

A Complete 5E Science Unit with Lesson Plans

4TH GRADE

ENERGY OF COLLISIONS

Engage, Explore, Explain, Extend, Evaluate

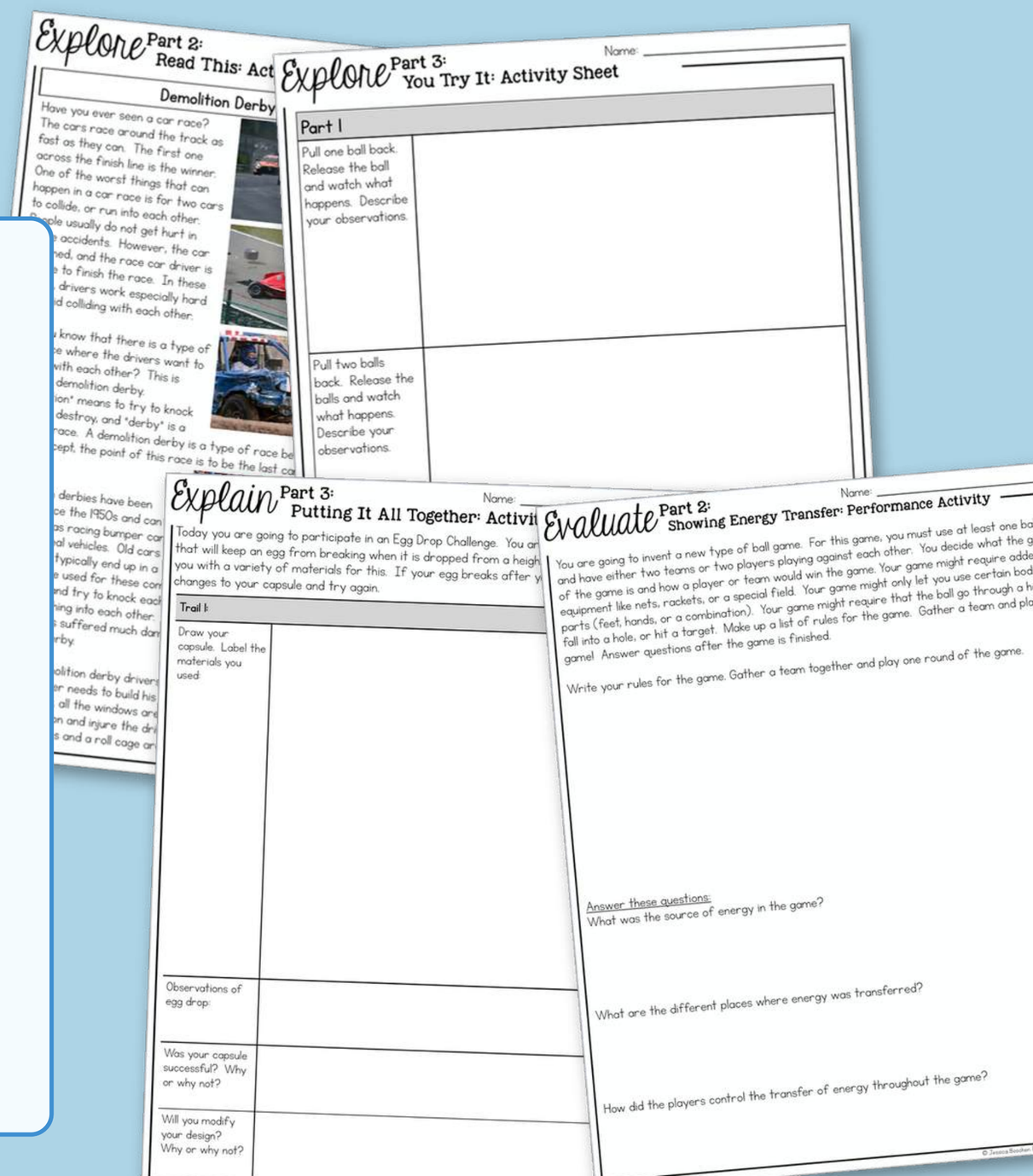
NGSS 4-PS3-3

KEEP SCROLLING TO SEE WHAT'S INSIDE!

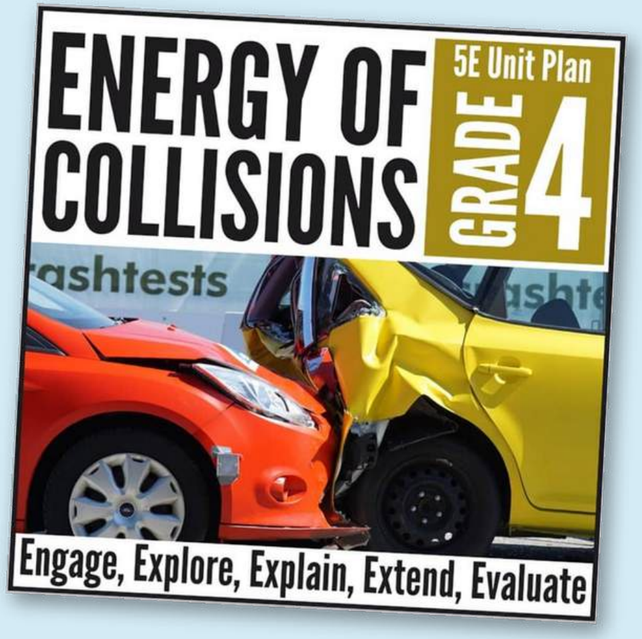
WHAT'S INCLUDED

5E ENERGY OF COLLISIONS UNIT

- 210+ Page 5E Unit Plan
- Lesson Plans for All 5 Phases
- Teacher Notes and Misconceptions
- Materials Checklist and 4 Timelines
- Hands-On Collision Investigations
- Reading Passages on Collisions
- Vocabulary Cards and Big Idea Posters
- Exit Tickets in 3 Formats
- Performance Assessment
- Answer Keys for Student Pages
- Google Slides and Google Forms Versions



UNIT AT A GLANCE



- Students build a water bottle Newton's cradle, drop eggs, and design crumple zones.
- Teacher background, lesson plans, and student pages in every phase.
- Aligned to NGSS 4-PS3-3.

