Teaching Through Inquiry
OSLN PD Webinar Series
Checklist—before we start

➢ Use the Zoom chat to communicate with Mackenzie (moderator)
➢ Interactive Polling
➢ You may ask questions via the Q&A box or raise your hand if you would like to ask your questions out loud
➢ The slide deck will be emailed to you
➢ This webinar is being recorded
Teaching Through Inquiry
OSLN PD Webinar Series

Objectives
• Strengthen understanding of science inquiry
• Enhance pedagogical knowledge of science teaching

Session 1: Teaching Science Through Inquiry
Session 2: Examples of Subtle Shifts for Promoting Student Inquiry
Session 3: Incorporate More Student Inquiry in Your Science Lesson

Facilitator: Jacob J. White, Ph.D.
Voinovich School of Leadership and Public Affairs
Ohio University
Email: jacob.white@ohio.edu
Today’s Agenda

• Review of scientific inquiry (session 1)

• Consider examples of subtle shifts in lesson plans intended to promote student inquiry

• Share reflection tool for gauging student inquiry in science lessons

• Q&A
What is Scientific Inquiry?

The process skills of science
• asking questions
• planning and conducting experiments
• analyzing data to draw conclusions
• communicating results to others
The guiding principles for *Ohio’s Learning Standards and Model Curriculum for Science* include:

**Scientific and Engineering Practices**

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

The guiding principles for Ohio’s Learning Standards and Model Curriculum for Science include:

Table 1: Nature of Science

<table>
<thead>
<tr>
<th>Nature of Science</th>
<th>K-2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scientific Inquiry, Practice and Applications</strong> numbers used in all science</td>
<td>All students must use these scientific processes with appropriate</td>
</tr>
<tr>
<td>content areas.</td>
<td>laboratory safety techniques to construct their knowledge and</td>
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<tr>
<td></td>
<td>understanding in all science content areas.</td>
</tr>
<tr>
<td><strong>Science is a Way of Knowing</strong></td>
<td>• Apply knowledge of science content to real-world challenges.</td>
</tr>
<tr>
<td>Science assumes the universe is a vast single system in which basic laws are</td>
<td>• Plan and conduct simple scientific investigations using appropriate</td>
</tr>
<tr>
<td>consistent. Natural laws operate today as they did in the past, and they will</td>
<td>safety techniques based on explorations, observations and questions.</td>
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<tr>
<td>continue to do so in the future. Science is both a body of knowledge that</td>
<td>• Employ simple equipment and tools to gather data and extend the</td>
</tr>
<tr>
<td>represents a current understanding of natural systems and the processes used to</td>
<td>senses.</td>
</tr>
<tr>
<td>refine, elaborate, revise and extend this knowledge.</td>
<td>• Use data and mathematical thinking to construct reasonable</td>
</tr>
<tr>
<td></td>
<td>explanations.</td>
</tr>
<tr>
<td></td>
<td>• Communicate with others about investigations and data.</td>
</tr>
<tr>
<td><strong>Science is a Human Endeavor</strong></td>
<td>• The world is discovered through exploration.</td>
</tr>
<tr>
<td>Science has been, and continues to be, advanced by individuals of various races,</td>
<td>• Exploration leads to observation. Observation leads to questions.</td>
</tr>
<tr>
<td>genders, ethnicities, languages, abilities, family backgrounds and incomes.</td>
<td>• Natural events happen today as they happened in the past.</td>
</tr>
<tr>
<td></td>
<td>• Events happen in regular patterns and cycles in the natural</td>
</tr>
<tr>
<td></td>
<td>world.</td>
</tr>
<tr>
<td><strong>Scientific Knowledge is Open to Revision in Light of New Evidence</strong></td>
<td>• Everyone explores the world which generates questions.</td>
</tr>
<tr>
<td>Science is not static. Science is constantly changing as we acquire more</td>
<td>• The answer is not always as important as the process.</td>
</tr>
<tr>
<td>knowledge.</td>
<td>• Questions often lead to other questions.</td>
</tr>
<tr>
<td></td>
<td>• Discoveries are communicated and discussed with others.</td>
</tr>
<tr>
<td></td>
<td>• People address questions through collaboration with peers and</td>
</tr>
<tr>
<td></td>
<td>continued exploration.</td>
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<tr>
<td></td>
<td>• Everyone can see themselves as scientists.</td>
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<tr>
<td></td>
<td>• It is essential to learn how to identify credible scientific</td>
</tr>
<tr>
<td></td>
<td>evidence.</td>
</tr>
<tr>
<td></td>
<td>• Ideas are revised based on new, credible scientific evidence.</td>
</tr>
</tbody>
</table>

*Adapted from Appendix H – Understanding the Scientific Enterprise: The Nature of Science in the Next Generation Science Standards*
What is Teaching Through Inquiry?

