COMPANION GUIDE · VOLUME 2 · MATTER MAYHEM

the Shoebox Lab *Kit Series*

Matter Mayhem

Mix, Squish, & Discover the Science of Stuff

ADULT FACILITATOR COMPANION

AUDIENCE	GRADES	TIME	ACTIVITIES
Facilitator + Learner	3–5	~2¾ hrs	3 + Challenge

Welcome to Matter Mayhem!

GRADES	AGES	TIME	ACTIVITIES
3-6	8-11	about 3 hours	3 + Challenge

This kit is a science lab in a box. The child will mix, squish, and bounce their way through real experiments. They will learn

1. How to use your senses to observe what a material is like
2. What happens when you mix things together
3. The difference between a physical change and a chemical change
4. How to use evidence to solve a mystery

Everything you need is in the box. It is all the child's to keep. Keep the box — everything stores inside!

YOUR JOB IS SIMPLE: ASK QUESTIONS. DON'T GIVE ANSWERS.

You do not need to be a science expert.   The kit, the workbook, and the videos help the child learn.

WHAT IS IN THE KIT?

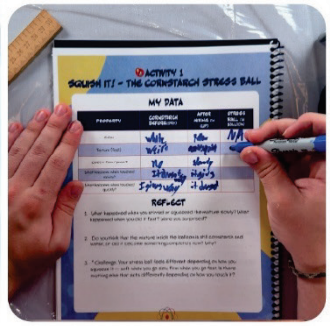
Check the box: is everything there?

- 5 balloons
- Cornstarch
- Linker
- Craft sticks
- 12 small cups
- 2 cups w/ lids
- Table cover
- Small funnel
- Clear glue
- Vinegar
- Small cup
- 3 bags
- Water bottle
- Ruler
- Small measuring scoops
- Workbook & a pencil

- 6 labeled vials: Baking soda, Cornstarch, Salt, Powder A, Powder B, Powder C

You will also need a few things from home —paper towels, a permanent marker, and water.

How It Works



1 MIX	2 OBSERVE	3 WRITE	4 TALK
The child mixes.	**The child looks closely.**	**The child writes what happened.**	**You talk about it together.**

The workbook leads the child step by step. Children can do most steps alone. The best part? Doing it together. Who knows, you might learn something, too!

ONE TIP: DON'T CORRECT A GUESS BEFORE THE TEST!

Wrong guesses can be good science. – Let the tests show the answers.

Also: measure carefully. Most slime that goes wrong starts with guessed amounts.

WHAT TO SAY

"What do you notice?"

"What do you think will happen?"

"Show me how it works."

"What changed?"

"Why do you think that happened?"

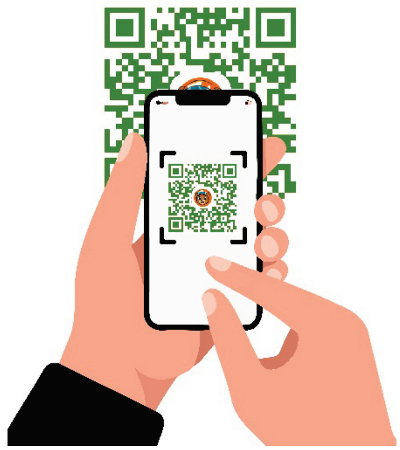
"Great try — test it again!"

Children often learn to read English fast. If they want, let the child read the workbook out loud to you!

Watch the Videos

SCAN ME

MM • All Videos
shoeboxlab.org/mm



MM • Activity 1	MM • Activity 2	MM • History Spotlight	MM • Activity 3	MM • Science Spotlight	MM • Grand Challenge

No reading is needed. Every step is in a short video. Scan a code with a phone camera. Watch together before you start. Each activity has its own code — find it in the table.

What are the Activities

Activities at a Glance

		WORKBOOK	THIS GUIDE	VIDEO
1	**Squish It! — The Cornstarch Stress Ball** *Does mixing change what something is made of?*	pp. 5–8	p. 11	mm1
2	**Stretch It! — The Slime Test** *Did a brand-new substance appear?*	pp. 9–13	p. 15	mm2
H	**History — A Timeline of Amazing Polymers** *How do tiny pieces link up to make our world?*	p. 14	p. 21	mm6
3	**Bounce It! — The Polymer Bouncy Ball** *Can the same ingredients make something different?*	pp. 15–18	p. 18	mm3
S	**Science Spotlight — What's Going On?** *The science behind your experiments!*	pp. 19–22	p. 22	mm5
★	**Challenge — Crack the Case!** *Can you use science to tell things apart?*	pp. 23–29	p. 24	mm4

Safety First

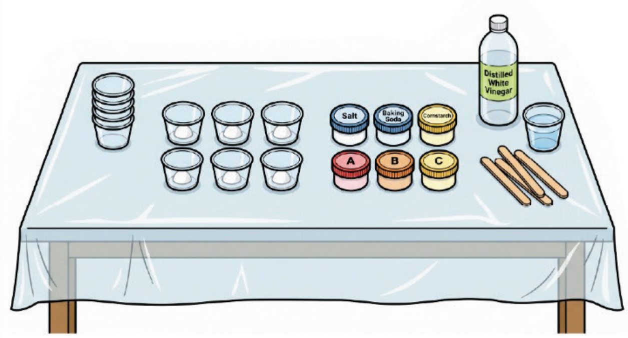
✓ SAFETY RULES

1. Do NOT eat or taste anything in this kit.
2. Wash hands with soap after every activity.
3. Keep materials away from eyes. Rinse with clean water and tell an adult.
4. Always work with an adult nearby.
5. Spread the table cover before you start!

✓ BEFORE THE FIRST RUN

Cover the table. • Get out the small cup, the cornstarch, a craft stick, paper towels, and water.

Activity 1



Grand Challenge

YOU'RE READY!

Read page 3 of the workbook together first. Then turn to page 5. Bolt the Bear meets you there. Have fun

! IF SOMETHING GOES WRONG !

1. Oobleck is crumbly → add water a few drops at a time. Too runny? Start over.
2. Slime is too sticky coming out → shake the closed container well first.
3. Bouncy ball is too sticky → add a few drops of linker only. That is the thing being tested!
4. You can't break the kit. Try again — that's what scientists do!

Need help?

The child is stuck → p 34.

Something sounds wrong (mix-ups) → p 32.

Check an answer → the end of each activity.

A science word → p 41.

A Note to the Facilitator

❖ HOW THIS GUIDE REFERS TO YOU AND THE LEARNER

A note on language used in this guide: the adult leading the session is called the facilitator, or "you" when addressed directly. The child doing the kit is called the learner. These terms are used throughout regardless of your relationship — adult facilitator, grandparent, homeschool educator, older sibling, or any other trusted adult.

Welcome — and thank you for taking the time to do this with the learner in your life. You don't need a science background, a teaching degree, or any special equipment beyond what's in this box and a few things from the kitchen. What you do need is curiosity, a willingness to ask questions rather than give answers, and a surface you don't mind getting a little messy.

This kit is designed so the learner does the discovering. Your job as the facilitator is to set up each activity, ask the right questions at the right moments, and get out of the way. This guide gives you those questions, explains the science behind what's happening, and tells you what to expect at each step — including when things don't go as planned.

A few things worth knowing before you begin:

- You do not need to read this guide front to back. It is a reference. Section 2 (Activity Guide) is the part you will use most — work through it alongside the student workbook.
- Unexpected results are not failures. When the learner's slime comes out sticky or their data surprises them, that's chemistry being real — and often the best teaching moment in the kit.
- The kit works equally well spread across several days or done in a couple of longer sessions. Session suggestions are in Section 1.

