INCORPORATING Interactive Science Notebooks INTO NGSS

Presenters
Jenna Francis and Melissa Foster
St. Joseph Public Schools
CONTACT INFO

Jenna Francis
jfrancis@stjoebears.com
@liebacklookup
@jennabfrancis

Melissa Foster
mfoster@stjoebears.com
@msscientistsatwork
@sci_cieniuch

PURPOSE OF ISNS
The research says.....

* communicating ideas through writing helps commit ideas to long term memory

* important tool for transforming claims & evidence into knowledge

* drawing & modeling boosts students’ capability to remember new concepts
PurPose of IsNs

Organization

* Set up notebooks by units

* Each new unit has a learning goal sheet that serves as a divider with a tab

* Students can keep track of their understanding as we learn each new topic in class
PURPOSE OF ISNS

Model #1

Model #2

Ongoing Data

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp</th>
<th>Wind</th>
<th>Clouds</th>
<th>Humidity</th>
<th>Rain</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/18</td>
<td>54°F</td>
<td>6mph</td>
<td>Clear</td>
<td>82%</td>
<td>0.00in</td>
<td>29.24in</td>
</tr>
<tr>
<td>10/19</td>
<td>57.9°F</td>
<td>4mph</td>
<td>Clear</td>
<td>81%</td>
<td>0.00in</td>
<td>30.29in</td>
</tr>
<tr>
<td>10/10</td>
<td>55.3°F</td>
<td>4mph</td>
<td>Clear</td>
<td>99%</td>
<td>0.00in</td>
<td>30.12in</td>
</tr>
<tr>
<td>10/11</td>
<td>66.4°F</td>
<td>5mph</td>
<td>Partly Cloudy</td>
<td>91%</td>
<td>0.2in</td>
<td>29.89in</td>
</tr>
<tr>
<td>10/12</td>
<td>43.9°F</td>
<td>4mph</td>
<td>Partly Cloudy</td>
<td>96%</td>
<td>0.00in</td>
<td>30.92in</td>
</tr>
<tr>
<td>10/13</td>
<td>58.1°F</td>
<td>5mph</td>
<td>Partly Cloudy</td>
<td>95%</td>
<td>0.00in</td>
<td>29.73in</td>
</tr>
<tr>
<td>10/14</td>
<td>51.3°F</td>
<td>3mph</td>
<td>Partly Cloudy</td>
<td>95%</td>
<td>0.00in</td>
<td>29.57in</td>
</tr>
<tr>
<td>10/15</td>
<td>43.3°F</td>
<td>4mph</td>
<td>Overcast</td>
<td>87%</td>
<td>0.00in</td>
<td>30.76in</td>
</tr>
</tbody>
</table>

Note: Data includes daily temperature, wind speed, cloud conditions, humidity, rainfall, and atmospheric pressure.
HOW ISNS SUPPORT NGSS

* Phenomena
* KWLs
* Modeling
* CER/Arguments
* Data Tables & Graphing
* Investigations to use for evidence
Asking Q’s & Defining Problems

what I already know
what I want to know
what I have learned

Natural disasters like thunderstorms happen because of lots of wind.
Precipitation can be rain, hail, snow, sleet.
Weather maps usually include temp, humidity, precipitation, air pressure, and wind.

what is air pressure?
How does air pressure affect weather?
Does air pressure affect storm development?
High vs. low pressure?
What are cold vs. hot "fronts"?
What causes clouds to appear dark.

Air pressure & density are closely related.
A storm needs instability to form.
High pressure > more dense & cold
Low pressure > less dense & hot WARM
Cold fronts bring severe weather
Stationary fronts behave like a warm front, except for several days at a time.
Asking Q’s & Defining Problems

Why is the sky blue?

The sky is blue because on the way into the sky, sunlight is scattered by the atmosphere. The sun projects more blue light than violet, and our eyes are more sensitive to blue than violet.

Our eyes are sensitive to blue. The element that makes up the air the sun gives off more blue than violet. The sun is white. Not yellow.
Developing & Using Models

Why is the Sky Blue?