*Teaching strategies that give students responsibility for applying the process skills of science*

- asking questions
- planning and conducting experiments
- analyzing data to draw conclusions
- communicating results to others

*Are my science lessons inquiry-based?*
Theoretical framework for understanding inquiry-based teaching

- Inquiry-based instruction is **NOT** dichotomous!!!
- For any given science lesson, the degree of student inquiry should be considered as existing across a continuum:

  - No Student Inquiry
  - **Everything In-Between!!!**
  - Full Student Inquiry
Inquiry Spectrum

**Didactic Direct**
- Teacher presents and explains science content directly, illustrates with example or demo
- No student activities

**Active Direct**
- Teacher presents and explains science content directly, illustrates with example or demo
- Students actively follow instructions

**Guided Inquiry**
- Students actively explore phenomenon or idea with teacher guidance toward desired science content

**Open Inquiry**
- Students actively explore phenomenon or idea as they choose
- Teacher facilitates process but does not prescribe

**Significant Portion of Science Curriculum**
Subtle Shifts: Adapting Activities for Inquiry

Take Home Messages

• To help learners develop the abilities to do scientific inquiry, teachers need to give students responsibility for using the process skills of science.

• Teachers can make small shifts in existing activities to help learners strengthen the process skills needed for scientific inquiry.

• Lessons can be modified in specific ways to achieve particular purposes.

https://www.exploratorium.edu/sites/default/files/pdfs/ifi/Subtle_Shifts.pdf
Changes Activity (Shifted)

In this activity, you’ll try to determine whether or not a chemical change has taken place by investigating the question, “What indicates the occurrence of a chemical change?” Careful observations will help you gather evidence.

Exploration: Part I
Read all of Part I. Then design a data-collection sheet on which you can record what you do and what you observe. Be sure that it is in a format that is easy to follow and can be shared with others. Then do the activity.

- Put on your safety equipment.
- Place 1/6 teaspoon of sodium bicarbonate (NaHCO₃) and 1/6 teaspoon of calcium chloride (CaCl₂) into a ziplock bag.
- Fill a medicine cup with 5 ml of phenol red solution. Carefully place the cup in the bag, keeping it upright until after you zip the bag closed.
- Squeeze out as much air as possible and seal the bag.
- Keeping the bag sealed, tip the cup over, mix the chemicals together, and observe the result.
- Record what you did and what you observed on your data-collection sheet. Record the evidence you think indicates a chemical change.

Exploration: Part II
Choose Option A or Option B (below) to continue your investigation. Design a new data-collection sheet for that option. Complete the second option if time permits, using another data-collection sheet.

OPTION A
- Predict what would happen if you tried the experiment again but left out one of the chemicals.
- Test your prediction. Record what you did and what you observed.
- Repeat this experiment, leaving out a different chemical.

OPTION B
- Predict what would happen if you varied the amount of one of the chemicals.
- Test your prediction. Record what you did and what you observed.
- Repeat this experiment several times, each time varying a different chemical.

Summary
1. Analyze and summarize the results of your experiments on your data-collection sheets.
2. List any questions you still have on your data-collection sheets.
3. Describe what you have discovered about chemistry from this activity.

Evidence of Chemical Change
Changes Activity (Shifted)

In this activity, you'll try to determine whether or not a chemical change has taken place by investigating the question, “What indicates the occurrence of a chemical change?” Careful observations will help you gather evidence.

Exploration: Part I
Read all of Part I. Then design a data-collection sheet on which you can record what you do and what you observe. Be sure that it is in a format that is easy to follow and can be shared with others. Then do the activity.

