Did It Really React?

Teacher		**Class**	Grade 7
Subject	Science	**Topic**	Chemical reactions
Date		**Room**	
Lesson length	60 minutes	**Country**	United States

Students compare properties before and after mixing. They decide with evidence if a new substance formed.

Curriculum links

- Know that a chemical reaction can be determined by examining a substance's properties before and after an interaction [1]

Learning objectives

- Students will compare color, state, bubbles and temperature in °F before and after mixing.
- Students will use property evidence to decide if a new substance formed.

Success criteria

- I can record before-and-after properties for each sample.
- I can claim reaction or not using two property changes.

What students already know

Ask: What is the difference between melting ice and burning wood? Listen for melting keeps same substance while burning makes something new.

Key words

reactant	a starting material present before a change happens [14]
product	a new material made after a change happens [14]
property	something you can observe about matter, like color, state, or temperature [1]
precipitate	a solid that forms inside a liquid during a change [8]
chemical reaction	starting materials changing into one or more different materials [13]

Materials

- clear cups
- baking soda
- vinegar
- ice cubes
- thermometers reading in °F
- observation sheet
- safety goggles
- stir sticks
- Slides 1-7, 9-12
- Worksheet Task D copies
- Worksheet Task F copies

Before the lesson

- Print observation sheet / Worksheet Task D for each group and Task F for each student
- Test Slide 6 Video clip 1 (0:00-4:21) with sound and captions
- Set out clear cups, baking soda, vinegar, ice cubes, stir sticks, thermometers reading in °F
- Check safety goggles, paper towels, trash bin, and hand-washing access

Lesson outline

0–5 min **Starter** 5 min · Whole class

Hook students and recall that new substances mean something different formed.

YOU DO

1. Show Slide 1: Did a Chemical Reaction Happen?
2. Say the hook question and show Slide 2 photo of before-and-after comparison.
3. Show Slide 5 question about toast turning brown and crunchy.
4. Take 3 quick votes: could you turn toast back to soft white bread?

STUDENTS DO

1. Look at title and photo and listen to hook.
2. Think, then tell a partner: toast cannot go back, so something new formed.
3. Vote reaction or not and give one reason.

Say: Did it bubble, change color, or get hot? You decide if that really means new chemistry. Today you will be the scientist who checks properties before and after to spot something brand-new.

Ask: Toast turns brown and crunchy. Could you turn it back to soft white bread? (No, you cannot reverse it easily, so properties show a different substance.) · What do scientists compare to decide? (Properties before and after, to spot something brand-new.)

Check understanding: Thumbs up / down: toast is a new substance. If split, restate that irreversible color and texture change points to new material.

Support: Show toast photo and point to color and crunch as two properties. **Stretch:** Ask what property data would prove it: color, smell, hardness before and after.

Use: Slides 1-2, 5

5–15 min **Teaching** 10 min · Whole class

Teach the 4 clues and how to record before-and-after evidence.

YOU DO

1. Show Slide 3 compare: melting ice and dissolving tea stay same substance.
2. Show Slide 4 steps: record color, state, smell, temperature first, mix, watch, record after.
3. Teach Slide 7 words: reactant, product, property, precipitate and Slide 10 cards for color change, gas bubbles, temperature shift.
4. Model one decision on the board with before-and-after boxes.

STUDENTS DO

1. Copy before / after boxes for color, state, bubbles, temperature in °F.
2. Label starting materials as reactants and new materials as products [14].
3. Choral respond: new substance or same substance for each case.

Say: A reactant is what you start with. A product is the new material made after. We decide by comparing properties. A new substance must be produced for a chemical reaction to take place [10].

Worked example: Ice melting: Before = clear solid, cold. After = clear odorless liquid, cold. Same material, just state changed, so physical change [18]. Baking soda + vinegar: Before = white powder + clear liquid, no bubbles. After = fizzing liquid, bubbles, cooler or warmer cup, powder gone. Bubbles appear when a gas is produced in a chemical reaction [12], plus color or large temperature change [10], so new gas formed means chemical reaction.

