STEM 434/534 Lesson Planning Template Spring 2021

(Complete answers in Purple font)

Name: Kellea Medlen	**Grade:** 3rd	**Topic: Matter**

Brief Lesson Description: This lesson introduces solubility and the effect of temperature on dissolving. Students will engage in hands-on experiences using sugar and hot chocolate powder to observe how solubility changes in different water temperatures. Through group investigations, discussions, and multimedia resources, students will explore why substances dissolve faster in hot water connect this concept to real-life experiences. This lesson incorporates scientific vocabulary, inquiry-based learning, and differentiation strategies to help all learners.

Time-

- Engage- 10 minutes
- Explore- 45 minutes
- Explain- 20 minutes
- Elaborate- 30 minutes
- Evaluate- 25 minutes

Safety Concerns-

- Hot water- ensure adult supervision when handling hot (not boiling) water
- Lab Safety- make sure students are dressed appropriately
- Ensure that no materials are ingested

Specific Learning Outcomes:

- Students will understand solubility, temperature effects on dissolving, and observation skills
- Students will analyze how different variables (stirring, temperature) impact solubility

"I can" statements

- I can investigate how different solids dissolve in water and describe what happens
- I can explain how temperature affects how well a solid dissolves in water
- I can compare real-life examples of dissolving

How did this lesson develop as a result of your examination of research and data about employing culturally sustaining pedagogical strategies? (Think equal opportunity, student interests, race, gender, disabilities etc.)

To address making the lesson assessable for students with disabilities I drew from my experience working in a special education classroom. Using visuals and modified work helps students access grade level material.

Narrative / Background Information

Prior Student Knowledge:

- Characteristics of the 3 phases of matter (2.3 B)
- The effect heating and cooling have on each phase (2.3 C)

Science VA SOL	Health VA SOL	NGSS (You may have to look to a different grade level for the connection)
3.3 TSW investigate and understand how materials interact with water. Key ideas include a- solids and liquids mix with water in different ways b- many solids dissolve more easily in hot water than in cold water	3.3.q demonstrate positive ways to communicate with family and friends During group discussion	5-PS1-3 make observations and measurements to identify materials based on their properties (students investigate physical properties and behaviors of various materials when mixed with water 3.3A) 5-PS1-4 conduct an investigation to determine whether the mixing of two or more substances results in new substances (students explore how solids and liquids interact with water and how different conditions such as temp affect the solubility of the solid/liquid 3.3B)

Science & Engineering Practices: (You must tie engineering practices into your plan)

- Ask question
- Plan & conduct experiment
- Analyze & interpret data
- Construct explanation

Possible Preconceptions/Misconceptions:

- All solids dissolve in water
- All liquids/solids behave the same in water
- Temp does not affect
- Once a solid dissolves, it cannot be recovered

LESSON PLAN – 5-E Model

ENGAGE: Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions: (Discrepant events are awesome to use here)

Procedure:

1. **Pre-assessment activity (5 minutes)**

   Distribute an Entry Ticket with 3 questions

- What happens when you put sugar in water?
- Do all solids dissolve in water? Why or why not?
- How do you think temperature affects dissolving?

Students complete the entry ticket individually, then discuss their answers in pairs. Then conduct a **class discussion** to identify common misconceptions.

2. **To remind students of previous material, the class will review by playing a game. Class will be divided into 4 groups. The game is on** Pink Cat

3. **After the review, students will return to tables.**

4. **Hook Activity:** Teach will do discrepant event in the video on Seesaw that demonstrates dissolving solids in water. Have students observe closely and discuss what they notice about the speed of dissolving in different temperatures

5. **Discussion:** Facilitate a short class discussion where students share their predictions. Ask guiding questions such as:

    - What do you think affects how fast a solid dissolves?
    - Have you noticed this happening in real life, like when making tea or hot chocolate?

EXPLORE: Lesson Description – Materials Needed / Probing or Clarifying Questions:

Approx. Time 45 minutes

Materials Pages 19-24

- Entry Ticket
- Temperature & Dissolving Solids Worksheet
- Which dissolves faster? WS
- Clear cups
- Spoons
- Water
- Hot water (hot water from home kept in thermos so it's not too hot)
- Room temp water
- Hot chocolate powder
- Timers/stopwatches
- Tablespoon scoop

Procedure

1. Divide students into groups of 3-4 students
2. Give each student an entry ticket. This will help students review what they learned previously with the sugar/water about how solids mix with water
3. Give each student the "Temperature & Dissolving Solids" worksheet. Distribute 2 cups, a spoon, a timer/stopwatch, tablespoon scoop, and hot chocolate packet to each group. Place a TB of hot chocolate powder into each cup
4. Have students record their predictions about what they think will happen to hot chocolate powder. Will it dissolve in both cups? Which will dissolve faster?
5. One group member should Fill one cup halfway with room temp water and a second group member should fill the second cup half way with hot water. Have a third member of the group hit start on the timer as the water is poured. Students can stir the water to see how the powder is dissolving. The timer should run until both cups have dissolved. Students need to make note of the time when the cups have dissolved all powder.
6. Students should notice that the powder quickly dissolves in the hot water. Teacher will explain that the molecules in the hot water have more energy and move faster compared to the molecules in the room temp water. As the molecules move faster, they interact with the powder more often, causing it to dissolve faster.
7. Teacher plays the video Hot V Cold molecules video

Questions

- Before
    - What do you think will happen when we add the hot chocolate powder to each cup?
    - Will the powder dissolve at the same speed?
- During

- What do you observe happening in the hot water compared to the room temp water?
- How does stirring affect the process?
- At what point do you consider the powder to be fully dissolved?

