GOALS FOR OUR STUDENTS IN SCIENCE

- Be more curious about their world than when they started.
- Investigate the world to discover why things happen.
- To develop a greater appreciation and application of science.

Application of the content into everyday experiences
(ex. why that sidewalk cracked, etc.)

- Understand how the world works and apply critical thinking skills in real-life situations.

To interpret knowledge and apply it to the real world.

Making real world connections by engaging in investigations and real world examples:

- Ignite curiosity
- Challenge ideas & concepts
- Hands on & have fun!

- Explore & investigate the world
- Apply content knowledge
- Think critically
Sensemaking

Student
- Making connections
- Sparking ideas
- Talking in groups
- Listening in groups
- Stimulations
- Process new information
- Accessing background knowledge
- Stronger Academic Vocabulary

Teacher
- Facilitating discussion
- Recording thoughts
- Listens - Less talking
- Asking questions
- Interacting with Students
- Collaboration
- Helps students "see" learning & make connections
- Less of talking!

Why has this been missing?
Making sense of misconceptions

Finding evidence

Big Idea

Application of academic vocabulary

Teacher facilitating knowing where we're going

Student discourse!

What procedures are necessary for productive student discourse?
Sensemaking evidence

- Using prior knowledge and data to help make sense of the question at hand.

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Sensemaking

- Summarize (put their ideas together)
- Compart-mentalize and connect to other curriculums.
- Asking questions and Brainstorming about their misconceptions.
- Collaborating
- Supporting ideas w/evidence and Observations

Big Idea
Sensemaking evidence

- Using prior knowledge and data and new ideas to help make sense of the question at hand.

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How will I be successful at this in 30 min/day?
Sense Making

- Collaborating w/ others
- Probing
- Facilitating
- Gathering evidence
- Concept mapping

Big Idea

* Using evidence to make claims

Time?

Teacher gave list of probing questions which led to the students wanting to discuss the findings that were, in their thoughts, findings.
Sense Making

- Students gather evidence (through experimentation)

- Use evidence to draw conclusions

- Understand/discover science concepts

- Teacher facilitates and introduces vocabulary/key concepts

- Make claims & ask questions

Investigate to answer questions with evidence.
Sensemaking

- endless pathways
- fluid
- making connections
- exploratory
- collaborative
- activating background knowledge
- trial & error
- discovery + investigation
- educated hypothesis

Teacher Role
- facilitator
- work with students ideas

Student Role's
- Share cognitive lift
Sensemaking

- Thinking out loud
- Discussion to build understanding
- Reasoning through application of ideas
- Recognizing points of confusion and gaps in knowledge
- Using evidence to support reasoning
- The use of student language
- Teacher acts as facilitator
  - Phenomena
Sensemaking

- Clarifying Misconceptions
- Flexibility
- Trust the process; They will get there!
- Prior Knowledge
- Accepting & Changing POV
- Collaboration
- Observations (Support for claims; evidence)
- Student Agency (Ownership)
- Guidance through questions (Teacher or Student)
- Meaningful Discussion
Moving Our Science Thinking FORWARD

• We use and build on other's ideas.

• We use evidence to support our thinking, ask for evidence from others, and suggest ways to get additional ideas.

• We are open to changing our minds with new evidence.

• We challenge ourselves to think in new ways.
Mixing ingredients, then baking creates a cake.

- Cake while baking rising, liquids are now solid.
- Noticing solids became liquid, expanding, growing.
- Dry (solid) ingredients ≠ wet.
- Zest in mix, but we can’t see it in the cake.
- Small cakes ≠ donuts.

- Big cake heated 350°F.
- Cake batter changed color while baking.
- Edge of cakes darker brown, inside of cakes (near middle) golden brown.
- Inside the cake there are holes.
- Larger cake took longer (11 min) than small cakes to bake.
- Cake cooked still looks a little wet.
Our Related Phenomena (events)

- mixing cement ingredients and then hardening becoming hard cement
- igneous rocks forming lava and other particles wet becoming a solid rock baking which sand/clay and creating a pot, vase
- burn wood in a campfire and get ash
- Getting nails done-powder, a liquid mixed, painted on nails, put under a UV light to dry? Harden?

- Making jello - hot liquid mixed with jello mix and put in fridge (cooling)

- Mixing vinegar and baking soda makes a gas creates (helps an upset stomach)
**During**

- What type of change occurs during the mixing process?
- How could you ensure that the same result using different methods?
- How did the ingredients change into a cake?
- Did the ingredients change into the cake?
- What made the ingredients change?
- How much time does it take to make the cake?
- Why can't the cake be cut earlier when it is the same amount of time?
- Why can't the cake be cut earlier when it is the same amount of time?
- How can you make the cake brown?
- What if the cake isn't brown?
- How do I make the cake brown?
AFTER

Slice of cake

*Why does it have air holes?*

*Holes*

*Yellow food*

*Looks wet*

*Where did the ingredients go?*

*Do all the ingredients completely change when becoming a cake?*
Our Ideas for Investigations

- Use an easy bake oven to bake a cake at different temperatures. Take out ingredients to see if you still get a cake.
- Research the job of the ingredients in baking.
- Use something that is not an oven to heat/bake like a grill, hotplate or the sun.
- Use different amounts of time at the same temperature to see how texture changes.
• Watch balking through a glass dish to watch holes to form or see if it's boiling

• Mixing ingredients to see if we get bubble (a gas to form)
EQUITABLE ACCESS

- Shared experience everyone in the room can point to/use
- Every student had time to think, put their ideas together and participate in class idea building. We recognize we have gaps in knowing.
- Making it personal to the students
- We are open to all ideas/no right or wrong
- Ownership of next step
- All questions valuable
the color of what you get is different than what you started with.