MEET BOLT THE BEAR

Bolt appears throughout the student workbook as a mascot and guide. When the learner reads a "Bolt Says" box, feel free to read it together — they're often the most important tips in that section.

How This Guide Is Organized

This guide has five sections. You don't need to read them in order — skim the table below, find what you need, and come back as questions come up. A a

Section	What It Contains	When to Use It
1 — Before You Begin *page 8*	Kit checklist and how to set up your space — read this before Session 1.	*Read before Session 1*
2 — Activity Guide *page 11*	Step-by-step facilitation for each activity: learning goals, prep tips, questions to ask, and what good results look like.	*Use alongside the student workbook*
3 — Supporting the Learner *page 30*	Opens the For Teachers & Group Leaders pages: the science primer, grade tips, common mix-ups, and troubleshooting.	*Reference when needed*
4 — Standards & Awards *page 37*	Full Next Generation Science Standards (NGSS) alignment, math connections, and Cub Scout Adventure connections.	*For homeschool documentation or program tracking*
5 — Quick Reference *page 41*	Word Watch answer guide for every vocabulary term, plus suggested outside resources.	*Use after finishing the kit*

SECTION 1

Before You Begin

This section gives you everything you need to run the kit well: what's in the box, how to set up your space, and a plain-language primer on the science. You don't have to read every word before Session 1 — skim what's useful and come back as questions come up.

1.1 Kit Contents

Confirm the following items are in the kit before your first session:

KIT ITEM	NOTES
Balloons (×5, round, 9-inch)	For the Activity 1 stress ball
Small funnel	For filling the balloon
Cornstarch	Activities 1, 3, and a Grand Challenge reference powder
Clear school glue (×1 bottle)	The base for slime and the bouncy ball
Linker solution (pre-mixed, sealed)	The activator that links the chains — Activities 2 & 3
Graduated measuring cup with lid (×2)	For measuring and shaking in Activities 2 & 3
3 labeled mystery vials (A, B, C)	The Grand Challenge unknowns
Reference powders (cornstarch, baking soda, salt)	The Grand Challenge "known" powders
White vinegar (small bottle)	The fizz test
Plastic drop cloth	Disposable table cover
Zipper bags (×3, quart)	For storing slime / the bouncy ball
Empty water bottle	For filling the stress-ball balloon
This companion guide	You're reading it!
Student workbook	For the learner participating

You will also need to supply:

- 2–3 small bowls or cups (for mixing and the powder tests)
- A ruler or tape measure (metric preferred — centimeters give more precise drop-test readings)
- A spoon or craft stick for stirring
- A permanent marker (to label cups)
- Paper towels, water, and a pencil
- A kitchen scale (this is optional – for an optional Activity 2 weighing bonus)

1.2 Setting Up Your Space

The ideal setup is a washable, flat surface — a kitchen table or counter — with the provided drop cloth spread over it, set up near a sink. This is a mixing kit: cornstarch, glue, and slime are forgiving, but they’re easier to clean up while they're still wet. Keep paper towels within reach.

Spills wipe up with warm water and a little soap while they’re fresh — slime and glue are hardest to remove once dried. A tray or a second tablecloth under the work area contains the splash zone.

IF YOU’RE WORRIED ABOUT MESS

Everything in this kit cleans up with warm water and a little soap while it’s fresh. Slime and glue are hardest to remove once dried, so wipe spills promptly. A plastic tablecloth or a tray under the work area contains the splash zone.

- Keep paper towels and a damp cloth within reach.
- Work over the drop cloth, not bare furniture.
- A sink nearby makes cleanup and hand-washing easy.

(Tip: have the learner wear old clothes or an apron — slime happens.)

MEASURE CAREFULLY, NOT PERFECTLY

The recipes are forgiving, but proportions matter. Use the measuring cup’s marks for the glue, water, and linker. If a batch doesn’t work, it’s almost always the amounts — not you or the learner.

RUNNING THE KIT WITH MULTIPLE LEARNERS

If more than one learner is participating, assign roles for each step: one measures, one pours, one records. Rotate roles between activities to keep everyone engaged.

⚠ SAFETY NOTES

- The linker solution is safe to handle but is not to be swallowed; rinse eyes with clean water if it gets in them and tell an adult. Wash hands after each activity.
- Nothing in this kit is food — the powders and liquids are safe to touch but must never be tasted. Keep the fine powders and small parts away from children under three.

Suggested Session Schedule

Now that your space is set up, here's a suggested pacing for getting through the kit:

Session	Activities	Estimated Time
Session 1	Activity 1 (Stress Ball) + Activity 2 (Slime)	~60 min
Session 2	History (Timeline of Polymers) + Activity 3 (Bouncy Ball) + Science Spotlight	~65 min
Session 3	Grand Challenge (Crack the Case!)	~40 min
Total		~2 hr 45 min

FOR HOMESCHOOL FACILITATORS

These three sessions map cleanly onto three lesson periods and can be spread across a week without losing continuity. The Science Spotlight in Session 2 works well as a short read-and-discuss lesson that directly prepares the learner for the Grand Challenge.

Before You Open the Kit: What Your Learner Already Knows

Before you open the kit with your learner, spend three to five minutes in conversation. Their answers tell you where to pitch the activities and which ideas to reinforce. Don't correct anything yet — just listen, and jot a note if something surprises you. You'll come back to these same questions at the end. Think of them as conversation starters, not a quiz — there are no wrong answers yet.

- What do you already know about what things are made of? Can something change without becoming something new?
- If we mix two liquids together, do you think we always get something brand new — or just a mixture?
- Have you ever done an experiment where you changed one thing at a time to see what happened?
- What would you like to find out by the end of this kit?

SECTION 2

Activity Guide

This section walks through each activity. Every activity has the same rhythm: a short build or mix, a test with data, and a reflection. You don't need to read it all before you start. Work through it with the student workbook, one activity at a time.

Each activity opens with learning goals, standards, and a “Before the Session” checklist. While you work, use the Questions to Ask sidebar for prompts. The Answer Guide at the end of each activity covers the workbook's Reflect questions. Read it yourself before the learner gets there.

ACTIVITY 1

Squish It! The Cornstarch Stress Ball

LEARNING GOALS	STANDARDS AT A GLANCE
For the learner to understand… ▪ How to observe a material's properties before and after mixing ▪ That mixing cornstarch and water is a physical change — it's still cornstarch and water ▪ How to record observations consistently across the stages of mixing	**Primary:** 2-PS1-1, 5-PS1-3 **Also supports:** 2-PS1-4, 5-PS1-1 Full alignment details are in Section 4.

TIME BUDGET FOR THIS ACTIVITY

Mix ≈ 12 min · Investigate ≈ 12 min · Reflect ≈ 6 min (≈ 30 min total)

A short break before filling the balloon helps — give the oobleck a minute to settle while the learner records observations.

✓ BEFORE THE SESSION

1. Have the drop cloth down and a cup of water and paper towels ready.
2. Read the oobleck tip below — the water amount is the whole trick.
3. If you have a minute, mix a small test batch yourself first so you know what “right” feels like.

How the activity runs

First the learner observes dry cornstarch. Then they mix cornstarch and water into a gooey paste called oobleck. They explore how strangely it acts, then funnel it into a balloon to make a stress ball (workbook pp. 5–7). They record properties at three stages — dry, mixed, and in the balloon (workbook p. 8). The activity closes with reflection. Figure 1 shows the oobleck's surprise.

Figure 1. Oobleck behaves like a solid under a fast poke *or push* and a liquid when you stop *or go slow* — the heart of Activity 1's surprise.