Exploration:
- Explanation: The blue color of the sky is due to the scattering of sunlight by the Earth's atmosphere.
- Solar light consists of many wavelengths, but the blue wavelength is scattered more than others.

States of Matter:
- Solid: Definite shape, volume, and rigidity.
- Liquid: Definite volume, no definite shape, can flow.
- Gas: No definite shape or volume, will spread out to fill a container.
Developing & Using Models

Diagram: A model of how Earth's atmosphere works, showing the flow of energy from the Sun to Earth. The diagram includes symbols for absorption, reflection, and emission of radiation. Specific areas labeled include solar radiation, Earth's surface, and the atmosphere. The diagram also illustrates the greenhouse effect with CO₂ and pollutants.

Legend:
- CO₂: pollution/CO₂
- ⇐: absorbs radiation
- ⇒: emits radiation
- •••: air molecules
- ◐: surface molecules
- ↑: vibration motion
- f = conduction
- Φ = light energy
Developing & Using Models

[Diagrams of climate and weather processes, including key terms like 'Front', 'Warm air mass', 'Cool air mass', and processes of 'Convection', 'Condensation', and 'Radiation'.]
Planning & Carrying Out Investigations

Types of Investigations

* Teacher led
  - Students follow procedures
  - Do not come up with own procedures or variables

* Student led
  - Students choose own variables
  - Carry out own investigation

How Can I Improve My Soap?

Activity 14.1

Procedures Day 1
1. Put on safety goggles
2. Put 50g of table salt and 175ml of water into the large container and stir to dissolve.
3. Label the container with your group members’ names and place the container to the side.
4. Put 11g of fat and 20ml of rubbing alcohol into the small beaker. (*Add any other oils to the mixture at this time*).
5. Stir the mixture with the stirring rod for three minutes. The fat will not completely dissolve.
6. Call your teacher over to have him/her pour 20ml of sodium hydroxide solution into the small beaker.
7. Place the small beaker on the hot plate on low.
Planning & Carrying Out Investigations
Planning & Carrying Out Investigations

How Can I Improve My Soap?

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Hot plate setting
Planning & Carrying Out Investigations

What I Envision for Next Year

* Redo our Newton’s Laws Unit

* Have students design their own investigations to see the relationship between mass & acceleration with different masses on Hotwheels cars @mrsnelsonsmiddles
Constructing Explanations/Designing Solutions
Constructing Explanations/Designing Solutions

Penguin Dwellings

Initial Model
Be sure to include:
- place where convection, conduction & radiation are happening
- markers &

Good insulators:
- Plastic
- Rubber

Atrocies is made of foam and plastic

What to use:
- For $10
- Wooden sticks $5/

- Cupcake liner $30, Foam stick $40
- Plastic cup $5
- Frank cup $5

Line inside of foam cup with foil,
hat made out of plastic cup,
whole thing in foil,
use wooden sticks as legs to hold
it off the ground
- Cover the entire house with wooden
sticks
- flat baking cup on top (also covering)
Analyzing & Interpreting Data

<table>
<thead>
<tr>
<th>Date</th>
<th>Appearance</th>
<th>#</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/1/20</td>
<td>fish</td>
<td>90</td>
<td>Hover around doing nothing in particular</td>
</tr>
<tr>
<td>4/1/20</td>
<td>fish</td>
<td>90</td>
<td>Shimmery around, not to afraid of us we know</td>
</tr>
<tr>
<td>5/1/20</td>
<td>fish</td>
<td>60</td>
<td>Wander freely around the tank</td>
</tr>
</tbody>
</table>

