Effort

Less

Practical

Strategies for Science

Presented by Rosemary Martin
Supporting Science, Inc.
ssibastrop@gmail.com
www.sciencecutups.com
You are invited to record information during the training
• What does research tell us about the most effective ways to teach science?
  - Build in ways for students to use their communication skills (reading, writing, listening, speaking, sketching)
• How does notebooking help my students?
• What is the next level?
• How can I move them there?
• Make notes during your table talk under each section of your notebook foldable®

Improving Interactive Notebooking

Rosemary’s Science Notebook

How does notebooking help my students?

What is the next level?

How can I move them there?
A notebook is a running record of what a student is learning.
What do your students need?

- Demonstrate/use many ideas for entries

Ways to show what you know in your Science Notebook

- Charts/Tables
- Graphs
- Reflections about learning
- Claims
  - I claim that . . . or I know that . . .
  - I claim this because . . . or I know this because . . .
- My question:
  - Today we want to find out...
  - I think it will happen because...
  - I noticed . . .
  - Today I learned . . .
  - I wonder . . .
  - Questions I have now are . . .
- Evidence
  - I predict ______________ (will happen) because ______________.
- Vocabulary
- Photos
- Technical drawings
- Diagrams to label
- Foldables
- Charts/Tables
- Reflections about learning
- Claims
- My question
- Evidence
- Vocabulary
- Photos
- Technical drawings
- Diagrams to label
- Foldables

Developed by Rosemary Martin, Supporting Science, Inc., 2008
Books/articles are full of ideas and teacher tips to help you.

The Science Teacher, 2009

November, 2008
For more ideas & support . . .

www.sciencenotebooks.org

Linking science, reading, writing, communication, and mathematics in K-12 classrooms

• Notebook features
• Student work
• Classroom tools
• Teacher resources
• FAQ
• What does research tell us about the most effective ways to teach science?
  - Build in ways for students to organize information
• Have students interact with word wall & picture cards to make sentences, create thinking maps, webs, etc.
• Have students sequence & organize information in a way that makes sense to them.
Provide students with a variety of formats.
• What does research tell us about the most effective ways to teach science?
  
  - Build in ways for students to use process skills such as observing, measuring, making inferences & using tools to investigate.
• What does research tell us about the most effective ways to teach science?
  - Provide many hands-on experiences
Earth Science
• How did the Grand Canyon form & how long did it take?
• Why did it get wider and deeper over time?
Did these parts of the Earth always look like this?
What *forces* are causing the changes?
What evidence indicates that changes have occurred?
How long did it take for the changes to be noticeable or measureable?
Were the changes **constructive** (shaping or building land up) or **destructive** (shaping or tearing land down)?
Just as people go through changes over time, so does the Earth, but it may take thousands or millions of years for the changes to be noticeable or measurable.
• Follow the **Weathering Investigation** directions.

• Be looking for evidence of
  - **Dissolving** (water combining with minerals)
  - **Erosion** (sediments moving from place to place)
  - **Flow** (water, ice, mud, or lava moving)
  - **Deposition** (sediments left in a new location)

• Label these words on your drawing.
• What might be responsible for the different dissolving rates?
• Do you see evidence of dissolving?
• Do you see evidence of erosion?
• Do you see evidence of flow?
• Do you see evidence of deposition?

Generalization

The resistance of a rock to weathering determines how fast the changes will be noticeable.
Questions to ask when using a model.

• Evaluate the model.
• What are its limitations (weaknesses)?
• How is it similar to and different from what it is representing?
• How could it be improved?
Record information in your notebook data chart

<table>
<thead>
<tr>
<th>Example of landform changes (picture cards)</th>
<th>Forces that caused the changes (word cards)</th>
<th>Explain if changes are constructive or destructive and why</th>
<th>Explain if the changes occur quickly or slowly</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• Choose 1 picture card to use.
• Select as many word cards as you can to describe forces causing changes to take place.
• Complete the explanations in your data chart.
• What does research tell us about the most effective ways to teach science?
  - Provide many ways for students to learn & use academic vocabulary

A process in which liquid water turns into vapor

4

EVAPORATION

5

6
Teaching vocabulary. . . let me count the ways . . .

- Require/encourage students to use new vocabulary terms in their notebook entries.

- Have them underline in color/highlight the words in their notebook entries.
Teaching vocabulary . . . let me count the ways . . .

- Have students draw pictures of words when they are first introduced or create a pictorial glossary.

Pollution—anything in the environment that can harm living things or damage natural resources.
Teaching vocabulary . . .
let me count the ways . . .

- Have students make a **Frayer Model** in the notebook as a new word is introduced.

<table>
<thead>
<tr>
<th>Definition (in own words)</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>A change in size, shape, or state of matter.</td>
<td>New materials are NOT formed. Same matter present before and after change.</td>
</tr>
</tbody>
</table>

**Physical Change**

- Examples (from own life)
  - Ice melting
  - Breaking a glass
  - Cutting hair

- Nonexamples (from own life)
  - Burning wood
  - Mixing baking soda & vinegar
Tic-Tac-Toe

• Make a Tic-Tac-Toe grid on your table with 12 popsicle sticks.
Tic-Tac-Toe

- Pull 9 random cards from the bag and place them face side up anywhere in the Tic-Tac-Toe grid.
It might look similar to this

<table>
<thead>
<tr>
<th>niche</th>
<th>camouflage</th>
<th>scavenger</th>
</tr>
</thead>
<tbody>
<tr>
<td>carnivore</td>
<td>consumer</td>
<td>habitat</td>
</tr>
<tr>
<td>ecosystem</td>
<td>biotic factors</td>
<td>population</td>
</tr>
</tbody>
</table>
• As a team **choose** a vertical, horizontal or diagonal row of the board.