Your job during the test: get the learner to describe the dry cornstarch in detail first. That "before" record is what makes the "after" surprising. Don't explain the oobleck. Let them find it with their hands.

WHY OBSERVE FIRST?

The whole point of Activity 1 is to slow down and look before concluding. A careful "before" description turns the oobleck surprise into evidence rather than just a fun mess. Observation is the skill every later activity builds on.

✎ QUESTIONS TO ASK THE LEARNER

While observing the dry cornstarch: *How would you describe it? What does it feel like?*

Before mixing: *What do you think will happen when we add water?*

After mixing: *Poke it fast, then slow. What's going on? Did that surprise you?*

Looking at your three stages: How did the cornstarch change from dry to mixed to inside the balloon?

★ Challenge: *Is the stuff in the balloon still cornstarch and water, or something new? How could we find out?*

○ WHAT GOOD RESULTS LOOK LIKE

Properly mixed oobleck is thick like toothpaste: it cracks and feels solid under a fast poke, then oozes when you stop.
If the mix feels dry and crumbly, add water a few drops at a time and keep stirring — go slowly.
If it turns soupy and wet, start over; you can't easily pull it back from too much water. (With oobleck, it's much easier to add water than to remove it.)

→ GOING FURTHER

- Try the oobleck on a cookie sheet and let the learner run their fingers across it quickly versus pressing slowly.
- Leave a spoonful of oobleck out overnight — what comes back? (A small preview of physical change and conservation.)

Activity 1 — Answer Guide

These notes describe the type of thinking to listen for in each Reflect question *(workbook p. 8)* — they are not scripted answers. ★ marks the challenge question.

Q1: What happened when you stirred or squeezed the mixture slowly? What happened when you did it fast? Were you surprised?

Key ideas: a description of the surprise — firm under a fast poke, runny when slow. A strong answer notices that it depends on how you touch it.

If stuck: "Show me with your hands — poke it fast, then slow. Describe what your fingers feel."

Q2: Do you think that the mixture inside the balloon is still cornstarch and water, or did it become something completely new? Why?

Key ideas: it is still cornstarch and water — a mixture, a physical change. You could dry it out and get the cornstarch back.

If stuck: "If we left it out for a few days, what do you think we'd find?"

★ Challenge: What else have you seen that acts differently depending on how you touch it?

Key ideas: any reasoned example — quicksand, ketchup, wet sand at the beach. Look for the learner tying the idea to the world, not one right answer.

If stuck: "Have you ever felt something change when you pressed it fast versus slow?"

CARRYING FORWARD TO ACTIVITY 2

In Activity 1 the learner mixed two things and got a mixture — still the same stuff. In Activity 2 they'll mix two things and get something genuinely new. Before starting, ask: "Last time, mixing gave us a mixture. Do you think that always happens?"

ACTIVITY 2

Stretch It! The Slime Test

LEARNING GOALS	STANDARDS AT A GLANCE
For the learner to understand… ▪ That mixing glue and linker creates a new substance — a chemical change ▪ How to compare an ingredient's properties before and after mixing ▪ That mass is conserved when a new substance forms (the weighing bonus)	**Primary:** 5-PS1-4, 2-PS1-1 **Also supports:** 5-PS1-2, 5-PS1-3 Full alignment details are in Section 4.

TIME BUDGET FOR THIS ACTIVITY

Observe ≈ 8 min · Mix & investigate ≈ 16 min · Reflect ≈ 6 min (≈ 30 min total)

Activity 2 uses fresh ingredients. If you're running Activities 1 and 2 back-to-back, a quick hand-wash and a clean cup between them helps the learner reset for a new question.

✓ BEFORE THE SESSION

1. Confirm the measuring cup and the linker bottle are on hand — the proportions matter, so read the slime tip below.
2. A short conversation first: "We're going to mix two liquids. Do you think we'll get a mixture, like last time — or something new?"
3. Have a zipper bag ready to store the finished slime.

How the activity runs

The learner observes the glue and the linker on their own and records their properties. Then they mix them in the measuring cup and shake (workbook pp. 9–10). The slime forms while shaking. They record the slime's properties in the data table (workbook p. 11). An optional Bonus Weighing Test (workbook p. 12) weighs the parts before and the slime after. The totals match — that is conservation of matter you can watch.

Your job during the test: hold the line on careful measuring. Let the learner notice that the slime acts like neither thing it came from. Don't name "chemical change" before they describe what they see.

Background for the facilitator — physical vs. chemical change

This is where the kit's big idea lands. Mixing glue and linker makes a brand-new substance — slime — and you can't easily turn it back into glue and linker. That is a chemical change. Compare it with Activity 1. The oobleck stayed cornstarch and water, so that was a physical change. Figure 2 shows the before and after.

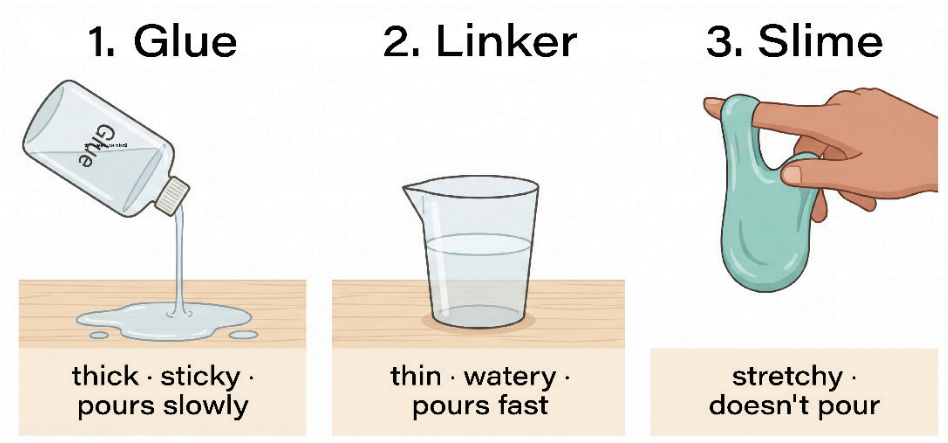


Figure 2. The glue and linker are both liquids you can pour — but the slime holds its shape and stretches. New properties are the clue that a new substance formed..

✎ QUESTIONS TO ASK THE LEARNER

Before mixing: *What are the glue and linker like on their own? Write down their properties.*

After mixing: **Does the slime act like the glue? Like the linker? Or like neither?**

Thinking it through: *Could you separate the slime back into glue and linker? Why or why not?*

Bonus: *Did the total weight change after mixing? What does that tell you?*

○ WHAT GOOD RESULTS LOOK LIKE

Good slime is stretchy and holds together, not dripping or stuck to everything.

If it’s too sticky: shake the closed container thoroughly, then knead — under-shaking, not the recipe, is the usual cause. A longer knead usually fixes it.

→ GOING FURTHER

- If you have a kitchen scale, try the bonus weighing test even if you skip the rest — the "before equals after" result is a memorable demonstration of conservation. Skip it if you don't have a scale.
- Make a second batch and stretch it slowly versus pulling it fast — slime is a polymer with its own surprising behavior.

Activity 2 — Answer Guide

These notes describe the type of thinking to listen for in each Reflect question *(workbook p. 13)* — they are not scripted answers. ★ marks the challenge question.

Q1: Which properties of the slime are different from both the glue AND the linker?

Key ideas: specific properties. It holds its shape. It stretches. It does not pour like the liquids did. The key idea: the new material has properties neither part had.

If stuck: "Point to a row in your data table where the slime differs from both the glue and the linker."

Q2: Could you separate the slime back into glue and linker? Is your slime a mixture, or is it a new substance? How do you know?