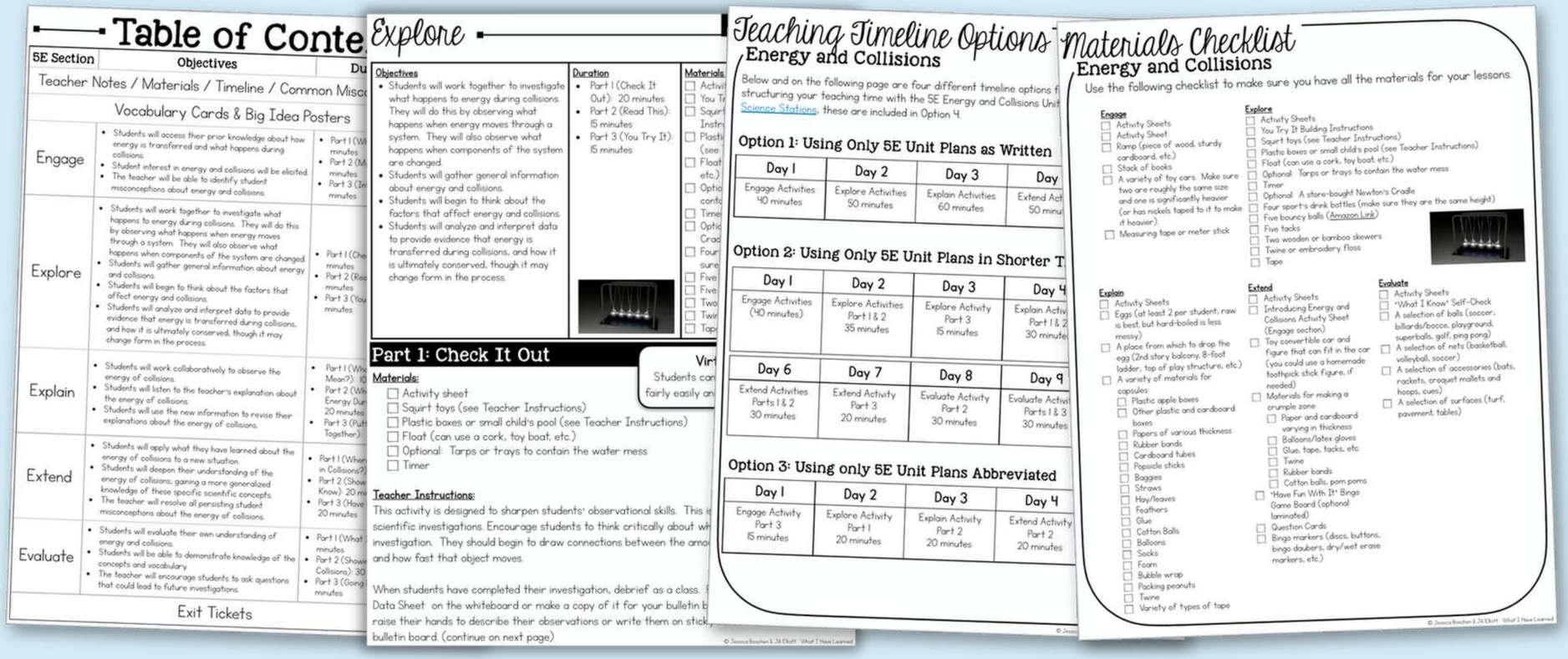
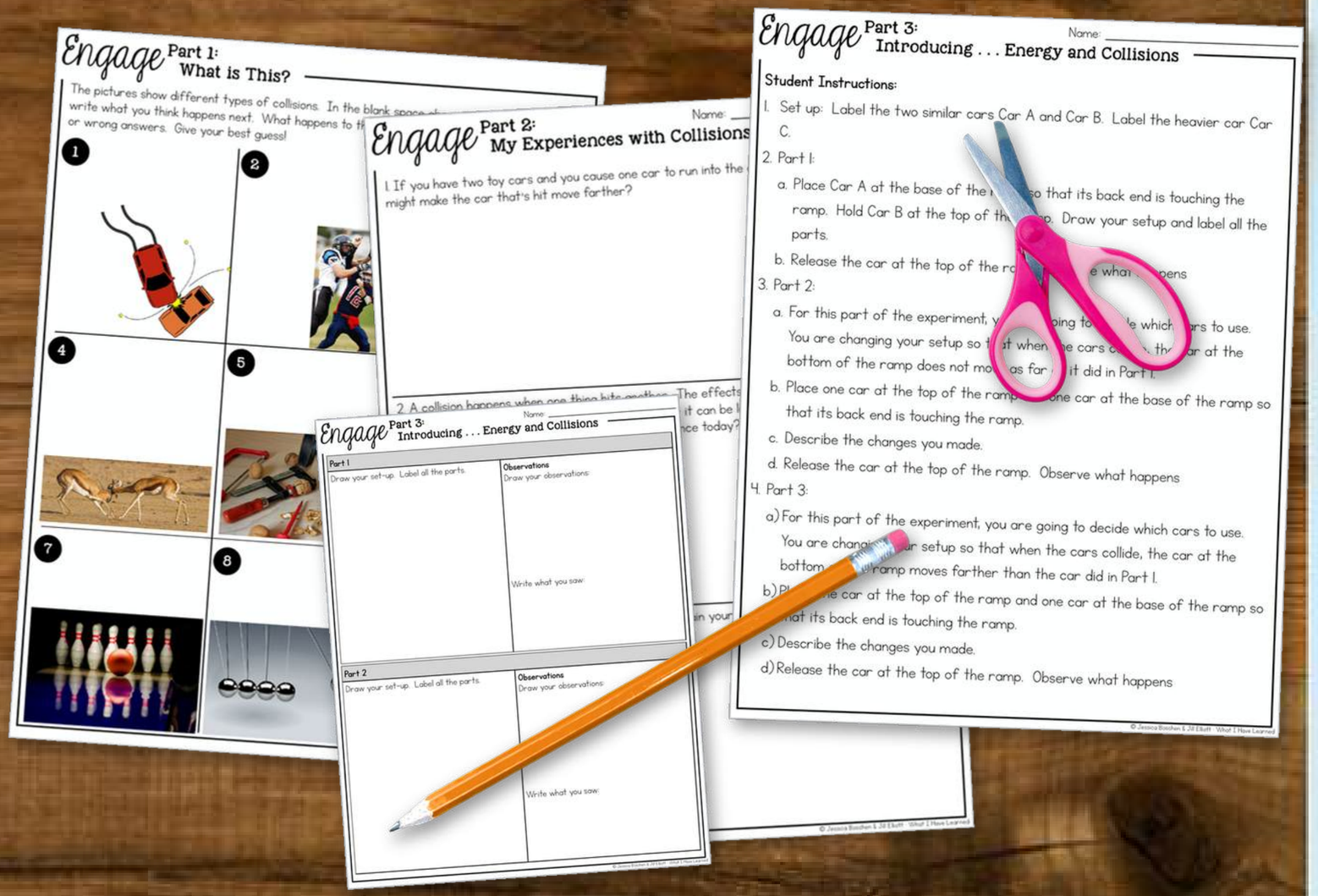


Table of Contents **Teacher Notes** **Timeline Options** **Materials Checklist**

ENGAGE



Teacher background, lesson plans, student pages, and answer key

E E E E E

Spark curiosity with toy cars on a ramp

1 What Is This?

Students look at pictures of different collisions and predict what happens to each object.