• **Compose & record** a sentence which includes all the terms in the row you selected.

• **The sentence must explain or describe the relationship or connection** among the 3 terms.
• Choose a couple of cards as **bonus terms**.

• **Groups get “extra”** points for using the bonus terms in their sentence.

• Have groups **roll a die** to see which column or row they will use.
• Set up criteria for the sentences.
  - Must be 10 words long
  - Must be compound, etc.

• Have groups copy their best sentence on a sentence strip to present to the class.

• Other groups can challenge anything incorrect in the sentence.
Have students combine all sentences to make a summary.
• What does research tell us about the most effective ways to teach science?
  - Scaffold the learning to move students to higher levels of thinking
5E lesson components

Engage
- Interest getting, intriguing, making connections to past learning

Explore
- Provide common experiences, question & probe concepts

Explain
- Information, terminology, communicate findings

Elaborate
- Connect new concepts to prior learning to create understanding

Evaluate
- Ongoing processes for determining levels of understanding
Match each term card with its corresponding description card

Atomic Mass
Green + Yellow = 2

Average mass of one atom of an element
• Organize at least ___ of the term cards using any graphic organizer.
• Use cards to create a map or web
• Use linking words to explain how each word connects to others

Sunlight
Water
Carbon Dioxide

Leaves
which contain
Chlorophyll

through the process of

Photo-synthesis
H₂O + CO₂ + \textcolor{Orange}{\textbf{\Large{\textbullet}}} \textcolor{Green}{\textbf{\Large{\textbullet}}} \textcolor{Green}{\textbf{\Large{\textbullet}}} \textcolor{Green}{\textbf{\Large{\textbullet}}} \textcolor{Green}{\textbf{\Large{\textbullet}}} \textcolor{Green}{\textbf{\Large{\textbullet}}} \textcolor{Green}{\textbf{\Large{\textbullet}}}

Glucose
C₆H₁₂O₆
Sugar

Combining in which contain to make
• What does research tell us about the most effective ways to teach science?
  - Build in many opportunities for students to work together cooperatively
• Give students harder work but let them work together more often

• In small cooperative groups students:
  - learn from each other
  - justify & explain their ideas to each other
  - hear & use more vocabulary
  - are more engaged
  - feel more at ease
• What does research tell us about the most effective ways to teach science?
  - Provide ways for students to connect learning experiences to big ideas.
# Science Unifying Concepts Questions

<table>
<thead>
<tr>
<th>Systems</th>
<th>Energy</th>
<th>Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What parts are in this system?</td>
<td>1. What is energy?</td>
<td>1. Why/how is this model useful?</td>
</tr>
<tr>
<td>2. How do the parts interact?</td>
<td>2. How was energy used in what you observed?</td>
<td>2. How is the model similar to what it is representing?</td>
</tr>
<tr>
<td>3. What is the function of the system?</td>
<td>3. Where did the energy come from and go to?</td>
<td>3. How is the model different from what it is representing?</td>
</tr>
<tr>
<td>4. What are the essential and non-essential parts of the system?</td>
<td>4. Did the energy change forms? From what to what?</td>
<td>4. What does this model show?</td>
</tr>
<tr>
<td>5. Name parts of the system and tell how the system would change if</td>
<td>5. How do you know that energy was involved?</td>
<td>5. What are the limitations of this model? What does it not show?</td>
</tr>
<tr>
<td>these parts were removed.</td>
<td>6. What evidence do you have?</td>
<td>6. How could the model be improved to better able to represent this</td>
</tr>
<tr>
<td>6. Explain how this system interacts with other systems.</td>
<td></td>
<td>science concept?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Change</th>
<th>Properties &amp; Patterns</th>
<th>Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Give examples of different types of change.</td>
<td>1. What is a property?</td>
<td>1. Give examples of different types of survival.</td>
</tr>
<tr>
<td>2. What changes did you observe?</td>
<td>2. What properties of objects or events did you observe?</td>
<td>2. What factors determine whether or not something survives?</td>
</tr>
<tr>
<td>3. What caused the changes?</td>
<td>3. What properties make the object or event you observed different from</td>
<td>3. What survived in this example?</td>
</tr>
<tr>
<td>4. Describe the rate of change.</td>
<td>anything else?</td>
<td>4. What interactions were necessary for survival to occur?</td>
</tr>
<tr>
<td>5. How could the rate of change be made faster or slower?</td>
<td>4. How can properties be used to find patterns?</td>
<td>5. Why was survival important in this example?</td>
</tr>
<tr>
<td>6. What did you observe that stayed the same?</td>
<td>5. What patterns did you observe?</td>
<td>6. How can you predict whether or not survival will occur?</td>
</tr>
</tbody>
</table>
Table Talk

• Talk about how you will use what you learned today in your classroom.

• Be ready to share your table’s ideas with the whole group.
Thanks for being a great group to share with!

Rosemary Martin
Supporting Science, Inc.
ssibastrop@gmail.com