❖ After
- Why do you think the powder dissolved faster in the hot water?
- Can you think of other real life examples where temperature affects dissolving speed?

How do you think this concept applies to cooking or making drinks?

EXPLAIN: Concepts Explained and Vocabulary Defined:

Concepts

- Dissolving- process of a solid mixing with a liquid to form a solution
- Temperature and molecular lotion- higher temps increase molecular movement, causing faster dissolving
- Kinetic energy- energy of moving particles, hotter water has more kinetic energy
- Rate of dissolution- the speed at which a substance dissolves in a solvent

Vocabulary

- Dissolve- when a substance mixes completely mixes into a liquid
- Molecules- tiny particles that make up substances
- Solvent- the liquid that dissolves a substance (water)
- Solution- uniform mixture of a solute dissolved in a solvent
- Kinetic energy- energy of motion; more heat=more energy
- Solid
- Liquid
- Gas

TTW do a guided fill-in-the-blank notebook with the class. Pages 14-25 here

ELABORATE: Applications and Extensions:

Does Stirring Affect How Fast Something Dissolves?

Worksheet Click Here

Materials

- 4 clear cups per group
- Warm water
- Room temp water
- 4 sugar packets per group
- 2 spoons per group
- Stopwatch/timer
- "Dissolving and Stirring" Worksheet

Procedure

Groups of 4-5 students

1. Make predictions- ask students "what do you think will happen if we stir one cup but leave the other still? Will the sugar dissolve faster?"
2. Set up- fill 2 cup with warm water. Label "stir" & "still" repeat with room temp cups
3. Have students add 1 sugar pack per cup and start timer
4. Students stir the cups labeled "stir". Observe how long it takes for the sugar to completely dissolve in each cup and record results
5. Discuss- "which cup dissolved the sugar faster? How did stirring affect the dissolving speed? How does this relate to real life situations? What would happen if we used salt instead?"
6. Relate- relate to experiences such as stirring hot chocolate to help it dissolve, mixing sugar into iced v hot tea, stirring soup to help blend flavors

EVALUATE:

Formative Monitoring (Questioning / Discussion):

- Entry and Exit tickets
- Observation notes
- Participation in class discussion
- Interactive vocab game- Pink Cat

Summative Assessment (Quiz / Project / Report) (Include a rubric):

Group Presentation

- Group of 3-4 students present their findings to the class. They will write a mini lab report, create a video explanation(use SeeSaw), or design a poster/inforgraphic(use Canva)
    - any of the activities completed in class and answer
    - temperature affect dissolving
    - Real-life connections
- Assess their ability to explain the concepts of dissolving, temperature effects, and kinetic energy
- Use a rubric to evaluate clarity of the material and how they worked as a team
- Rubric Link Click Here
- Indiviudally, pg 42-43, complete a test

Plan for differentiation: (Be sure to specifically address the following learners)

- Students with high-incidence disabilities (e.g., autism, ADHD, mild learning disorders)
    - A word bank with key vocabulary and their definitions will be provided
    - Visuals aids
    - Allow students to work with a peer
    - Offer sentences starters for write up – "Hot water dissolves powder faster because…"
- ELL
    - Word bank with translation in their native language
    - Work with a peer
    - Visual aids with language
- Gifted learners
    - Ask them to design a follow-up experiment (test how stirring or different solutes affect dissolving rates)

  Research real-life applications (sugar in hot/cold tea, laundry soap in hot/cold water)

Elaborate Further / Reflect: Enrichment:

- How will you evaluate your practice?
    - Take note on of the students actively participated, asked questions that showed curiousity, and if they stayed on task, use a suggestion box so students can provide feedback
- Where might/did learners struggle in the lesson?
    - Confusing dissolve with melt- demonstrate by using an ice cube (melt- heat alone is used) and sugar in water (dissolve- required a liquid)
- How can the lesson be strengthened for improved student learning?
    - Kahoot game to strengthen vocab
    - Extend the experiments- use different solutes
- Did the lesson reflect culturally sustaining pedagogies? If not, how can this be enhanced?
    - Only section where culture is referenced in the ELL differentiation section.

- To improve-
  - Use more real-world connection “what hot/cold beverages do you enjoy at home? Have you noticed how sugar or spices dissolve differently?”
  - Use references to different cultures- chai, miso soup

Materials Required for This Lesson/Activity			
Quantity	**Description**	**Potential Supplier (item #)**	**Estimated Price**
1 bag (50 cups)	Clear plastics cups Link	Walmart	$6.28
1 box (24 spoons)	Plastic spoons Link	Walmart	$7.49
6	Timer Link	Amazon	$19.99
1 box	Hot chocolate mix Link	Walmart	$1.72
1 box (48 packets)	Sugar packets Link	Walmart	$3.12
6 sets	Measuring spoons Link	Amazon	$11.99

Books to have in the classroom library	
What's the Matter in Mr. Whisker's Room?	What's the Matter with the Three Little Pigs? The Fairy-Tale Physics of Matter
Joe-Joe the Wizard Brews Up Solids, Liquids, and Gases	Libby Loves Science- States of Matter
Change It! Solids, liquids, gases, and You	
Libby Love Science- Mix and Measure	