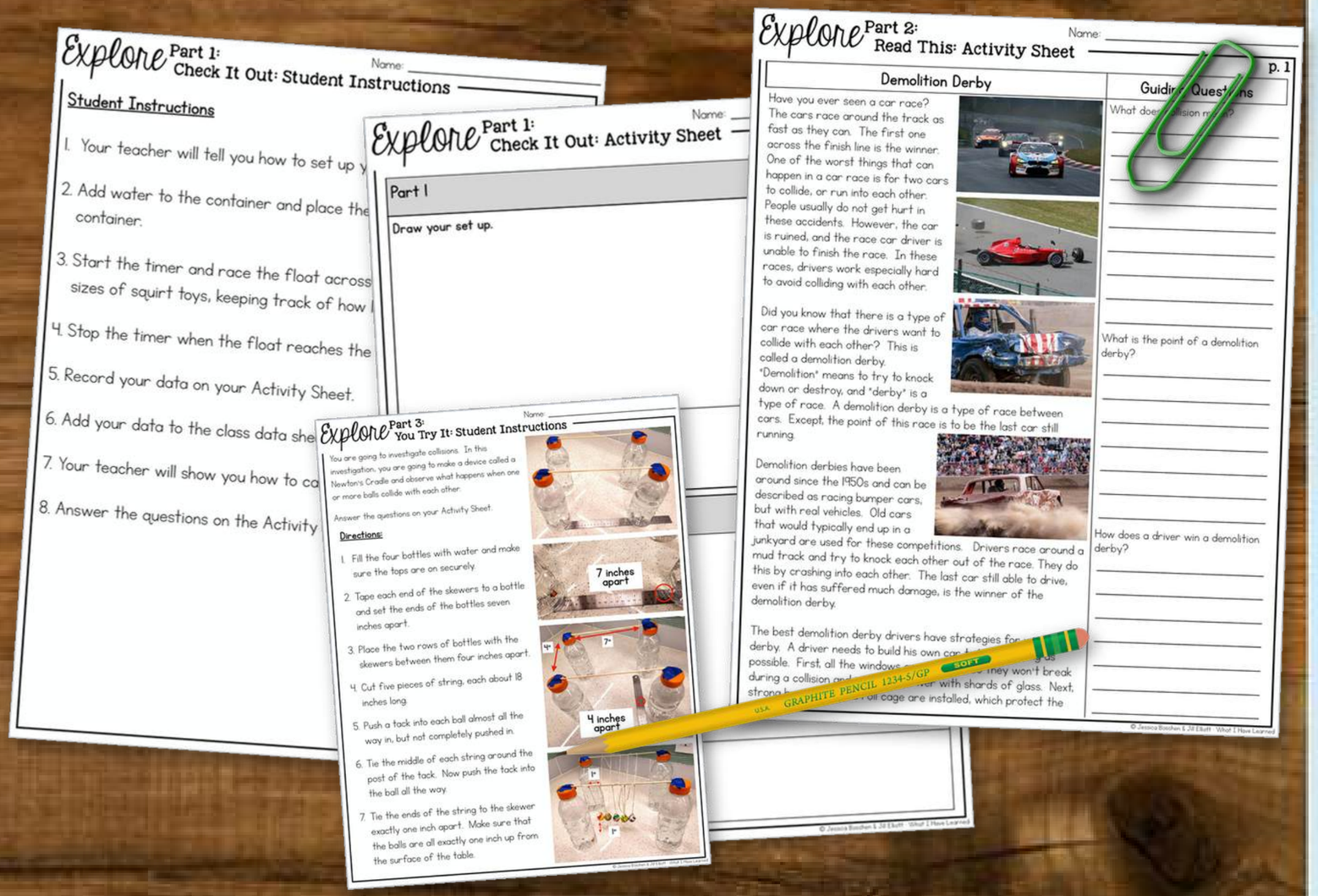
2 My Experiences

Students tell what happens when two toy cars crash and describe collisions they know.

3 Introducing Energy and Collisions

Students release toy cars down a ramp and see how a heavier car changes the crash.

EXPLORE



Teacher background, lesson plans, student pages, and answer key

E E E E E

Investigate what happens to energy in a crash

1 Check It Out

Students race a float across water with squirt toys of different sizes and compare the data.

