

Physical Science Problem-Based Learning (PBL) Bundle

- ✓ Designed for Middle School Science
- ✓ Complete Physical Science PBL Bundle - 10 PBL Activities
- ✓ Engaging, Student-Led Problem-Based Learning Projects



No Prep - Ready to Go!

10 Complete PBL Activities

- 1. PBL – Balloon Rocket Payload- Maximize Distance**
- 2. PBL – Energy Chain- Rube Goldberg Machine**
- 3. PBL – Evaporation Race- Drying Conditions**
- 4. PBL – Float the Boat- Maximum Cargo from Foil**
- 5. PBL – Hush the Noise- Classroom Soundproofing**
- 6. PBL – Inertia Slosh Stopper- Spill-Safe Cart**
- 7. PBL – Magnet Sorter- Separate a Mixed Stream**
- 8. PBL – Quake Safe- Shake-Table Tower**
- 9. PBL – Scooter Speed Graphs - Hallway Motion Study**
- 10. PBL – Sun Chef- Solar Oven Cook-Off**

All PBLs include

- Background for Students
- Full Instructions Sets
- Guiding Questions

PBL – Magnet Sorter: Separate a Mixed St

Driving Question

How can we build a simple device that separates magnetic from non-magnetic materials?

Background

Magnets pull on ferromagnetic materials (iron, steel). Separation devices use gravity/rollers to divert items. You will design for speed and accuracy.

Materials (or simple substitutes)

- Magnets (bar or ring), paper clips, aluminum foil balls, plastic bins
- Cardboard chute, tape, containers
- Timer, tally sheet

Instructions

Step 1: Design a chute where items fall past a magnet into sorted bins (proximity).
Step 2: Calibrate drop height and magnet distance to improve sorting.
Step 3: Run mixed batches (at least 50 items); record accuracy and time.
Step 4: Iterate and document changes that improved sorting rate or accuracy.

Final Product

- Accuracy/timetable and percent efficiency.
- Short explanation of magnetic vs. non-magnetic behavior.

Rubric (20 points)

Criteria	Excellent (4)	Good (3)	Fair (2)
Design	≥95% accuracy; fast throughput	85–94% accuracy	70–84%
Effectiveness	Repeat trials; fair comparisons	Some repeats	Limited
Reasoning	Clear magnetism explanation	Mostly clear	Basic
Iteration	Documented improvements	Some improvement	Minimal
Communication	Neat visuals & table	Mostly neat	Some clutter

PBL – Sun Chef: Solar Oven Cook-Off

Driving Question

Which solar oven design heats a s'more to the target temperature fastest?

Background

Light energy can be absorbed and converted to heat. Reflectors concentrate light; dark surfaces absorb more. You will test designs under teacher-approved sun or lamp conditions.

Materials (or simple substitutes)

- Pizza/shoe boxes, aluminum foil, black paper/paint (non-toxic)
- Plastic wrap or clear lids, tape
- Thermometer/probe
- S'more ingredients or water in a small cup

Instructions

Step 1: Design: Choose reflector angles and window size; sketch your design.
Step 2: Baseline: Measure how fast plain sunlight heats the target (control).
Step 3: Test: Record temperature every 2–3 minutes; avoid opening the oven too often.
Step 4: Iterate: Adjust angle, insulation, and absorber color to improve performance.

Final Product

- Heating curve and peak temperature table.
- One-page design spec with safety notes and results.

Rubric (20 points)

Criteria	Excellent (4)	Good (3)	Fair (2)	Needs Work (1)
Safety & Method	Safe handling of hot surfaces; consistent timing	Minor lapses	Occasional lapses	Unsafe
Data & Graphs	Accurate curves with units	Mostly accurate	Basic/partial	Incorrect/missing
Performance	Fastest to target or highest peak	Good performance	Moderate	Poor
Reasoning	Correct absorption/reflection links	Mostly correct	Basic	Incorrect
Communication	Clear spec & graph	Mostly clear	Some clutter	Unclear

PBL – Scooter Speed & Graphs: Hallway Motion Study

Driving Question

How fast do students really move in the hallway, and how can we use distance–time graphs to make it safer?

Background

You will measure walking or scooter (teacher-approved) speeds over a set distance, create distance–time and speed–time graphs, and recommend hallway timing or spacing rules based on evidence.

Materials (or simple substitutes)

- Measuring tape (10–20 m)
- Cones or tape to mark start/finish
- Stopwatches/phones (timer only)
- Data tables, graph paper or spreadsheet
- Safety cones/signage

Instructions

Step 1: Plan your test distance and safety rules; decide the number of trials per student (at least 3).
Step 2: Collect times for different movement styles (normal walk, fast walk) with multiple students.
Step 3: Calculate average speed and create distance–time graphs; identify outliers and explain why.
Step 4: Recommend a safe passing rule or time buffer for class transitions using your data.

Final Product

- Graphs (distance–time and speed summaries) with clear labels.
- One-page safety recommendation for hallway movement.

Rubric (20 points)

Criteria	Excellent (4)	Good (3)	Fair (2)	Needs Work (1)
Data Collection	10+ reliable trials with clear procedures	Adequate trials; minor gaps	Few trials; inconsistencies	Insufficient/unsafe testing
Graphing	Accurate, well-labeled graphs with units	Mostly correct graphs	Basic graphs; some errors	Incorrect/missing graphs
Calculations	Correct averages and speed calculations	Mostly correct	Some errors	Incorrect/omitted
Recommendation	Specific and feasible, tied to evidence	Reasonable but general	Weakly supported	Unsupported
Communication	Neat, organized write-up	Mostly clear	Some clutter	Hard to follow

Marking Rubrics

Who is it for?

- **Physical Science Teachers**
- **Teachers who want to increase their student engagement and retention**
- **Teachers who want low-prep and student-led classroom projects**

Save yourself the **STRESS AND TIME**



TWF

Spend your time WISELY