Key ideas: the learner sees it is a new substance from a chemical change. And that it is hard to reverse, unlike the oobleck.

If stuck: "Compare this to Activity 1. Could you get the cornstarch back? Can you get the glue back?"

★ Challenge: Your stress ball and your slime were both made by mixing — but one was a physical change and one was chemical. What's the difference? Use your data to explain.

Key ideas: a strong answer uses both experiments. Oobleck = physical change: same stuff, easy to undo. Slime = chemical change: new substance, hard to undo. Look for reasoning from their own data.

If stuck: "Which was easier to undo — the oobleck or the slime? What does that tell you?"

CARRYING FORWARD TO ACTIVITY 3

The learner has now seen the linker turn glue into slime. In Activity 3 they'll change how much linker they add and watch the properties change — same ingredients, different result.

ACTIVITY 3

Bounce It! The Polymer Bouncy Ball

A NOTE FOR THE FACILITATOR BEFORE YOU BEGIN

Heads-up: the two bouncy balls may bounce more alike than the learner expects. That's a real result — small, honest differences are part of science. Resist telling the learner what the data "should" show.

LEARNING GOALS

For the learner to understand…

- How changing the linker-to-glue ratio changes a material's properties
- How to run a fair test that changes only one thing across repeated trials
- That more cross-links make a polymer stiffer and bouncier

STANDARDS AT A GLANCE

Primary: 5-PS1-3, 3-5-ETS1-3

Also supports: 5-PS1-4, 5-PS1-1

Full alignment details are in Section 4.

TIME BUDGET FOR THIS ACTIVITY

Make the balls ≈ 16 min · Drop test ≈ 8 min · Reflect ≈ 6 min (≈ 30 min total)

✓ BEFORE THE SESSION

1. Lay out the glue, linker, cornstarch, and measuring tools. The learner makes two balls — one with less linker, one with more.
2. Have a ruler ready for the drop test and a surface that won't be harmed by a bouncing ball.
3. Encourage a written prediction first: "Which ball do you think will bounce higher — less linker or more? Why?"

How the activity runs

The learner makes two bouncy balls. Only one thing changes: the amount of linker. Then they drop each one from the same height, three times, and record the bounce heights (workbook pp. 15–18). Same ingredients, different amounts, different material.

✎ QUESTIONS TO ASK THE LEARNER

Before starting: *What is the one thing we're changing between the two balls? What are we keeping the same?*

After the first ball: *Make a prediction for the second ball before you test it.*

After the drop test: *Was the difference bigger or smaller than you expected?*

Looking at your data: *Which ball bounced higher? Does your data clearly show it, or is it close?*

Looking across all activities: *Which change had the biggest effect? Can you back that up with numbers?*

○ WHAT GOOD RESULTS LOOK LIKE

A workable ball holds a round shape and bounces; results between the two balls may be subtle, and that's a real finding.

If a ball is too sticky, add a few drops of linker only — too much undermines the less-vs-more comparison. Keep kneading; most stickiness resolves with a minute of work.

→ GOING FURTHER

- Make a third ball with an in-between amount of linker — where does it fall?
- Drop both balls from a greater height — does the difference between them grow?

Activity 3 — Answer Guide

These notes describe the type of thinking to listen for in each Reflect question *(workbook p. 18)* — they are not scripted answers. ★ marks the challenge question.

Q1: Which ball bounced higher — the one with less linker or the one with more linker?

Key ideas: an accurate read of their own data, and an attempt to say why. More linker means more cross-links. That makes a stiffer, bouncier ball.

If stuck: “What does your data table say? Is the difference big or small?”

Q2: Your slime and your bouncy ball were made from very similar ingredients. What do you think caused them to have such different properties?

Key ideas:the recipes are close, but the amounts are not. More linker means more cross-linking. More cross-links make a material stiffer and bouncier instead of stretchy.

If stuck:“What did you change between the slime and the bouncy ball? What did that do to the chains?”

★ Challenge: A scientist wants a material stretchy like slime but that also bounces a little. How much linker would you suggest, and what evidence supports it?

Key ideas: a suggestion tied to the data — somewhere between the two amounts they tested. Look for reasoning from evidence. There is no one right number.

If stuck: “Which of your two balls is closest to what she wants? What would you change?”

CARRYING FORWARD

Three activities, three materials, one big idea: properties change when you change what’s inside. The Science Spotlight now gives the learner the words for what they saw, and the Grand Challenge puts their observation skills to the test.

FACILITATED READING

A Timeline of Amazing Polymers

This section is a change of pace on purpose: a reading and talking break (workbook p. 14). It shows the learner that the stretchy, bouncy things they just made belong to a family called polymers. People have found and invented polymers for thousands of years. The timeline runs from natural rubber to Silly Putty to the plastic in LEGO bricks.

How to Approach It at Home

- have the learner read it silently. Then talk through the questions together.
- Prefer read-aloud: take turns reading one entry each.
- this reading links to social studies and history. The timeline pairs well with units on invention and everyday tools.

QUESTIONS TO ASK THE LEARNER

1. The slime and bouncy ball you made are polymers. What other polymers can you spot in this room?
2. Some of these materials were discovered by accident. What does that tell you about how science works?
3. Which invention on the timeline do you think changed everyday life the most? Why?
4. If you were an inventor, what new material would you want to create — and what would it do?

BRIDGE BACK TO THE EXPERIMENT

After the discussion: “Every one of these inventors was doing what you just did — mixing materials and paying close attention to what new properties showed up.”

SCIENCE SPOTLIGHT

What's Going On?

The Science Spotlight comes after all three activities on purpose (workbook pp. 19–22). The learner has already watched properties change, matter stay the same, and polymers form. Now they get the words for it. Experience first, then the words — that order makes learning stick.

Connecting it to the world outside the kit

The same ideas show up all over the kitchen and the world. A few prompts to help the learner notice them:

- **Cooking is full of both kinds.** Melting butter is physical — it is still butter. Baking a cake is chemical — you can't un-bake it. Have the learner sort a few kitchen examples.
- **Rusting, burning, and fizzing tablets** are everyday chemical changes — a new substance forms.
- **Ice melting, paper tearing, water boiling** are physical changes — the same substance in a new form.
- **Recycling** is conservation of matter you can watch. The material is rearranged into something new. It is not destroyed.

A NOTE ON THE VOCABULARY

The key terms — properties, physical and chemical change, conservation — are introduced with everyday examples. The learner doesn't need formal definitions; the goal is that they can use the words naturally: "the slime is a new substance." If they can say that in their own words, they've understood it.

QUESTIONS TO ASK THE LEARNER

For the multiple-choice questions: *Don't just check the answer — ask "Why is B right?" and "Why is A wrong?" A correct answer without reasoning is less valuable than a thoughtful wrong one.*

For question 3 (open-ended): *A strong answer explains that combining glue and linker makes a brand-new substance — a chemical change. If the learner repeats the definition verbatim, ask: "Can you give me an example of a chemical change from your own life?"*

If the learner asks how slime can be a "new substance" when it came from glue: *the linker rearranges the glue's long chains and links them together — same matter, new arrangement, new properties. That's a chemical change.*

Background for the Facilitator — Key Ideas to Listen For

- **Properties:** the learner ties properties to things you can observe and measure, not just "what it looks like."
- **Physical vs. chemical change:** the learner can sort an example and explain why — same substance vs. new substance; reversible vs. hard to reverse.
- **Conservation:** the learner says, in their own words, that the matter is still all there — just rearranged.

Science Spotlight — Answer Guide

The "Check Your Understanding" items (workbook p. 22) are answered below. The first two are multiple-choice; the third is open-ended.

