S.W.I.M.A.S.
Students With Inquiring Minds Are Scientists
S.W.I.M.A.S. In Action
S.W.I.M.A.S. Background

❖ Traditional models didn’t meet the needs of scientific inquiry.
❖ Needed a platform for reflection, hands-on, strong assessment, and student choice all in one.
❖ Wanted more of the focus to be on “doing” instead of “knowing.”
❖ Needed to be a better scientist myself.
Pre-Assessment

❖ Standards are bundled and analyzed for seamless connections to big ideas and concepts.
❖ Pre-assessment is constructed to give an “overall” picture of learners’ background knowledge.
❖ Prior conceptions about concepts and big ideas become apparent.
Pre-Assessment

1. Shadow read a riddle from the class chalkboard. The riddle is shown below.

   I am a colorless and odorless substance.
   I can change shape.
   I am not magnetic.
   What am I?

   Shadow thought the answer to the riddle could be air or water.

   - Name a property Shadow should ask about to help solve the riddle.
   - Explain how knowing this property will help solve the riddle.

2. A student observed that lead floats on an unknown liquid, whereas copper sinks in the liquid.

   - What should the student conclude from the data?
   - Justify your answer.

3. The table below shows the density of various substances. Use this data to answer the following:

<table>
<thead>
<tr>
<th>Substance</th>
<th>Density (kg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>2.7</td>
</tr>
<tr>
<td>Iron</td>
<td>7.8</td>
</tr>
<tr>
<td>Copper</td>
<td>8.9</td>
</tr>
<tr>
<td>Lead</td>
<td>11.3</td>
</tr>
<tr>
<td>Concrete</td>
<td>2.3</td>
</tr>
<tr>
<td>Granite</td>
<td>2.7</td>
</tr>
<tr>
<td>Wood (Average)</td>
<td>0.3</td>
</tr>
<tr>
<td>Glass (Common)</td>
<td>2.5</td>
</tr>
<tr>
<td>Ice</td>
<td>0.917</td>
</tr>
</tbody>
</table>

   Explain two ways in which rocks in Alaska have been exposed to very cold temperatures of miles south of the Arctic Circle, explaining the significance of these temperatures.
Modelled Investigations - Guided Inquiry

- Initial phenomena are designed to align with pre-assessment and big ideas.
- Focuses on authentic questioning in order to build curiosity.
- Careful observation leads to the generation of student-developed questions.
- S.W.I.M.A.S. leaders are encouraged to challenge their groups’ thinking and questioning using the S.W.I.M.A.S. rubric as a guide.
Modeled/Guided Investigations
Essential Question

How do scientists use physical properties to describe and classify matter?
S.W.I.M.A.S. Menu

- Student-driven based on analysis of pre-assessment and guided investigations.
- 4-5 questions from board that include both researchable and investigable questions.
- Menus are finalized with brief student-facilitator conference.
Question Board
Investigable vs Researchable

Researchable

Q1. What makes an object sink at the 1st attempt, but float at the 2nd attempt?

Investigable

Q2. Can a magnet rock in vinegar if there is 100 mL of vinegar? Also will it lose its magnetism?

Researchable

Q3. What are conductors, and what are insulators? Name 3 conductors, and 3 insulators.

Investigable

Q3. Can vegetable oil start evaporating if so then at what temperature?
S.W.I.M.A.S. Notebooking

- Set procedures result in a reliable and common process.
  - Questions
  - Predictions
  - Observations
  - Evidence Gathering (Researchable and Investigable)
  - Claims based on evidence
S.W.I.M.A.S. Notebooking

Density

- Coffee filter
- Plastic cups
- Glass

Density formula:

\[ \text{Density} = \frac{\text{mass}}{\text{volume}} \]

Filling the tanks: The greater the amount of water, the greater the depth, the greater the density.

What property is being measured here?

How do I...?

How do you get the marble out without missing up the crackers?