Ask: Why is melting ice not a chemical reaction? (It is still water, only state changed from solid to liquid [18].) · Why is tea spreading color in hot water not a chemical reaction? (The chemicals are dissolving, and dissolving is a physical change, not a chemical reaction [10].) · What shows atoms made new substances? (Atoms rearrange themselves to form new substances [12], with color change, bubbles, or large temperature change [10].)

Check understanding: Mini whiteboards: write R for reaction, P for physical for ice melting and fizzing powder. Reteach dissolving and melting if missed.

Support: Keep Slide 10 clue cards up and point to color, bubbles, temperature icons during each example. **Stretch:** Ask: if atoms rearranged but the number of atoms did not change [9], what would stay same in your count?

Use: Slides 3-4, 7, 10

15–25 min **Guided video** 10 min · Whole class

See real before-and-after tracking and name the evidence.

YOU DO

1. Show Slide 6: Watch: Before and After.
2. Play Video clip 1 (0:00-4:21) and pause twice to name properties.
3. Think aloud to fill before-and-after table for one demo.
4. Link each clue to new substance or just mixed.

STUDENTS DO

1. Watch and call out color, state, bubbles, temperature changes.
2. Help complete class table for one video demo.
3. Decide with partner: new substance or just mixed, and why.

Say: Track each substance's properties before mixing. Then name what evidence shows something new formed. Remember boiling bubbles do not count because steam condenses back to liquid water [10].

Ask: What did you see that points to a gas product? (Ongoing fizzing and bubbles that do not stop when stirring stops [12].) · When would bubbles NOT count? (When boiling makes steam bubbles that cool back to liquid water, a physical change [10].)

Check understanding: Fist-to-five confidence on spotting color change, bubbles, temperature change. Replay 30 seconds if many show 1-2.

Support: Give listening grid with 4 boxes: color, state, bubbles, temperature in °F to tick during video. **Stretch:** Ask what follow-up check would rule out room warming, like re-measuring after 2 minutes.

Use: Slide 6, Video clip 1 (0:00-4:21)

25–50 min **Main Activity** 25 min · Groups

Test samples and write claims with before-and-after evidence.

YOU DO

1. Show Slide 9 task: A yellow solid case, B ice melts case, C fizzing warm powders case.
2. Hand out goggles, cups, baking soda, vinegar, ice cubes, thermometers in °F, observation sheet / Worksheet Task D.
3. Direct groups: record before, mix small amounts, record after for 2 live tests, then use data photos for yellow solid case.
4. Circulate, prompt claims with two property changes and reactant/product labels.

STUDENTS DO

1. In groups record before properties and temperature in °F for ice and for baking soda + vinegar.
2. Mix, observe 2 minutes, record after properties and temperature in °F without tasting.
3. Study yellow-solid data: two clear liquids make white precipitate instantly [4] or bright yellow solid [4], which is a precipitation reaction with solid products [8]. Write claims for A, B, C.

Say: Record color, state, temperature in °F, and bubbles before and after. Mix carefully and watch closely. A chemical reaction can be determined by examining properties before and after an interaction [1]. Then write: reaction or not, plus two pieces of evidence.

Worked example: Sample C - baking soda + vinegar: Before: white powder + clear liquid, 72°F, no bubbles. Steps: add 1 spoon powder to 2 spoons vinegar, stir, wait 2 minutes. After: cloudy fizzing liquid, lots of bubbles, 68°F, powder gone. Claim: chemical reaction. Evidence 1: gas bubbles mean a new gas formed [12]. Evidence 2: temperature change shows large energy change [10]. Reactants are powder and vinegar; products include new gas and liquid [14]. Atoms rearranged but number did not change [9].