Q3: In your own words explain what happens when you combine the glue and linker to make slime.

Key ideas: the idea that a chemical change makes a new substance — the linker cross-links the glue's chains. A strong answer uses "new substance" or "doesn't act like either one."

If stuck: "Look back at Concept 3 — what happened to all the matter?"

GRAND CHALLENGE

Crack the Case! Mystery Powder Investigation

The synthesis moment (workbook pp. 23–29). The learner uses everything they have practiced. They observe properties. They run fair tests. They read evidence. Then they identify three unknown powders in labeled vials: Powder A, Powder B, and Powder C. They compare each one against known powders, using four tests: look, touch, water, and vinegar.

LEARNING GOALS	STANDARDS AT A GLANCE
For the learner to understand… ▪ How scientists identify unknown substances from evidence ▪ How a reference (control) makes a comparison fair ▪ How to draw a conclusion that cites specific test results	**Primary:** 5-PS1-3, 3-5-ETS1-2, 3-5-ETS1-3 **Also supports:** 5-PS1-4, 5-PS1-1 Full alignment details are in Section 4.

★ YOUR ROLE IN THE GRAND CHALLENGE

Step back. This is the learner's chance to be the scientist. If they jump to a conclusion, don't confirm or deny it — ask, "Which test result is your evidence for that?" Let the data do the deciding. The one rule to enforce firmly: no tasting, ever — real scientists identify unknowns by testing, not tasting.

✎ QUESTIONS TO ASK THE LEARNER

Before testing: *Why do we test the known powders first? What would happen if we skipped that?*

During testing: *Which test is giving you the clearest yes-or-no answer?*

After testing: **Which test was most useful for telling the powders apart? Which was least?**

Final reflection: *How sure are you about each powder? What's your evidence?*

What a Good Finish Looks Like

Listen for three signs of a strong finish:

- **Evidence-based identification.** The learner points to real test results, not a guess. For example: "Powder B fizzed in vinegar, and only baking soda does that."
- **Use of the reference card.** They check each mystery powder against the known powders. They do not guess from memory.
- **Comfort with uncertainty.** If two powders look alike, a strong learner names the test that would tell them apart. They do not force an answer.

Marking the End Together

Ending the kit well takes just a few minutes. Pick what feels right:

- **Return to the opening questions.** Ask the same questions you asked before opening the kit (see "Before You Open the Kit" in Section 1). Note out loud how the learner's answers changed.
- **Invite a "show and explain."** Have the learner explain to someone else how they cracked the case. Teaching someone is the strongest test of understanding.
- **Name something specific you were impressed by.** Avoid a generic "good job." Instead: "You used the vinegar test as your deciding clue — that's exactly how a chemist would do it."
- **Ask what they want to explore next.** "After doing this, what do you wonder about now?" Their answer is a gift — it points straight to the next thing worth learning about.

Grand Challenge — Answer Guide

These notes cover what to listen for in each Reflect question (workbook p. 29).

Q1: Which powder was the easiest to identify? Which was the hardest? Why?

Key ideas: reasoning tied to the tests. Baking soda is easiest — the fizz gives it away. Cornstarch and salt need the water test to tell apart.

If stuck: "Which test gave a clear yes-or-no answer? Which left you unsure?"

Q2: Which test gave you the most useful information? Could you have solved the mystery without it?

Key ideas: any answer works if it is justified. The vinegar test flags baking soda. The water test separates salt from cornstarch. No single test does it all — and that is the insight.

If stuck: "If two powders looked the same, which test finally told them apart?"

Going further: If you had a fourth mystery powder, what tests would you run first — and why? (Not in the workbook — a good extra question to ask aloud.)

Key ideas: a plan that starts with the most useful tests: water and vinegar. Then they reason from the reference card.

If stuck: "Which two tests would you run first, and what would each one tell you?"

For Teachers & Group Leaders

The pages after this one go deeper: the science behind the kit, common mix-ups, grade tips, and standards. Parents can stop here — or keep reading!

A Quick Science Primer for Facilitators

This section gives you just enough background to feel confident facilitating each activity. You don't need to read it all before you start — return to it as each topic comes up.

What is Matter, and what are Properties?

Matter is anything that has weight and takes up space — in other words, all the "stuff" around us. Every material has properties: the ways you can describe it, such as its color, texture, how it flows, and how it behaves when you push or stretch it. Scientists use properties to tell materials apart and to group them.

When the learner describes how the cornstarch looks and feels, then how the slime looks and feels, they are doing exactly what a materials scientist does — using properties as evidence.

ON TELLING ORIGIN STORIES

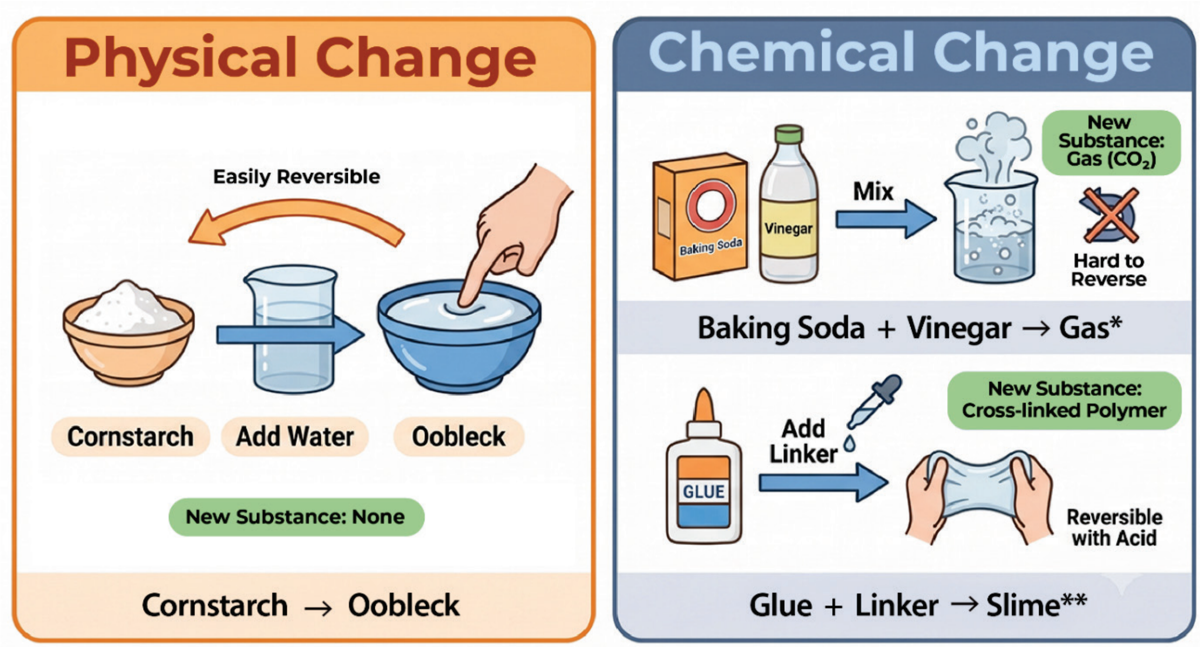
Many science stories — Goodyear and the hot stove, Silly Putty by accident — get embellished over time. They're worth telling because they make real history feel alive, but add "...or so the story goes!" so the learner also learns that scientific history gets retold sometimes with a little polish. The science stays true even when the anecdote is embellished.

What is a Physical Change vs. a Chemical Change?

A physical change alters a material's shape, size, or form, but the material is still the same substance — and you can usually reverse it. Mixing cornstarch and water makes "oobleck," which behaves strangely, but it's still cornstarch and water; let it dry and the cornstarch comes back.