- Put on your safety equipment.
- Place 1/4 teaspoon of sodium bicarbonate (NaHCO₃) and 1/4 teaspoon of calcium chloride (CaCl₂) into a ziplock bag.
- Fill a medicine cup with 5 mL of phenol red solution. Carefully place the cup in the bag, keeping it upright until after you zip the bag closed.
- Squeeze out as much air as possible and seal the bag.
- Keeping the bag sealed, tip the cup over, mix the chemicals together, and observe the result.
- Record what you did and what you observed on your data-collection sheet. Record the evidence you think indicates a chemical change.

Exploration: Part II
Choose Option A or Option B (below) to continue your investigation. Design a new data-collection sheet for that option. Complete the second option if time permits, using another data-collection sheet.

OPTION A
- Predict what would happen if you tried the experiment again but left out one of the chemicals.
- Test your prediction. Record what you did and what you observed.
- Repeat this experiment, leaving out a different chemical.

OPTION B
- Predict what would happen if you varied the amount of one of the chemicals.
- Test your prediction. Record what you did and what you observed.
- Repeat this experiment several times, each time varying a different chemical.

Summary
1. Analyze and summarize the results of your experiments on your data-collection sheets.
2. List any questions you still have on your data-collection sheets.
3. Describe what you have discovered about chemistry from this activity.
Changes Activity (Shifted)

In this activity, you'll try to determine whether or not a chemical change has taken place by investigating the question, “What indicates the occurrence of a chemical change?” Careful observations will help you gather evidence.

Exploration: Part I
Read all of Part I. Then design a data-collection sheet on which you can record what you do and what you observe. Be sure that it is in a format that is easy to follow and can be shared with others. Then do the activity.

• Put on your safety equipment.
• Place ⅛ teaspoon of sodium bicarbonate (NaHCO₃) and ⅛ teaspoon of calcium chloride (CaCl₂) into a ziplock bag.
• Fill a medicine cup with 5 ml of phenol red solution. Carefully place the cup in the bag, keeping it upright until after you zip the bag closed.
• Squeeze out as much air as possible and seal the bag.
• Keeping the bag sealed, tip the cup over, mix the chemicals together, and observe the result.
• Record what you did and what you observed on your data-collection sheet. Record the evidence you think indicates a chemical change.

Exploration: Part II
Choose Option A or Option B (below) to continue your investigation. Design a new data-collection sheet for that option. Complete the second option if time permits, using another data collection sheet.

**OPTION A**
• Predict what would happen if you tried the experiment again but left out one of the chemicals.
• Test your prediction. Record what you did and what you observed.
• Repeat this experiment, leaving out a different chemical.

**OPTION B**
• Predict what would happen if you varied the amount of one of the chemicals.
• Test your prediction. Record what you did and what you observed.
• Repeat this experiment several times, each time varying a different chemical.

Summary
1. Analyze and summarize the results of your experiments on your data-collection sheets.
2. List any questions you still have on your data-collection sheets.
3. Describe what you have discovered about chemistry from this activity.

Observations (Part I)
• Color change, turned yellow
• Foaming/bubbling, bag expanded
• Feels hot
Part II (Option A)
Repeated Part I without CaCl\textsubscript{2}
- No change observed when mixed together

Repeated Part I without NaHCO\textsubscript{3}
- Color change, turned purple
- Feels hot
- No foaming/bubbling
Teacher and Learner Responsibility in Science Activities

<table>
<thead>
<tr>
<th>Learner</th>
<th>Teacher / Learner</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who determines the question/problem?</td>
<td><img src="image" alt="Star" /></td>
<td><img src="image" alt="Star" /></td>
</tr>
<tr>
<td>Who determines the procedure/design?</td>
<td><img src="image" alt="Star" /></td>
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<tr>
<td>Who determines the results/analysis?</td>
<td><img src="image" alt="Star" /></td>
<td><img src="image" alt="Star" /></td>
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</tbody>
</table>

**Learner**
The learner determines. The teacher may have a small role. (Note that, in this context, "Teacher" may also refer to lessons from science kits and other curriculum materials.)

**Teacher/Learner**
The teacher determines some parts and the learner determines some parts. There are a number of ways in which teachers and learners can share responsibilities. The following are some examples:

- **The question/problem**
The students raise a number of questions after exploring materials. The teacher chooses one of these questions for the students to investigate.

- **The procedure/design**
The teacher provides the procedure. The students decide how to record the data.

- **The results/analysis**
The teacher tells students to expect to find a pattern in the data. The students figure out what the pattern is.