Ask: Sample B ice melted but stayed clear and odorless. Reaction? (No, same substance, only state changed, no new substance [10].) · Sample A clear liquids made a yellow solid in liquid. Reaction? (Yes, a precipitation reaction with one or more solid products [8], so reactants converted to different products [13].)

Check understanding: Collect one claim per group on board. Check each has two properties and reactant/product labels. Fix missing temperature in °F on the spot.

Support: Give sentence frame with word bank for color, gas, temperature in °F, and solid: Before ___. After ___. Claim ___ because ___ and ___ [10]. **Stretch:** Have students predict what the same observations would look like if the atoms rearranged but the number of atoms did not change [9].

Use: Slide 9, Worksheet Task D

50–60 min **Plenary** 10 min · Whole class

Fix the boiling trick and agree on when bubbles count.

YOU DO

1. Show Slide 11 mystery: kettle bubbles hard when hot.
2. Contrast with fizzing mixture that leaves new material.
3. Show Slide 12 true/false for rearrangement and bubbles in boiling water.
4. Hand out Worksheet Task F for final two-sentence rule.

STUDENTS DO

1. Vote no reaction for kettle and explain water vapor cools back to liquid water.
2. Answer true/false: atoms rearranging to new substance is a reaction.
3. Write two-sentence rule for when bubbles count, noting a new substance must be produced [10].

Say: My kettle bubbles like crazy. Is my kitchen doing chemistry? No. Bubbles of steam do not show a new substance because steam condenses back to water. Boiling is a physical change, not a chemical reaction [10]. Fizzing that makes a new gas you cannot easily reverse does count.

Ask: Is kettle bubbling a new gas product? (No, it is water vapor that becomes liquid water again, so no new substance [10].) · When do bubbles prove a reaction? (When fizzing makes a new gas with other clues like color or temperature change [12].)

Check understanding: Exit slips / Task F: need rule + one example. If many say all bubbles count, re-show ice vs fizz table.

Support: Provide starters: Bubbles count when ___. Boiling does not count because ___. Dissolving tea is also physical [10]. **Stretch:** Ask what extra data like color after cooling or temperature in °F would settle a tricky case.

Use: Slides 11-12, Worksheet Task F

Common mistakes

Mistake	How to spot it	How to fix it
Thinking all bubbles mean a chemical reaction.	Calls boiling kettle water a reaction.	Cool the steam: it condenses back to liquid water, so boiling is a physical change, not a chemical reaction [10]. Ask for proof of a new gas [12].
Thinking color spreading by dissolving means new substance.	Calls tea in water a reaction because color changed.	Tea chemicals dissolving is a physical change [10]. A new substance must be produced for a reaction [10].
Thinking atoms disappear or appear.	Counts show different totals before and after.	Recount together: atoms are rearranged but the number of atoms does not change [9].

Support

- Give sentence frame with word bank for color, gas, temperature in °F, and solid for all claims [10].
- Pre-fill before-properties so focus is on after-properties and evidence.

Stretch

- Have students predict what observations would look like if atoms rearranged but number did not change [9].
- Have teams add an everyday example card and defend with before-and-after properties.

For the LSE or teaching assistant

Stay with main activity groups: help read thermometer in °F, scribe before/after words, prompt two evidences and reactant/product labels.

Safety

- Wear safety goggles
- Do not taste anything and avoid skin contact, check for skin allergies
- Wipe up spills right away and wash hands after handling materials

Check for understanding

Question	Answer
Clear liquids mix and a bright yellow solid appears. Reaction? Give one evidence.	Yes. New solid product formed from clear liquids shows a precipitation reaction with solid products [8].
Ice melts to clear liquid and temperature stays cold. Reaction? Why?	No. Same substance, only state changed from solid to liquid [18].
Powder + liquid fizzes, makes new gas, and temperature drops. Reaction? Why?	Yes. Gas bubbles [12] plus large energy change [10] show new substances formed from reactants [13].

Homework

Complete Worksheet Task F: answer the big question with before-and-after evidence.

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