A chemical change happens when substances combine to make a new substance with different properties — and it's difficult to reverse. When glue and linker make slime, the slime doesn't act like either ingredient, and you can't easily get the glue and linker back.

A useful framing: in a physical change, the same actors put on a costume; in a chemical change, the actors become someone new. (Note for you: "you can never reverse a chemical change" is an oversimplification — say difficult or not easily reversible, as the workbook does.)



A physical change occurs when materials change form. A chemical change creates a new substance, which is often difficult to reverse. Mixing cornstarch and water yields Oobleck as a physical change. *Mixing baking soda and vinegar creates three new substances: CO2 gas, as shown here, as well as water and a salt. **Mixing glue and linker creates a cross-linked polymer we call slime. Some debate if this is a true chemical change, but we use it here as a memorable, tangible example.

HOMESCHOOL NOTE

The formal vocabulary (polymer, cross-linking, conservation of mass) is typically developed across Grades 3–8. This kit builds the intuitive foundation by letting the learner experience the relationships first. They don't need the formal definitions — they need the hands-on memory the definitions will later attach to.

What is Conservation of Matter?

Conservation of matter is one of the biggest ideas in science: matter is never made or lost — it only gets rearranged. When the learner makes slime, nothing disappears and nothing is created from nothing.

The glue and linker rearrange into a new material, but if you weigh everything before and after (the Activity 2 bonus), the totals come out about the same. Nothing was lost; nothing was gained; the matter just changed form.

Dissolving looks like disappearing — but it isn't. When salt dissolves, it breaks into pieces too small to see and is still all there; let the water dry and the salt returns. The water hasn't vanished either — it evaporates into the air. Recycling is the same idea: matter is rearranged, never destroyed.

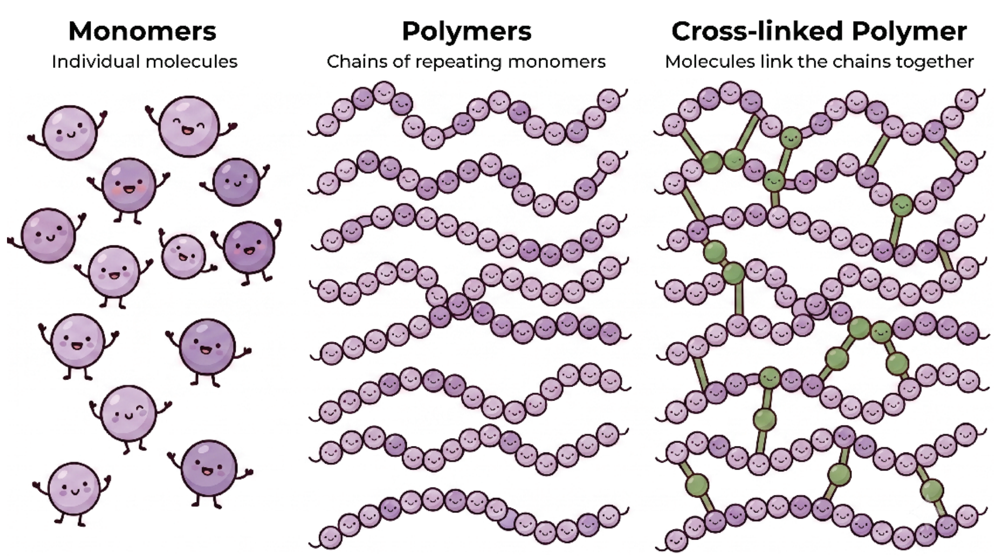
Conservation of matter means that nothing is lost: the glue and linker weigh the same as the slime they make — the matter just rearranges (before = after)

What are Polymers and Cross-linking?

A polymer is a material made of very long chains of tiny repeating pieces (molecules) linked together — "poly" means "many." Rubber, slime, plastic bottles, and even DNA are polymers. The clear glue in this kit is already full of long polymer chains.

The linker adds short connections — cross-links — between those chains, like rungs in a ladder:

- **A few cross-links** and the chains can still slide past each other, so you get stretchy slime.
- **More cross-links** and the material holds its shape and bounces, like the polymer ball.
- **Same ingredients, different result** — changing how much linker is the heart of Activities 2 and 3.



Polymers are long chains of repeating units called monomers. Adding linker ties the long polymer chains together — a few links make stretchy slime; more links make a firmer, bouncier ball.

SECTION 3

Supporting the Learner

This section gives you three kinds of support: how to adjust the kit to the learner's grade level, a map of the most common misconceptions that come up, and a troubleshooting table for when something physical goes wrong.

3.1 Adapting the Kit by Grade

3rd Grade

The workbook is a slight stretch for many 3rd graders — but a productive one.

- Prioritize observation and description over formal explanation. "The slime is stretchy and the glue wasn't" is a complete, correct answer at this level — don't push for "chemical change" language.
- Focus on accurate recording as the primary skill. Neat, honest entries in the data table are a genuine achievement.
- The Grand Challenge's written planning may work better as a spoken plan you write down together than an independent writing task.
- The open-ended Check-Your-Understanding question may work better as a spoken conversation than a written answer.
- The ★ challenge questions are optional — skip them if they create frustration. They are enrichment, not requirements.
- Build in more time, and do the measuring together so proportions stay right.

4th Grade

The workbook is calibrated for this level and should feel appropriately challenging without being overwhelming.

- Encourage vocabulary in written reflections — not as labels but in explanatory sentences ("it's a chemical change because the slime doesn't act like the glue").
- Push gently on the "why" in reflection questions.
- The Grand Challenge's written planning should be done before mixing begins.
- The ★ challenge questions are appropriate and worth attempting.

5th Grade

Push for precision: "by how much did one ball bounce higher?" not just "it bounced higher."

- Encourage the learner to compare their two balls' bounce heights and explain what the difference means.
- Ask the learner to write their own prediction before Activity 3.
- The ★ challenge questions should be treated as required, not optional.
- Consider a short written "lab report" after the Grand Challenge — what they tested, what they found, and what they'd do next.

MATH EXTENSIONS (GRADE 5)

Math extensions for homeschool facilitators who wish to add a math layer:

- **Compare the two balls' best bounce heights** and compute the difference — connects to CCSS.MATH.4.NBT.B.4 (multi-digit subtraction).
- **Express the linker-to-glue amounts as a ratio** (Activity 3) — connects to fractions and ratio reasoning.
- **Read and record the kitchen scale** to the nearest gram (the bonus weighing test) — connects to CCSS.MATH.2.MD.A.1 (measurement).

3.2 Common Misconceptions & How to Address Them

These are the most frequent misunderstandings that come up in this type of experiment. You don't need to raise them proactively — use this section when you hear them.

? "MIXING TWO THINGS ALWAYS MAKES SOMETHING NEW"

Why they think it: Activity 2 makes a dramatic new substance, so it's natural to generalize.

The real science: mixing can make a simple mixture (each part keeps its properties — like the oobleck, or sand and salt) or, sometimes, a new substance through a chemical change.

How to address it: "Compare Activity 1 and Activity 2. Both mixed two things — but did both make something new? How do you know?"

? "WHEN SALT OR SUGAR DISSOLVES, THE MATTER IS GONE"

Why they think it: it disappears from view.

The real science: the salt is still there, broken into pieces too small to see, and it comes back if the water dries — conservation of matter. And the water doesn't vanish either — it evaporates into the air, where it's still all there.

How to address it: "If we let that cloudy cup dry out on the windowsill, what do you think we'd find?"