Temp, wind, clouds, humid, rain, air pressure:
- 54.0°F, 5mph, clear, 82%, 0.00in, 30.29 in |
- 57.9°F, 4mph, clear, 81%, 0.00in, 30.29 in |
- 55.2°F, 2mph, clear, 99%, 0.00in, 30.13 in |
- 66.4°F, 5mph, partly cloudy, 91%, 0.02in, 28.89 in |
- 43.9°F, 4mph, partly cloudy, 96%, 0.00in, 30.13 in |
- 58.1°F, 7mph, overcast, 85%, 0.00in, 29.73 in |
- 51.3°F, 8mph, overcast, 86%, 0.00in, 29.57 in |
- 48.2°F, 8mph, overcast, 87%, 0.00in, 30.23 in |
# Analyzing & Interpreting Data

## Rock Observations

<table>
<thead>
<tr>
<th>Sample</th>
<th>Picture</th>
<th>Color</th>
<th>Particles</th>
<th>Nail Test</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>one</td>
<td><img src="image1.png" alt="Image" /></td>
<td>Middle gray with yellow rust</td>
<td>Small black speckle</td>
<td>Becomes lighter, no change in size</td>
<td>Why is it turning yellow?</td>
</tr>
<tr>
<td>two</td>
<td><img src="image2.png" alt="Image" /></td>
<td>Tan, light gray</td>
<td>White, small, air pockets</td>
<td>Break off with force</td>
<td>Why are there holes?</td>
</tr>
<tr>
<td>three</td>
<td><img src="image3.png" alt="Image" /></td>
<td>Brown-gray with black shelly</td>
<td>White stripes</td>
<td>Nothing</td>
<td>Very dense, why?</td>
</tr>
<tr>
<td>four</td>
<td><img src="image4.png" alt="Image" /></td>
<td>Multicolor, whites, grays, blacks</td>
<td>Big, very visible</td>
<td>Nothing</td>
<td>Why are the particles so big?</td>
</tr>
<tr>
<td>five</td>
<td><img src="image5.png" alt="Image" /></td>
<td>Black</td>
<td>None, visible</td>
<td>Scraps easily</td>
<td>What made this rock so hard?</td>
</tr>
<tr>
<td>six</td>
<td><img src="image6.png" alt="Image" /></td>
<td>Sparkly, light gray with black stripes</td>
<td>Sparkly specks condensed</td>
<td>Nothing</td>
<td>Why is it sparkly?</td>
</tr>
</tbody>
</table>

![Graph](image7.png)
Engaging in Argument from Evidence

What is a scientific explanation that states whether you think new substances were formed by combining the three solid substances with water?

**Claim** (state what you think):
Thick white was formed a chemical change when we mixed the 3 substances.

Yes, I do think new...

**Evidence** (give 3 pieces of evidence to back up your claim) (use qualitative data from your data table):
- First there were bubbles produced when the water was added and heat was given off.

**Reasoning** (connect your claim and evidence to show how your data links to your claim using scientific principles) (the why and how of science):
Because heat and bubbles were given off it suggests that there was a chemical change produced.

**Question** (what questions do you have?):
Why did the calcium chloride turn the water dark when water was added?
Engaging in Argument from Evidence

CER Writing Rubric

<table>
<thead>
<tr>
<th></th>
<th>one</th>
<th>two</th>
<th>three</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLAIM</td>
<td>Claim is scientifically correct &amp; complete.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EVIDENCE</td>
<td>Does not provide evidence, or only provides inappropriate evidence (evidence that does not support the claim).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REASONING Completeness</td>
<td>Provides appropriate or insufficient evidence to support claim or also includes some inappropriate evidence.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REASONING Accuracy</td>
<td>Provides appropriate and sufficient evidence to support the claim.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Suspect Bio (Claim): I think Mrs. Francis is an animal lover.

I can also tell she is very organized.

C-E-R examples:

1. The shark population will be out. The shark eats other fish, especially ocean fish, and the ocean fish are the lantern fish. The ocean fish and the lantern fish eat other organisms such as shrimp and copepods; the ocean fish and copepods eat the phytoplankton. Phytoplankton are producers and they make their own food from the sun. All of the other organisms in the food web depend on the phytoplankton. Even if they do not directly eat them, if the phytoplankton die, primary consumers (shrimp and copepods) will die because they will not have food which will cause the secondary consumers (ocean fish and lantern fish) to die, which will cause the shark to die.