**Teacher**
The teacher determines. The learner may have a small role.

---

**Note:** This chart draws upon ideas from the following:


In this activity, you'll experiment with chemical reactions that take place in a ziplock sandwich bag. The sealed bag prevents any chemicals from escaping before you have a chance to observe the reactions.

Chemists gather evidence by observing. A chemical detective watches out for these four indicators (among others) of a chemical reaction:

- change of color
- change of temperature
- formation of solids
- formation of gases

A good chemist must be careful and take the time to look for each of these kinds of evidence.

**Procedure**

- Put on your safety equipment.
- Place 1/4 teaspoon of sodium bicarbonate (NaHCO₃) and 1/8 teaspoon of calcium chloride (CaCl₂) into the ziplock bag.
- Pour 5 mL of phenol red into the medicine cup.
- Place the cup carefully in the baggie so that it stays upright, squeeze out as much air as possible, and seal the bag.
- Tip over the cup and mix the contents together.

Use the back of this sheet if you need more room to record your observations and discoveries.

**Questions**

1. Write detailed observations of the changes you see.

2. What evidence have you gathered that a chemical reaction took place?

3. Predict what would happen if you left out the calcium chloride (CaCl₂). Try the experiment again, make careful observations of the changes you see and record them below. Predict what would happen if you left out the sodium bicarbonate (NaHCO₃). Try this, and record your observations and results.

4. What happens when you use 1/4 teaspoon of sodium bicarbonate (NaHCO₃)? What if you use 1 teaspoon of calcium chloride (CaCl₂)? Record everything that happens and the amount of each chemical added.

5. What have you discovered about chemistry from this experiment?
Changes Activity (Unshifted)

in this activity, you'll experiment with chemical reactions that take place in a ziplock sandwich bag. The sealed bag prevents any chemicals from escaping before you have a chance to observe the reactions.

Chemists gather evidence by observing. A chemical detective watches out for these four indicators (among others) of a chemical reaction:
- change of color
- change of temperature
- formation of solids
- formation of gases

A good chemist must be careful and take the time to look for each of these kinds of evidence.

Procedure

- Put on your safety equipment.
- Place 1/4 teaspoon of sodium bicarbonate (NaHCO₃) and 1/2 teaspoon of calcium chloride (CaCl₂) into the ziplock bag.
- Pour 5 ml of phenol red into the medicine cup.
- Place the cup carefully in the baggie so that it stays upright, squeeze out as much air as possible, and seal the bag.
- Tap over the cup and mix the contents together.
- Use the back of this sheet if you need more room to record your observations and discoveries.

Questions

1. Write detailed observations of the changes you see.

2. What evidence have you gathered that a chemical reaction took place?

3. Predict what would happen if you left out the calcium chloride (CaCl₂). Try the experiment again, make careful observations of the changes you see and record them below. Predict what would happen if you left out the sodium bicarbonate (NaHCO₃). Try this, and record your observations and results.

4. What happens when you use 1/4 teaspoon of sodium bicarbonate (NaHCO₃)? What if you use 1 teaspoon of calcium chloride (CaCl₂)? Record everything that happens and the amount of each chemical added.

5. What have you discovered about chemistry from this experiment?

Changes Activity (Shifted)

in this activity, you'll try to determine whether or not a chemical change has taken place by investigating the question, "What indicates the occurrence of a chemical change?" Careful observations will help you gather evidence.

Exploration: Part I

Read all of Part I. Then design a data-collection sheet on which you can record what you do and what you observe. Be sure that it is in a format that is easy to follow and can be shared with others. Then do the activity.

- Put on your safety equipment.
- Place 1/4 teaspoon of sodium bicarbonate (NaHCO₃) and 1/2 teaspoon of calcium chloride (CaCl₂) into a ziplock bag.
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Exploration: Part II

Choose Option A or Option B (below) to continue your investigation. Design a new data-collection sheet for that option. Complete the second option if time permits, using another data collection sheet.

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- Predict what would happen if you tried the experiment again but left out one of the chemicals.
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- Repeat this experiment several times, each time varying a different chemical.

Summary

1. Analyze and summarize the results of your experiments on your data-collection sheets.
2. List any questions you still have on your data-collection sheets.
3. Describe what you have discovered about chemistry from this activity.
Teacher-Identified Shifts

- Language of instruction is more open-ended.