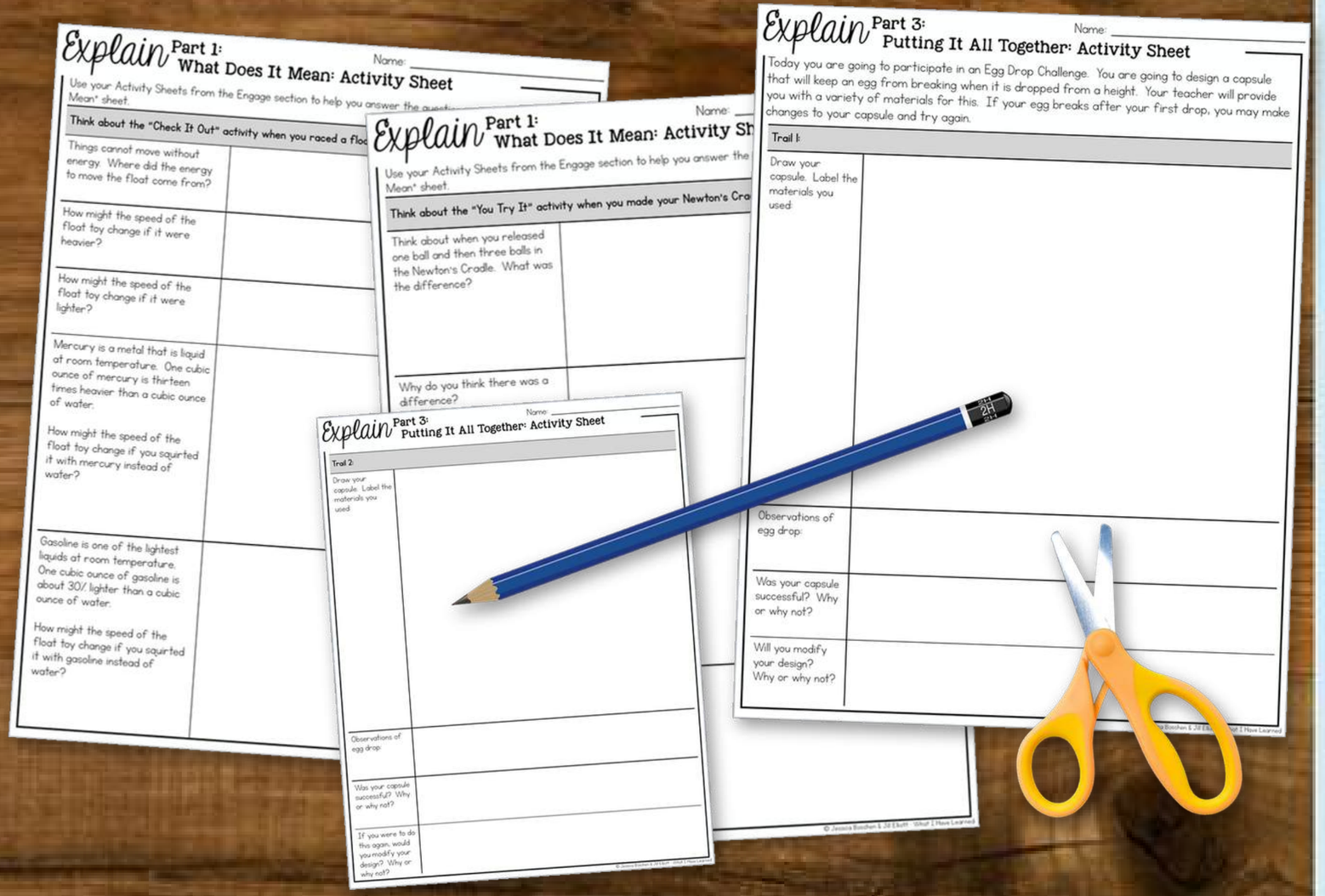
2 Read This

Students read about demolition derbies and answer guiding questions.

3 You Try It

Students build a water bottle Newton's cradle and watch what happens when balls collide.

EXPLAIN



Teacher background, lesson plans, student pages, and answer key

E E E E E

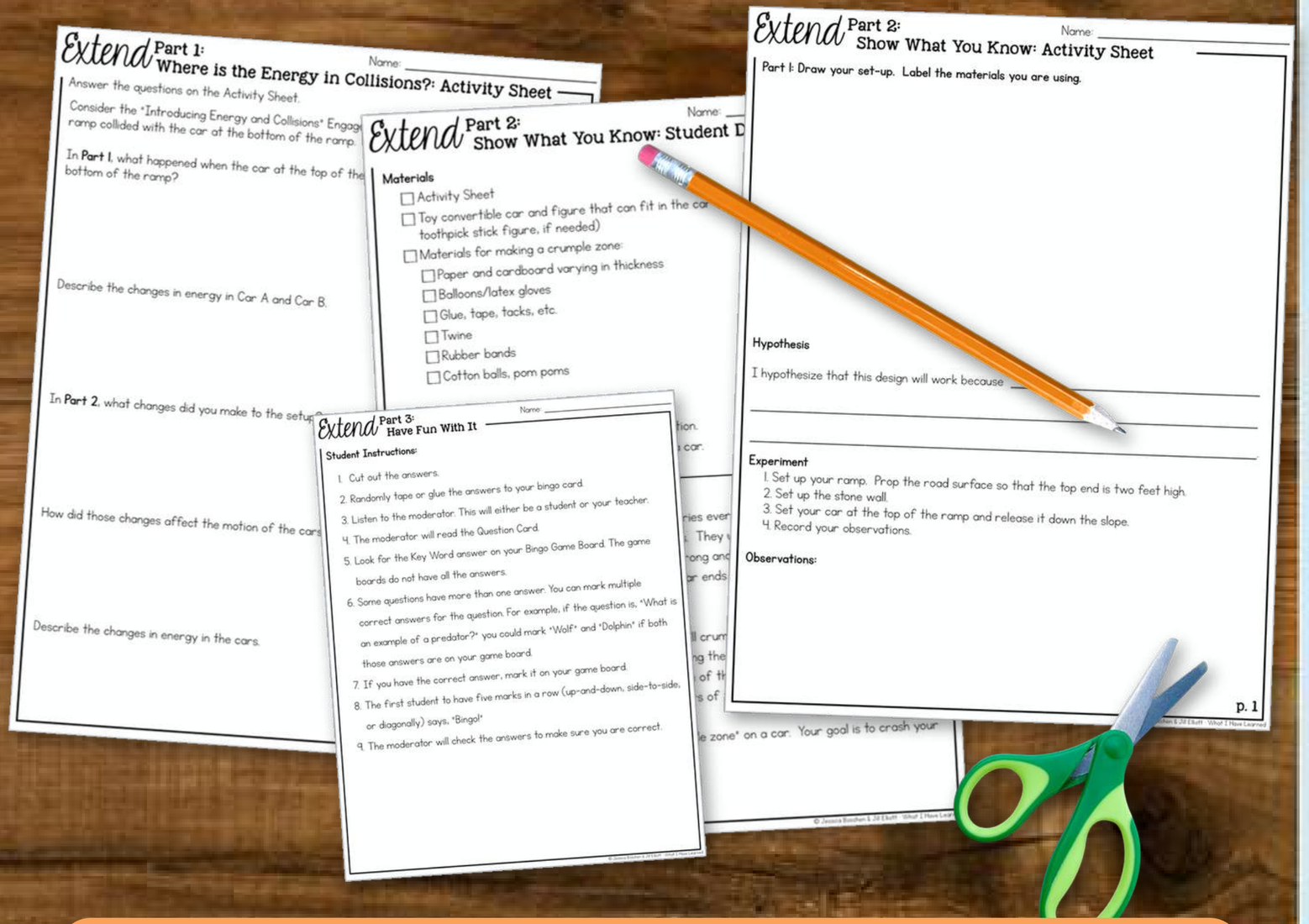
Build explanations from evidence

1. **What Does It Mean?**
   Students use the squirt toy and Newton's cradle results to answer questions about energy.

2. **What Happens to Energy During Collisions?**
   Students read how kinetic energy moves between objects and sum up what they learned.

3. **Putting It All Together**
   Students design a capsule to keep an egg from breaking in an egg drop.

EXTEND



Teacher background, lesson plans, student pages, and answer key

E E E E E

Apply collisions to new situations

1

Where Is the Energy in Collisions?

Students revisit the toy car ramp and describe the changes in energy.