2. As a result, I think the shark has more because in the balloon experiment, when we were comparing the height of the inflated balloon to the balloon filled with air, the balloon filled with air weighed more. It is because of mass. Mass is the amount of matter in something. The balloon which had air in it has more mass. Another reason why I think air has mass is because in the spring experiment, it was difficult to push the top of the syringe because the air was backing up, so it was difficult. The tiny air molecules were trapped in a small and created more pressure. All pressure made it difficult to push down because the air takes up space. It is made of matter and has mass. It is true that air is made of matter and has mass.
Engaging in Argument from Evidence

Question: What is causing the rise in global temperatures that we've seen over the last century?

Claim: Humans burning fossil fuels that release CO₂ + greenhouse gases into the atmosphere.

Evidence:
- Humans burn fossil fuels
- How much CO₂ humans emit
- CO₂ absorbs heat + forms green-house gas
- Temperature data correlated in CO₂ data
- Rule out natural effects

Reasoning:
- CO₂ levels are made when burning coal happens when an animal dies or decomposes and then companies use it to their advantage later.

Evidence:
- PPM increased by 80 from 1960 - 2020 [5 from 2015 - 2020]
- Reasoning: Since CO₂ traps heat, it makes it a greenhouse gas
- Reasoning: When temp goes up, you can see CO₂ rises go up at the same time.
- Reasoning: Although climate change is natural, human's contributing to it make it worse + cause the rise in global temps.

Grand Canyon Formation CER

<table>
<thead>
<tr>
<th>Claim</th>
<th>Evidence</th>
<th>Reasoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erosion from wind, rain, and Colorado River</td>
<td>Weathering</td>
<td>There was a river coming from the East, X, Y, &amp; Z shoveling the sand.</td>
</tr>
<tr>
<td>Weathering &amp; Erosion formed the Grand Canyon</td>
<td></td>
<td>Stream Table</td>
</tr>
</tbody>
</table>
| Widening Canyon | | The rocks fall off and was shale when the canyon

Evidence:
- CAlcium, Green clay, Limestone
How We Set Up ISNs

Back to School Stations

* Once at the beginning of each semester

* Students work through different stations to set up notebooks

- CER rubric
- Syllabus
- Essential standards
- New unit page
How We Set Up ISNs

Unit Pages & Unit Reflection

*Learning Goals

*Test Tracker
Managing Notebooks

Numbering Pages
*everyone is on the same page
*blank pages mean something is missing
*table of contents?
Managing Notebooks

*Teacher Notebook
*Students who lose them
*New students during semester
Managing Notebooks

* Students have supplies at each table for them to use to set up notebooks
* Keep students on task with timers or music

15:00
Managing Notebooks

[Image of glue containers with a red 'no' symbol over them]

[Image of notebooks with a red 'no' symbol over them]
To grade... or not to grade...

* Only when I see middle schoolers being middle schoolers

* Choose 10 pages

* Check up on students

* Checkpoint Quizzes

---

10
Where To Get Ideas

@marteinthemiddle

@marteinthemiddle

@reinscience6

@mrsnelsonsmiddles

@reinscience6

@mrsnelsonsmiddles

21 likes
reinscience6 Proof of the Law of Reflection! I've done variations of this investigation for years. This year I switched from flashlights to pen lights and we ended up with quantitative AND qualitative data for the first time! This accidental discovery made this concept so easy for kids to understand.

Mrsnelsonsmiddles Let them "PLAY"! Even though middle schoolers act cool and seem disinterested at times, they still get excited to learn through play. Today my 8th... more

View all 3 comments

October 22, 2019
Where To Get Ideas

@liebacklookup

@msscientistsatwork
Where To Get Ideas

Shared Google Drive Folder
SCECH Code: Hypothesis
CONTACT INFO

Jenna Francis

jfrancis@stjoebears.com
@liebacklookup
@jennabfrancis

Melissa Foster

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