- Learners design their own data sheets.

- Learners choose what they investigate.

- Learners are asked to report what they think is significant.

- There’s no assumption that there’s a “right” answer.

- There’s an expectation that learners will have new questions when they’re finished.
Teacher-Identified Benefits of Shifts

- Designing their own data sheets gives students a sense of freedom and also helps them focus.

- Because students aren’t told what to look for, they have to observe and interpret their results very carefully.

- Students have to use higher-order thinking skills to interpret and analyze what they are seeing.

- Students have to describe in detail what they observe, then analyze and summarize what they did very carefully.

- To explain their results, students have to write more than just brief notes.

Teacher-Identified Benefits of Shifts (continued)

- Students have ownership of what they do.

- Students are encouraged to make discoveries.

- It’s empowering to make your own discoveries.

- Having choices gives students confidence.

- Students have to think for themselves.

- Anticipating what results they might get keeps students involved.
Changes Activity (Unshifted)

In this activity, you'll experiment with chemical reactions that take place in a riplock sandwich bag. The sealed bag prevents any chemicals from escaping before you have a chance to observe the reactions.

Chemists gather evidence by observing. A chemical detective watches out for these four indicators (among others) of a chemical reaction:

change of color
change of temperature
formation of solids
formation of gases

A good chemist must be careful and take the time to look for each of these kinds of evidence.

Procedure

1. Put on your safety equipment.
2. Place ¾ teaspoon of sodium bicarbonate (NaHCO₃) and ½ teaspoon of calcium chloride (CaCl₂) into the riplock bag.
3. Pour 5 ml of phenol red into the medicine cup.
4. Place the cup carefully in the baggie so that it stays upright, squeeze out as much air as possible, and seal the bag.
5. Tip over the cup and mix the contents together.

Use the back of this sheet if you need more room to record your observations and discoveries.

Questions

1. Write detailed observations of the changes you see.

2. What evidence have you gathered that a chemical reaction took place?

3. Predict what would happen if you left out the calcium chloride (CaCl₂). Try the experiment again, make careful observations of the changes you see, and record them below. Predict what would happen if you left out the sodium bicarbonate (NaHCO₃). Try this, and record your observations and results.

4. What happens when you use ¾ teaspoon of sodium bicarbonate (NaHCO₃)? What if you use 1 teaspoon of calcium chloride (CaCl₂)? Record everything that happens and the amount of each chemical added.

5. What have you discovered about chemistry from this experiment?

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- **The results/analysis**
  The teacher tells students to expect to find a pattern in the data. The students figure out what the pattern is.

**Teacher**
The teacher determines. The learner may have a small role.

NOTE: This chart draws upon ideas from the following:

Any shift in responsibility from teacher towards learner will give students more practice in developing inquiry skills.

Subtle shifts are possible, manageable, and VERY effective.
Measuring Shadows Activity (Unshifted)

Procedure
1. Keep the light source in the same spot and move the object. Measure and record the size of the shadow with the object at the listed positions.

<table>
<thead>
<tr>
<th>Distance from light to screen</th>
<th>Distance from light to object</th>
<th>Size of object</th>
<th>Size of shadow</th>
</tr>
</thead>
<tbody>
<tr>
<td>240 cm</td>
<td>60 cm</td>
<td>15 cm</td>
<td></td>
</tr>
<tr>
<td>240 cm</td>
<td>80 cm</td>
<td>15 cm</td>
<td></td>
</tr>
<tr>
<td>240 cm</td>
<td>120 cm</td>
<td>15 cm</td>
<td></td>
</tr>
</tbody>
</table>

2. What patterns do you see in the sizes of the shadows?

3. Move the light source and keep the object in the same place. Measure and record the size of the shadow with the light source at the listed positions.