- Tape
- Coffee filter
- Straw
- Fingers

<table>
<thead>
<tr>
<th>Tool</th>
<th>Height</th>
<th>Diameter of crater</th>
<th>Diameter of crater 2</th>
<th>Diameter of crater 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marble</td>
<td>28.4 cm</td>
<td>1.4 cm</td>
<td>1.6 cm</td>
<td>1.5 cm</td>
</tr>
<tr>
<td>Meter stick</td>
<td>22.3 cm</td>
<td>1.2 cm</td>
<td>1.8 cm</td>
<td>2.0 cm</td>
</tr>
</tbody>
</table>

I think this material is flour.
S.W.I.M.A.S. Vocabulary

❖ Helps to reinforce conceptualization of ideas.
❖ Necessary when looking at how concept is applied to other areas outside S.W.I.M.A.S. setting.
❖ Embedded vocabulary connects concepts for holistic meaning.
❖ Specifically helps ELLs gain a firmer grasp on what was done during the guided investigation.
Post-Assessment

❖ A mix of both practical and conceptual applications used to asses true science knowledge of the learner.
❖ Comments and questions take the place of traditional grading practices.
❖ No “grade” is posted on the assessment itself so that learners are concerned with progress and “fixing their thinking.” Learners are also able to discuss evidence and claims without feeling self-conscious about a “grade.”
Post-Assessment

8. Table: Sample Mass (g) Length (cm) Magnetic Conducts Electricity Sinks or Floats
   A 5.5 21 no no Floats
   B 24.3 13 no no Floats
   C 56 26.7 yes yes Sinks
   D 12.4 19.2 no yes Sinks

Mr. Ewbank's students were classifying materials based on physical properties. Their results are recorded in the table above. Based on the data, what do you think each sample could be? Please explain how each piece of evidence supports your claim.

9. Diagram: The diagram shows what happens when ice is heated.

Is the change shown above an example of a physical change or a chemical change?
What evidence did you use to make your claim?

A physical change. The chemicals aren't changing. It's just adding heat.

10. Diagram: The diagram above shows a light ray approaching a prism.

- Describe two things that happen to light as it passes through the prism.

It bounces off the prism. The light gets brighter. The light appears bent. The light goes through the prism in two different directions.

11. Diagram: Mr. Ewbank has set up the investigation shown above. Vonster claims that the light bulb won't illuminate based on the circuit shown. What step(s) would you take in order to "fix" this investigation?

You would test the circuit with a switch instead of the battery, you would have to switch one of the batteries so negative and positive would wire together.
Post-Assessment
Stages of SWIMAS

- Pre-Assessment
- Guided Investigation/Inquiry
- S.W.I.M.A.S. Menu
- S.W.I.M.A.S. Journal/Vocabulary
- Post-Assessment
Our Journey
Our S.W.I.M.A.S. Journey

Malachi’s Story

Linda’s Story

First Attempts at Solving the Problem

Brainstorming, Classroom Support, Twitter, Finding Materials

Areas of Continued Focus - Vocabulary, Rubric
Classroom Culture

❖ High expectations are set for everyone.
❖ Student-driven questioning is required at all times. We practice, practice, practice.
❖ Safety is a priority because autonomy requires safe practices at all times.
❖ Transitions are constant, consistent and practiced.
❖ I believe they can, so they do!
Sharing with Others

District Professional Learning Experience for All K-5 Teachers

CAST (State Science Conference) Presentation

Published Article 1 and Article 2

National Conference Presentations

Embedded Supports for S.W.I.M.A.S. within District Curriculum

Mentoring Support - On Campus, District, National, Twitter
Our Next Steps
Possible Next Steps for S.W.I.M.A.S.

Connections to 3-Dimensional Learning

- Intentional Integration of Cross-Cutting Concepts
- Use of EQuIP Rubric to Assess S.W.I.M.A.S. Units
- Second iteration of our S.W.I.M.A.S. rubric

Continued Professional Learning and Mentoring Support
S.W.I.M.A.S. Rubric
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