of results for your group, to be read to the whole group
2. Poster containing a table showing results
3. Finalized and revised procedures for the next data-gathering trip (May), including predictions (hypotheses) about light intensity and leaf canopy and characteristics. You’ll turn this in.
4. List of vocabulary used in the activity
Light and Energy Activity II: Debrief

**Discuss in small groups:**

1. How did it go? What surprised, challenged, or puzzled you?
2. How did your plan and procedure compare to what you actually did? What changes or revisions did you make?
3. Did your measurements and/or plans fit the level of learning progression appropriate to your home classroom?
4. What kinds of writing did you do as part of the planning, as part of the actual field investigation, and afterward?
Content-Area Literacy Connections: Writing

Summary writing:
Writing type?
Purpose?
Audience?
Topic?
When writing a summary there are three main requirements:
1. The summary should cover the original as a whole
2. The material should be presented in a neutral fashion
3. The summary should be a condensed version of the material, presented in your own words
Consider the summary rubric
Content-Area Literacy Connections: Writing

CCSS Connections

**Scientific Procedure:**

- **WHST2a** Introduce topic and organize ideas
- **WHST2b** Well-chosen and sufficient facts
- **WHST2d** Domain-specific vocabulary
- **WHST2f** Concluding statement

**Report of Findings**

- **WHST1a** Precise claims
- **WHST1b** Providing evidence and data
- **WHST1c** Text cohesion
- **WHST1e** Concluding statement
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Exit Slip (on a note card): Considering what we’ve learned and experienced today:

1. What was something you learned?
2. What went well?
3. What suggestions do you have?
4. What was something you would like to learn more about?