? "IF IT LOOKS AND FEELS TOTALLY DIFFERENT, IT MUST BE A NEW SUBSTANCE"

Why they think it: dramatic change reads as transformation.

The real science: a physical change can look dramatic (oobleck!) while the substance stays the same. The test is whether you can reverse it and whether it's truly a new material.

How to address it: "It sure looks different — but is it still cornstarch and water? What would prove it?"

? "SLIME IS JUST A LIQUID"

Why they think it: it flows and drips a little.

The real science: slime is a polymer whose chains are cross-linked, so it behaves partway between a liquid and a solid — it flows slowly but holds together and stretches.

How to address it: "Pull it slowly, then yank it fast. Does a liquid do that?"

? "A CHEMICAL CHANGE CAN ALWAYS BE UNDONE"

Why they think it: many physical changes (melting, freezing) reverse easily, so they assume all changes do.

The real science: chemical changes make a new substance and are difficult — often not — reversible; you usually can't easily get the original ingredients back.

How to address it: "Try to think of a way to turn the slime back into plain glue and linker. Why is that so hard?" (Avoid "impossible" — difficult to reverse is the accurate framing.)

3.3 When Things Go Sideways: Troubleshooting

Use this table as a quick reference when something physical goes wrong mid-activity.

Problem	Likely Cause	What to Do
Oobleck is dry and crumbly	Too little water	Add water a few drops at a time, stirring between additions, until it's like toothpaste.
Oobleck is soupy and runny	Too much water	Start over — you can't easily remove water. Add cornstarch only if you have extra.
Slime too sticky when first removed	Under-shaken	Shake the closed container thoroughly, then knead for a minute. Stickiness usually resolves with kneading.
Slime won't form at all	Not enough linker	Re-measure; add linker a little at a time and shake. The cup's marks matter.
Bouncy ball is too sticky	Needs a touch more linker	Add a few drops of linker only — too much undermines the less-vs-more comparison.
Bouncy ball won't hold a shape	Too little kneading or linker	Keep kneading; if still loose, add a couple of drops of linker.
A reference powder won't fizz	Expected — only baking soda fizzes	Use it: "What does no fizz tell you about this powder?"
Powders look identical	By design — that's the challenge	Steer to the water and vinegar tests, which separate them.

3.4 When the Learner Gets Stuck

Every kit has a moment where the learner goes quiet, shrugs, or says "I don't know." That is not failure — it is exactly where real thinking happens. The facilitator's job in those moments is to stay present without rescuing. These five prompts work across grade levels and activities. Use whichever feels natural.

- "Tell me what you're noticing so far." (Starts observation without demanding an answer.)
- "What would you try first if you could change one thing?" (Opens action without prescribing.)
- "Can you show me in the data where that happened?" (Anchors claims in evidence without telling them if they're right.)
- "That's a real question. What could we do to find out?" (Converts a confused moment into an experiment.)

- Silence and a patient nod. (The single most underused facilitation tool. Five to eight seconds of quiet is often what unlocks the answer.)

A note on resisting rescue: if you give the answer the moment the learner hesitates, you save them from the brief discomfort of not knowing — but you also take the learning with you. Research on productive struggle (sometimes called "productive failure") consistently shows that the effortful, uncertain part of a task is what builds the durable understanding. Waiting is a gift.

3.5 Adapting for Different Learners

Section 3.1 offered adjustments by grade. Learners also vary within a grade. The adjustments below draw on Universal Design for Learning (UDL) — none change what is being learned; they only change how the learner can access it. Use any combination that helps.

- **For a learner who reads below grade level:** read workbook instructions aloud and have the learner talk through their thinking rather than write it. The workbook can be filled in together with you scribing.
- **For a learner whose first language is not English:** the physical nature of the activities lets understanding show through action. Pair English terms with gestures; accept responses in either language; use photos as a record alongside written answers.
- **For a learner with attention or focus differences:** split each activity into 10–15-minute chunks. The three-session structure (Session 1, 2, 3) can easily become six short sessions. A brief reset between chunks — water, stretch, a moment outside — is fine; it does not break the science.
- **For a learner with fine-motor challenges:** help with measuring, funneling, and tying the balloon. The science is in the predictions and reasoning, not the dexterity.
- **For a learner who is well ahead:** invite a self-designed extra test (a third linker amount, a new powder) and a short written lab report.
- **For a learner who is quiet or shy:** drawing or pointing to a data row is a valid response. Let them write predictions down first; they can read them aloud afterward if they want.

3.6 Reading the Learner: When Behavior Is the Symptom

Section 3.3 troubleshoots the physical setup; this table does the same for the learner. If you see one of these behaviors, try the response on the right — and don't assume it means the learner isn't learning. It often means the opposite.

- **"I don't know" to every prediction.** Offer a forced choice: "Stickier or stretchier? Just pick one — the test will tell us."
- **Rushing through without observing.** Slow it down: "Before you mix — describe the glue to me. Now the linker."
- **Frustration when slime or the ball doesn't work.** Normalize it: "Real chemists adjust their recipes all the time. What should we change?"
- **Constantly asking "is this right?"** Redirect to evidence: "What does your data table show? That's your answer."
- **One-word answers to Reflect questions.** Expand with their data: "Point to the row where the slime differs from the glue. What do you see?"
- **Jumping to conclusions after one test.** Require the reference test first: "Let's check it against a powder we know before we decide."

SECTION 4

Standards & Program Connections

This section maps the kit's activities to the national standards and program frameworks most relevant to its audience. Read the sections that apply to you — you don't need to work through all of them.

A NOTE ON ALIGNMENT

Standards *alignment* means the kit's activities touch the same concepts and practices the standards describe. Standards *achievement* is something a learner builds over many experiences, not a single kit. Treat the maps below as a signal of where this kit fits in a larger learning arc — not a checkoff list.

A NOTE FOR HOMESCHOOLERS

If you're homeschooling, use the grade-band maps that follow as guideposts. A strong reader in 2nd grade may work happily at the 3–5 level; a 5th grader new to chemistry vocabulary may benefit from the K–2 framing first. Adjust the support you give (hints, read-alouds, extra time) rather than the activity itself.

4.1 NGSS Alignment — Grades K–2

These standards apply if the kit is used with younger children, or as an informal framework for the foundational ideas being developed.

Code	Standard Name	What the Learner Develops	How This Kit Addresses It
2-PS1-1	Properties of Materials	Observe and describe the properties of different materials.	The learner describes cornstarch, glue, linker, slime, and the mystery powders by their properties.
2-PS1-2	Classifying by Properties	Test and classify materials by their observable properties.	The Grand Challenge identifies powders by comparing observed properties to a reference.
2-PS1-4	Reversible & Irreversible Change	Recognize that some changes can be reversed and some cannot.	Oobleck (reversible / physical) vs. slime (hard to reverse / chemical) is the core contrast.

4.2 NGSS Alignment — Grades 3–5 (Primary)

These are the primary targets for this kit.

Code	Standard Name	What the Learner Develops	How This Kit Addresses It
5-PS1-1	Particles Too Small to See	Model that matter is made of particles too small to be seen.	Polymers and dissolving are explained with "tiny pieces / molecules" too small to see.

Code	Standard Name	What the Learner Develops	How This Kit Addresses It
5-PS1-2	Conservation of Mass	Measure and graph quantities to show mass is conserved.	The Activity 2 bonus weighs the ingredients before and the slime after — the totals match.
5-PS1-3	Identify Materials by Properties	Make observations and measurements to identify materials.	The Grand Challenge is a direct identification-by-properties investigation.
5-PS1-4	Mixing → New Substance	Conduct tests to see whether mixing substances makes a new one.	Glue + linker → slime, and baking soda + vinegar → gas, are both mixing-makes-new-substance cases.
3-5-ETS1-2	Comparing Solutions	Compare multiple solutions using evidence.	The mystery investigation compares evidence across four tests to reach the best-supported identification.
3-5-ETS1-3	Fair Tests & Variables	Plan and carry out fair tests controlling variables.	Activity 3 isolates one variable (linker amount); the reference powders act as controls.