2

Show What You Know

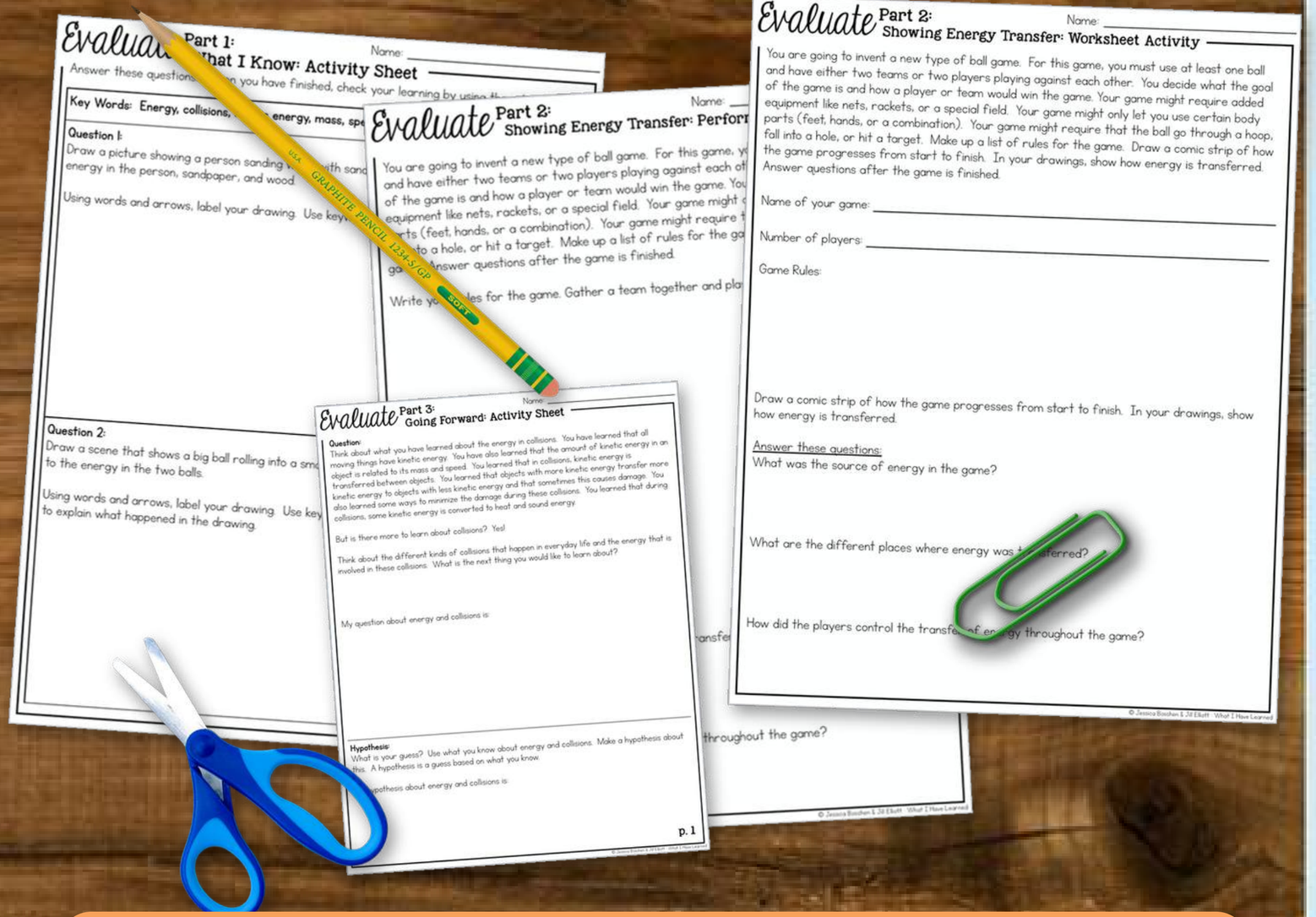
Students design a crumple zone to protect a toy car's passenger.

3

Have Fun With It

Students play bingo with collision and energy questions.

EVALUATE



Teacher background, lesson plans, student pages, and answer key

E E E E E

Check understanding with evidence

1 What I Know

Students draw scenes of energy in a collision and score themselves with a rubric.

2 Showing Energy and Collisions

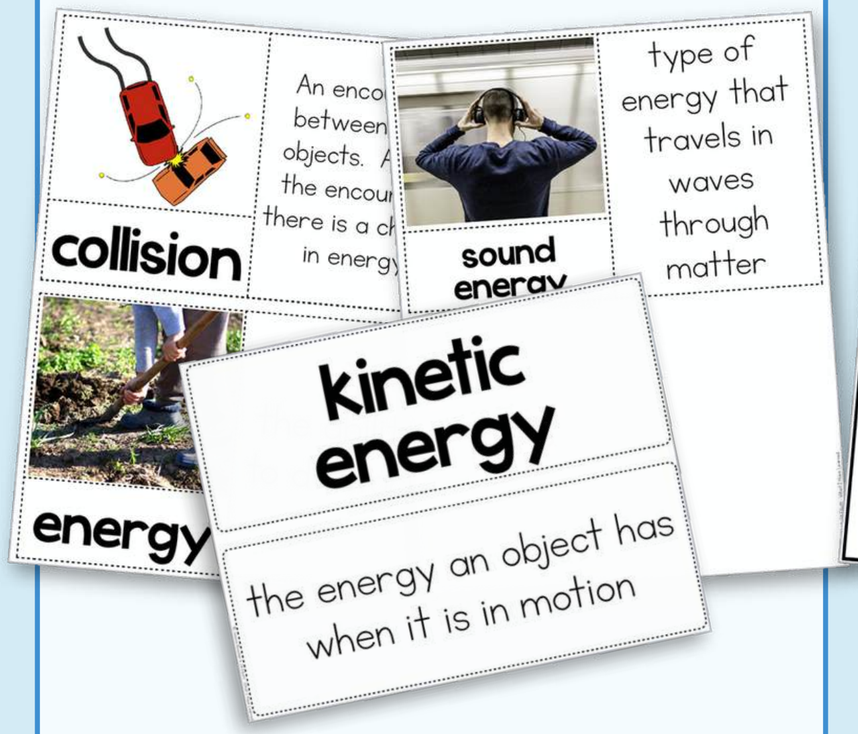
Students invent a new ball game and show how energy is transferred in a comic strip.

3 Going Forward

Students write a new question and hypothesis about collisions.