<table>
<thead>
<tr>
<th>Distance from light to screen</th>
<th>Distance from object to screen</th>
<th>Distance from light to object</th>
<th>Size of object</th>
<th>Size of shadow</th>
</tr>
</thead>
<tbody>
<tr>
<td>160 cm</td>
<td>120 cm</td>
<td>40 cm</td>
<td>15 cm</td>
<td></td>
</tr>
<tr>
<td>180 cm</td>
<td>120 cm</td>
<td>60 cm</td>
<td>15 cm</td>
<td></td>
</tr>
<tr>
<td>240 cm</td>
<td>120 cm</td>
<td>120 cm</td>
<td>15 cm</td>
<td></td>
</tr>
</tbody>
</table>

4. What patterns do you see in the sizes of the shadows?
# Measuring Shadows Activity (Shift 1)

**Note:** Gray areas indicate shifts in the activity.

**Procedure**

1. Keep the light source in the same spot and move the object. Measure and record the size of the shadow with the object at different positions. Choose positions that will help you see patterns in your result.

<table>
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</table>

2. What patterns do you see in the sizes of the shadows?

3. Move the light source and keep the object in the same place. Measure and record the size of the shadow with the light source at different positions. Choose positions that will help you see patterns in your result.

<table>
<thead>
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<tr>
<td></td>
<td>120 cm</td>
<td></td>
<td>15 cm</td>
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<tr>
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<tr>
<td></td>
<td>120 cm</td>
<td></td>
<td>15 cm</td>
<td></td>
</tr>
</tbody>
</table>

4. What patterns do you see in the sizes of the shadows?
**Measuring Shadows Activity (Unshifted)**

**Procedure**
1. Keep the light source in the same spot and move the object. Measure and record the size of the shadow with the object at the listed positions.

<table>
<thead>
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</tbody>
</table>

2. What patterns do you see in the sizes of the shadows?

3. Move the light source and keep the object in the same place. Measure and record the size of the shadow with the light source at the listed positions.

<table>
<thead>
<tr>
<th>Distance from light to screen</th>
<th>Distance from object to screen</th>
<th>Distance from light to object</th>
<th>Size of object</th>
<th>Size of shadow</th>
</tr>
</thead>
<tbody>
<tr>
<td>160 cm</td>
<td>120 cm</td>
<td>40 cm</td>
<td>15 cm</td>
<td></td>
</tr>
<tr>
<td>180 cm</td>
<td>120 cm</td>
<td>60 cm</td>
<td>15 cm</td>
<td></td>
</tr>
<tr>
<td>240 cm</td>
<td>120 cm</td>
<td>120 cm</td>
<td>15 cm</td>
<td></td>
</tr>
</tbody>
</table>

4. What patterns do you see in the sizes of the shadows?

**Measuring Shadows Activity (Shift 1)**

**Note:** Gray areas indicate shifts in the activity.

**Procedure**
1. Keep the light source in the same spot and move the object. Measure and record the size of the shadow with the object at different positions. Choose positions that will help you see patterns in your result.

<table>
<thead>
<tr>
<th>Distance from light to screen</th>
<th>Distance from light to object</th>
<th>Size of object</th>
<th>Size of shadow</th>
</tr>
</thead>
<tbody>
<tr>
<td>240 cm</td>
<td></td>
<td>15 cm</td>
<td></td>
</tr>
<tr>
<td>240 cm</td>
<td></td>
<td>15 cm</td>
<td></td>
</tr>
<tr>
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</tr>
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2. What patterns do you see in the sizes of the shadows?

3. Move the light source and keep the object in the same place. Measure and record the size of the shadow with the light source at different positions. Choose positions that will help you see patterns in your result.

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<th>Distance from object to screen</th>
<th>Distance from light to object</th>
<th>Size of object</th>
<th>Size of shadow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>120 cm</td>
<td></td>
<td>15 cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>120 cm</td>
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4. What patterns do you see in the sizes of the shadows?
Subtle Shifts:
Adapting Activities for Inquiry

Take Home Messages

• To help learners develop the abilities to do scientific inquiry, teachers need to give students responsibility for using the process skills of science

• Teachers can make small shifts in existing activities to help learners strengthen the process skills needed for scientific inquiry

• Lessons can be modified in specific ways to achieve particular purposes

https://www.exploratorium.edu/sites/default/files/pdfs/ifi/Subtle_Shifts.pdf
Subtle Shifts: Adapting Activities for Inquiry

Take Home Messages

• Lessons can be modified in specific ways to achieve particular purposes
  • asking questions
  • planning and conducting experiments
  • analyzing data to draw conclusions
  • communicating results to others

This will be focus of webinar session 3

https://www.exploratorium.edu/sites/default/files/pdfs/ifi/Subtle_Shifts.pdf
Q&A

THANK YOU!!!

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