4.3 Common Core State Standards (CCSS) Math Connections

The kit does not require formal math instruction, but it generates data that naturally connects to several math standards. These are noted for homeschool facilitators who wish to extend into math lessons.

Standard	Topic	Connection to This Kit
2.MD.A.1	Measuring with standard tools	Measuring liquids and the drop height.
3.MD	Represent & interpret data	Data tables in every activity.
4.NBT.B.4	Multi-digit subtraction	Difference between the two balls' bounce heights.
5.NF / ratios	Fractions & ratios	The linker-to-glue ratio in Activity 3.

A NOTE ON AVERAGES

Computing the mean (average) of trial results is a Grade 6 standard (CCSS.MATH.6.SP.B.5) and has been intentionally excluded from the student workbook. The workbook uses "Best Run" rather than average. If the learner asks about averaging, it's fine to show the concept informally.

4.4 Cub Scout Program Connections

If the learner is a Cub Scout, this section is for you. Since the 2024 program update, Cub Scouting's science content lives in the rank Adventures themselves — and this kit's mystery-powder investigation is nearly a requirement word for word.

Adventure / Rank	How This Kit Connects
Forensics — Bear (3rd grade), elective	"Do an analysis of four different substances: salt, sugar, baking soda and cornstarch." The Grand Challenge tests three of those four powders (cornstarch, baking soda, salt) with the same look-touch-water-vinegar approach.
Super Science — Bear (3rd grade), elective	Hands-on chemistry investigations (sink-or-float, color-morphing, color-layering). The kit's observe-mix-record habit is the same skill; the slime and oobleck make a natural fifth investigation.
Engineer — Arrow of Light (5th grade), elective	Requirements 4–5: identify a project and build it using the engineering process. Tuning the bouncy-ball recipe — change one thing, test, improve — fits as a materials-engineering project.
What the kit does not cover	Fingerprints, shoe prints, and chromatography (Forensics), and the static-electricity investigation (Super Science). The kit supplies the substance analysis and the fair-test habit.

The national STEM Nova awards were retired in June 2025; some councils now run their own local STEM Nova award, so ask your den leader. Adventure requirements change over time — confirm the current wording with your den leader or at scouting.org before recording anything.

4.5 Common Questions

A few questions come up again and again when learners — or other adults watching — get into this kit. Here's how we'd answer them.

Q: My learner's slime is too sticky or too runny. Is the kit broken?

Almost never. Sticky slime is usually under-shaken — shake the closed cup well and knead. Runny slime usually needs a bit more linker. See the troubleshooting table (Section 3.3).

Q: Is the linker safe?

It's safe to handle but not to swallow, and shouldn't get in the eyes (rinse with water if it does). Wash hands after. Treat it like any household cleaner — respectful, not fearful.

Q: Can we taste the powders to identify them?

No — and that's a teachable rule. Real scientists never identify unknowns by tasting. The four tests do the job.

Q: Do we have to do all three activities, in order?

In order is best — each builds the observation habits the next one needs, and the Grand Challenge assumes all three are done. If time is tight, the bonus weighing test is the most skippable part.

Q: My learner says, "I already know this."

Great — promote them to expert. Have them predict first and explain why the result happens. Knowing slime is "a chemical change" and showing why from their own data are different skills; this kit rewards the second.

SECTION 5

Quick Reference Materials

This section collects the kit's ready-reference material: the Word Watch answer guide for all vocabulary terms and a list of outside resources for extending the learner's curiosity beyond the kit.

5.1 Word Watch Answer Guide

For each vocabulary term in the student workbook, this guide shows what key ideas to listen for in the learner's response, and a follow-up question to extend the conversation.

Term	Listen for · Go deeper
Observe (p. 3)	**Listen for: using all the senses, not just looking. Go deeper: What did you observe about the oobleck that you didn't expect?**
Property (p. 7)	**Listen for: a describable feature — color, texture, how it flows. Go deeper: Name three properties that tell slime apart from glue.**
Physical change (p. 11)	**Listen for: shape or form changes, but it's the same substance; reversible. Go deeper: What physical change could you reverse right now?**
Chemical change (p. 11)	**Listen for: a new substance forms; hard to reverse. Go deeper: What's your evidence that the slime is new and not just mixed?**
Mixture (p. 12)	**Listen for: parts combined, but each keeps its properties. Go deeper: Is the oobleck a mixture? How do you know?**
Substance (p. 12)	**Listen for: a specific kind of matter with its own properties. Go deeper: Is slime a new substance, or a mix of two?**
Variable (p. 16)	**Listen for: the one thing you change on purpose. Go deeper: What was the variable in the bouncy-ball test?**
Ratio (p. 18)	**Listen for: how much of one compared to another. Go deeper: How did changing the linker-to-glue ratio change the ball?**
Polymer (p. 18)	**Listen for: long chains of tiny pieces linked together. Go deeper: Name three polymers in this room.**

Term	Listen for · Go deeper
Matter (p. 19)	Listen for: anything with weight that takes up space. Go deeper: Is air matter? How could we tell?
Observation (p. 19)	Listen for: what you notice with your senses or a tool. Go deeper: Which of your data-table entries are observations?
Conservation of matter (p. 22)	Listen for: matter is never made or lost, only rearranged. Go deeper: How did the weighing test show this?
Evidence (p. 23)	Listen for: information from testing that supports a conclusion. Go deeper: What evidence identified Powder B?
Cross-linking (glossary)	Listen for: connections between polymer chains that stiffen the material. Go deeper: More cross-links — stretchier or bouncier?
Molecule (glossary)	Listen for: a tiny piece of matter too small to see. Go deeper: How do molecules make a polymer?
Experiment (glossary)	Listen for: a fair test that changes one thing. Go deeper: What made the bouncy-ball test fair?
Hypothesis (glossary)	Listen for: a testable prediction based on what you know. Go deeper: What did you predict before Activity 3?
Trial (glossary)	Listen for: one run of an experiment; repeat for reliability. Go deeper: Why three trials instead of one?

5.2 Suggested Resources

External resources for extending the kit. None are required — include any that fit the learner's interests.

For the Learner

Resource	Notes
What Is the World Made Of? (K. W. Zoehfeld)	A picture-book introduction to solids, liquids, gases, and properties of matter.
National Geographic Kids — Science: Matter	Accessible articles and photos on materials and changes.
PBS LearningMedia — Matter & Its Interactions	Free interactives at pbslearningmedia.org — search "matter grades 3–5."

For Facilitators Who Want to Go Deeper

Resource	Notes
Khan Academy — States of Matter & Reactions	Free, beginner-friendly lessons at khanacademy.org.
NGSS Standards Explorer	Full text of the standards at nextgenscience.org/search-standards.
ACS — Adventures in Chemistry	The American Chemical Society's hands-on chemistry resources at acs.org.

For Replacement Materials

Source	Notes
Household / grocery	Cornstarch, baking soda, salt, white vinegar, and clear school glue are all common grocery items.
The kit's linker	A pre-mixed activator (a dilute borax solution). A homemade equivalent is ½ tsp borax in 1 cup warm water — adult-prepared only.

Matter Mayhem

Mix, Squish, & Discover the Science of Stuff

a the Shoebox Lab kit

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