• bubbles (gas) appears when you mix things that are not gases.

• temperature is a new Kemp different than what we started with.

new smell
<table>
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<th>BEFORE</th>
<th>AFTER</th>
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<tr>
<td>No sound from Alka Seltzer</td>
<td>Sound of &quot;fizzing&quot; gas being created with Alka Seltzer and water</td>
</tr>
<tr>
<td>Solid and liquid</td>
<td>Liquid and gas</td>
</tr>
<tr>
<td>Alka Seltzer smelled like vinegar</td>
<td>Alka Seltzer + water didn't smell like vinegar</td>
</tr>
<tr>
<td>Water was 22.6°C</td>
<td>Water + Alka Seltzer dropped to 21.3°C</td>
</tr>
<tr>
<td>Water surface flat</td>
<td>Water + Alka Seltzer bubbled all over that looked like the cake</td>
</tr>
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What we think might count as evidence that a new substance has formed when substances are mixed:

- The taste of what you get is different than the taste you started with.
- The color of what you get is different than the color(s) you started with.
- A gas is created (we see bubbles) when you mix substances that are not gasses.
- A new state of matter that we did not start with.
- The temperature of what you get is different than the temperature(s) you started with.
- The smell of what you get is different than the smell(s) you started with.
L3

2. Mixed 2 substances and observed measured amount of matter [salt + water] together. Group +1g, group -1g.
3. Made a claim about [salt], [water], [new substance]: 27 claims (ish), 4 claims.
   Wondering?
4. We need to know what "new substance" means.
**Phenomenon**
Mixing ingredients and baking creates a cake

- **L4**

- **L5**

- **L6**
  - What information can help us understand if a change has occurred?
  - Observations and data that can help us predict if a change will occur.
  - Analyzing data to determine change

- **L7**
  - Change in temp in a closed system
  - Measure the temperature before, during, after mixing two substances
  - Temperature change due to the mixture of substances
Phenomenon
mixing ingredients to create a new substance

L4
• Change of weight in an open system, completing by measuring before and after
• Experiential interaction

L5
• In the closed system there is NOT a change in weight
• Performing measurements before and after interaction in the experiment

L6
• Collecting the data for lessons 3-5 to come to the conclusion there is something new

L7
• Adding a thermometer to determine if temp will alter the data of the substances

Same materials used/diff. concept + outcome (open 2 closed)
Lesson 4: In an open system, matter will leave (evaporate)

- Alka Seltzer
  - Liquid in cup
  - Weigh all ingredients separately and then after experiment

Helps students visually see and understand the interactions between materials and understand why they changed in weight and volume.

Lesson 5: Same as lesson 4, except closed system

At the end, students don't open the bag, weight stays the same as before change.

Lesson 6: Using observations to predict if a change has occurred from 1 to 5

Mixing ingredients and baking creates a cake.
mixing ingredients and baking creates a cake

Lesson 4
- Alka Seltzer
  - Liquid in cup
  - Weigh all copper separately and then after experiment

Lesson 5
- Same as lesson 4—except closed system
  * At the end—Students don’t open the bag; overall same as before change

Lesson 6
- Using observations to predict if a change has occurred from L3.5

Lesson 7
- Decay temperature increase decrease indicate a change
  - Cup of vinegar
  - Baking soda
  - Thermometer
  - Temperature of the substances before, during, and after the experiment
Phenomenon: Mixing ingredients and baking a cake

Lesson 5
- In a closed system, the weight does not change after mixing.
- No matter the closed container.
- Weigh before, close the box, mix, then weigh to show non-change.
- Showing support of weight not changing when mixing 2 substances. Example: A variable like gas.
Mixing Ingredients and Baking to Make a CAKE!

- Weight change (open system)
- AK + water in an open baggie
- Combine vinegar and baking soda
- Track temp change over time
- Return to evidence that a change has occurred
- Sometimes new substances are made from mixing original substances
- Sometimes the weight does not change
- What does that tell us?
- What is our evidence questions
- Compare all the data
- Are the original substances still the same
- Weight can increase or decrease over time
- Sometimes weight can change
- Change indicates a change
- Cold can increase over time
alkaseltzer/water
- weigh & mix
- weigh new substance in open container
- open container ⇒ change in weight (macer leaves)

PHENOMENON
- temp change
- bubbles

What happened to the air in the bubbles? Did it affect the weight?

alkaseltzer/water in closed container
L7 use video to show no change in weight

what is the difference between 3 & 4/15?

Baking Soda + Vinegar
- temp measured
- can increase or decrease during a change

What other indicators (besides bubbles) tell us a new substance was formed?

use data from L 3-5, see difference (new substance vs. no new substance) - understand how they are different
L4: Measure weight of 2 substances before and after mixing in an open system.

L5: Weight does not change in closed system; same but in a closed system.

L6: There are observations and types of data that can indicate a change has occurred. Comparing notes/data to determine if the substance is something different.

L7: Conduct exp. w/ thermometer; temperature can increase/decrease...