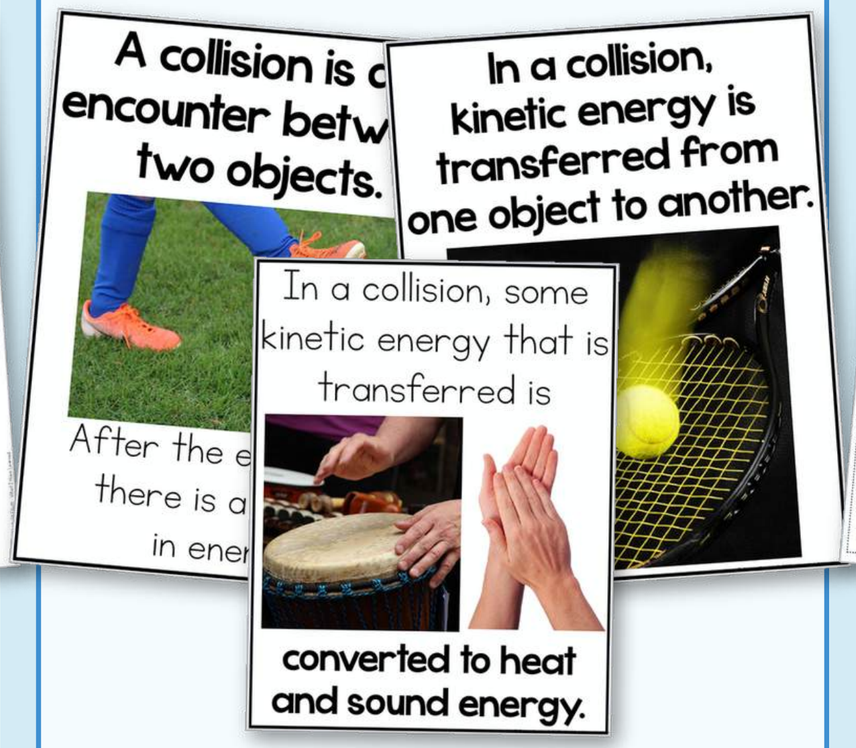
VOCABULARY, POSTERS & EXIT TICKETS

VOCABULARY CARDS



Picture cards and word cards for collision, energy, sound energy, kinetic energy, and more.

BIG IDEA POSTERS



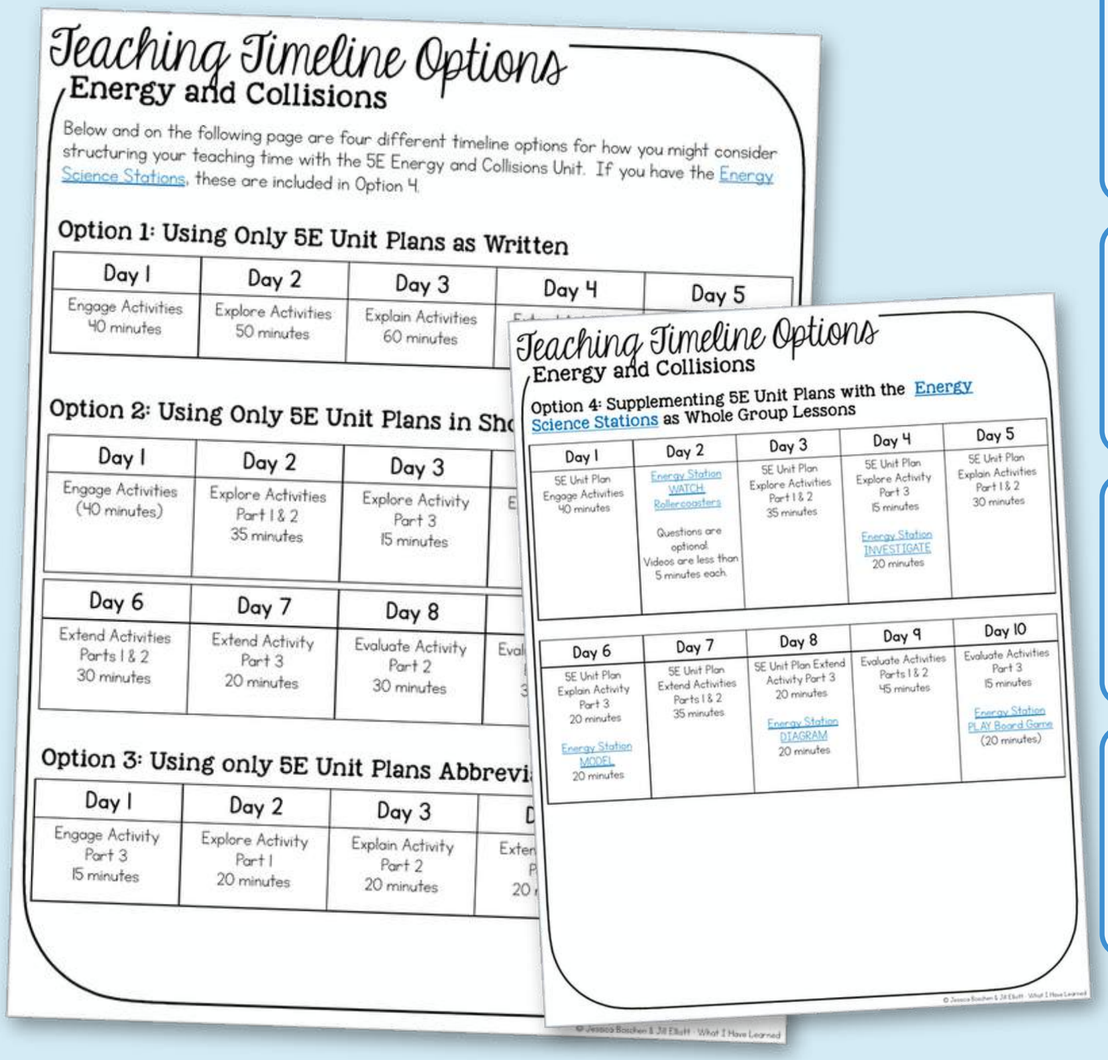
Four posters on collisions and how kinetic energy is transferred.

EXIT TICKETS



13 exit tickets, each in short answer, fill-in-the-blank, and multiple choice formats.

WAYS TO USE IN YOUR CLASSROOM



Teaching Timeline Options

Energy and Collisions

Below and on the following page are four different timeline options for how you might consider structuring your teaching time with the 5E Energy and Collisions Unit. If you have the Energy Science Stations, these are included in Option 4.

Option 1: Using Only 5E Unit Plans as Written

Day 1	Day 2	Day 3	Day 4	Day 5
Engage Activities 40 minutes	Explore Activities 50 minutes	Explain Activities 60 minutes		

Option 2: Using Only 5E Unit Plans in Sh

Day 1	Day 2	Day 3	
Engage Activities (40 minutes)	Explore Activities Part 1 & 2 35 minutes	Explore Activity Part 3 15 minutes	E

Day 6	Day 7	Day 8	
Extend Activities Parts 1 & 2 30 minutes	Extend Activity Part 3 20 minutes	Evaluate Activity Part 2 30 minutes	Eval 3

Option 3: Using only 5E Unit Plans Abbrevi

Day 1	Day 2	Day 3	
Engage Activity Part 3 15 minutes	Explore Activity Part 1 20 minutes	Explain Activity Part 2 20 minutes	Exten P 20

Teaching Timeline Options

Energy and Collisions

Option 4: Supplementing 5E Unit Plans with the Energy Science Stations as Whole Group Lessons

Day 1	Day 2	Day 3	Day 4	Day 5
5E Unit Plan Engage Activities 40 minutes	Energy Station WATCH Rollercoasters Questions are optional. Videos are less than 5 minutes each.	5E Unit Plan Explore Activities Part 1 & 2 35 minutes	5E Unit Plan Explore Activity Part 3 15 minutes Energy Station INVESTIGATE 20 minutes	5E Unit Plan Explain Activities Part 1 & 2 30 minutes

Day 6	Day 7	Day 8	Day 9	Day 10
5E Unit Plan Explain Activity Part 3 20 minutes Energy Station MODEL 20 minutes	5E Unit Plan Extend Activities Parts 1 & 2 35 minutes	5E Unit Plan Extend Activity Part 3 20 minutes Energy Station DIAGRAM 20 minutes	Evaluate Activities Parts 1 & 2 45 minutes	Evaluate Activities Part 3 15 minutes Energy Station PLAY Board Game (20 minutes)

© Jessica Boschen & Jill Elliott · What I Have Learned

1

Whole-Class 5E Unit

Teach one phase a day over 5 days as written, with 40 to 60 minutes per phase.

2

Shorter Science Blocks

Spread the unit across 9 days in shorter time blocks when science minutes are limited.

3

Alongside Science Stations

Add the Energy Science Stations for a 10-day plan.

4

Formative Checks

Use the exit tickets throughout the unit to see who needs reteaching before the performance activity.

TEACHING TIMELINE OPTIONS

Option 1 — 5 days
As Written

Day 1	Day 2	Day 3	Day 4	Day 5
Engage	**Explore**	**Explain**	**Extend**	**Evaluate**
40 min	50 min	60 min	50 min	60 min

Option 2 — 9 days
Shorter Time Blocks

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Engage	**Explore 1-2**	**Explore 3**	**Explain 1-2**	**Explain 3**	**Extend 1-2**	**Extend 3**	**Evaluate 2**	**Evaluate 1 & 3**
40 min	35 min	15 min	30 min	30 min	30 min	20 min	30 min	30 min

Option 3 — 5 days
Abbreviated

Day 1	Day 2	Day 3	Day 4	Day 5
Engage 3	**Explore 1**	**Explain 2**	**Extend 2**	**Evaluate 1**
15 min	20 min	20 min	20 min	15 min

Option 4 — 10 days
With Science Stations

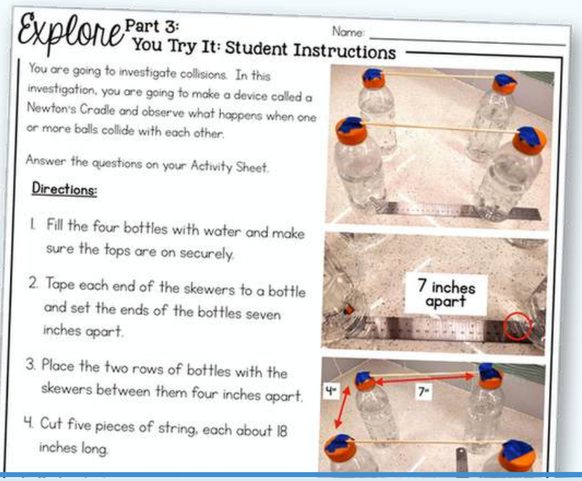
Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Engage	**Watch**	**Explore 1-2**	**Explore 3**	**Explain 1-2**	**Explain 3**	**Extend 1-2**	**Extend 3**	**Evaluate 1-2**	**Evaluate 3**
40 min	5 min	35 min	15 min +20 station	30 min	30 min +20 station	30 min	20 min +20 station	45 min	15 min +20 station

Orange days are Science Station lessons. Magenta notes are extra station activities you can add that day.

YOU WILL LOVE THIS BECAUSE

Hands-On From Day One

Students build a Newton's cradle, drop eggs, and design crumple zones, so collisions make sense.


Explore Part 3: You Try It: Student Instructions

Name: _____

You are going to investigate collisions. In this investigation, you are going to make a device called a Newton's Cradle and observe what happens when one or more balls collide with each other.

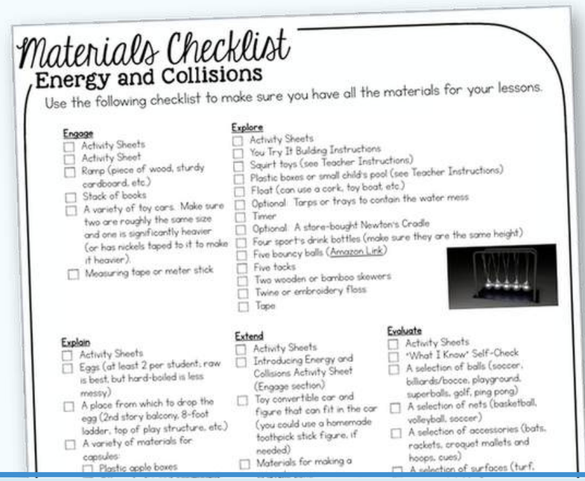
Answer the questions on your Activity Sheet.

Directions:

1. Fill the four bottles with water and make sure the tops are on securely.
2. Tape each end of the skewers to a bottle and set the ends of the bottles seven inches apart.
3. Place the two rows of bottles with the skewers between them four inches apart.
4. Cut five pieces of string, each about 18 inches long.

Planned and Ready to Teach

Teacher notes, a misconceptions guide, a materials checklist, and answer keys are done for you.


Materials Checklist

Energy and Collisions

Use the following checklist to make sure you have all the materials for your lessons.

Engage
- ☐ Activity Sheets
- ☐ Activity Sheet
- ☐ Ramp (piece of wood, sturdy cardboard, etc.)
- ☐ Stack of books
- ☐ A variety of toy cars. Make sure two are roughly the same size and one is significantly heavier (or has nickels taped to it to make it heavier).
- ☐ Measuring tape or meter stick

Explore
- ☐ Activity Sheets
- ☐ You Try It Building Instructions
- ☐ Squirt toys (see Teacher Instructions)
- ☐ Plastic boxes or small child's pool (see Teacher Instructions)
- ☐ Float (can use a cork, toy boat, etc.)
- ☐ Optional: Tarps or trays to contain the water mess
- ☐ Timer
- ☐ Optional: A store-bought Newton's Cradle
- ☐ Four sports drink bottles (make sure they are the same height)
- ☐ Five bouncy balls (Amazon Link)
- ☐ Five tacks
- ☐ Two wooden or bamboo skewers
- ☐ Twine or embroidery floss
- ☐ Tape

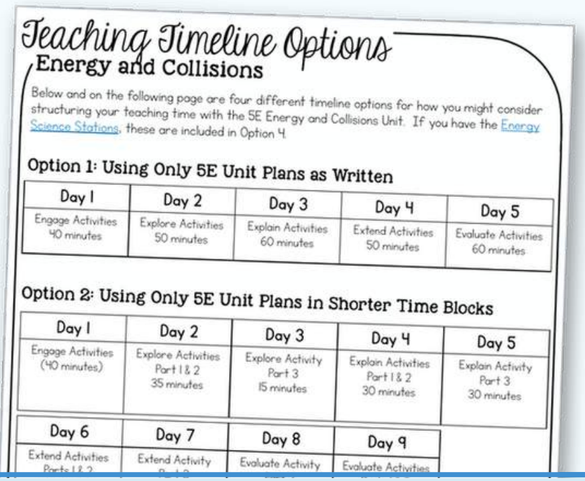
Explain
- ☐ Activity Sheets
- ☐ Eggs (at least 2 per student, raw is best, but hard-boiled is less messy)
- ☐ A place from which to drop the egg (2nd story balcony, 8-foot ladder, top of play structure, etc.)
- ☐ A variety of materials for capsules:
  - ☐ Plastic apple boxes

Extend
- ☐ Activity Sheets
- ☐ Introducing Energy and Collisions Activity Sheet (Engage section)
- ☐ Toy convertible car and figure that can fit in the car (you could use a homemade toothpick stick figure, if needed)
- ☐ Materials for making a

Evaluate
- ☐ Activity Sheets
- ☐ "What I Know" Self-Check
- ☐ A selection of balls (soccer, billiards/bocce, playground, superballs, golf, ping pong)
- ☐ A selection of nets (basketball, volleyball, soccer)
- ☐ A selection of accessories (bats, rackets, croquet mallets and hoops, cues)
- ☐ A selection of surfaces (turf,

Fits Your Schedule

Choose from 4 timeline options, and use the Google Slides and Google Forms versions for a print or digital classroom.


Teaching Timeline Options

Energy and Collisions

Below and on the following page are four different timeline options for how you might consider structuring your teaching time with the 5E Energy and Collisions Unit. If you have the Energy Science Stations, these are included in Option 4.

Option 1: Using Only 5E Unit Plans as Written

Day 1	Day 2	Day 3	Day 4	Day 5
Engage Activities 40 minutes	Explore Activities 50 minutes	Explain Activities 60 minutes	Extend Activities 50 minutes	Evaluate Activities 60 minutes

Option 2: Using Only 5E Unit Plans in Shorter Time Blocks

Day 1	Day 2	Day 3	Day 4	Day 5
Engage Activities (40 minutes)	Explore Activities Part 1 & 2 35 minutes	Explore Activity Part 3 15 minutes	Explain Activities Part 1 & 2 30 minutes	Explain Activity Part 3 30 minutes

Day 6	Day 7	Day 8	Day 9
Extend Activities Parts 1 & 2	Extend Activity	Evaluate Activity	Evaluate Activities

TEACHERS LOVE IT!

★★★★★

Lots of great information! Helped so much with my planning!

Kathryn B.

★★★★★

This was very helpful for my fourth grade students! Thank you!

Aisha S.

★★★★★

This is a great resource to go along with our science learning.

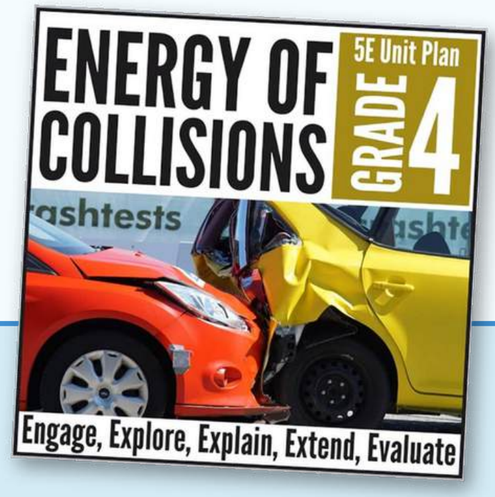
Kara Conlon





READY FOR YOUR CLASSROOM

- **Instant digital download**
- **Print and use the activities**
- **Google Slides and Forms versions**



WANT MORE 4TH GRADE 5E UNITS?

Save with a topic bundle or the full-year bundle.

TOPIC BUNDLE

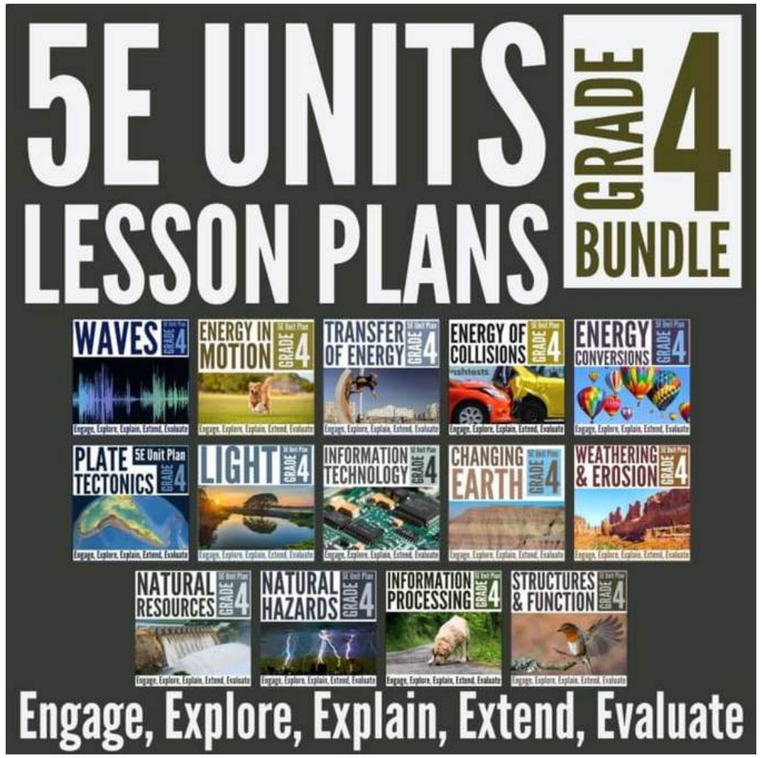
GOOD VALUE



SEE THE BUNDLE

FULL-YEAR BUNDLE

BEST VALUE



SEE THE BUNDLE

My passion is making learning accessible to all students.
I love scaffolding learning, breaking down the concepts and building them up so that students can see the connections.
I love figuring out the small components that build up to the big ideas and helping students see it all.



teach MATH | teach SCIENCE | teach READING | teach WRITING

What I have LEARNED