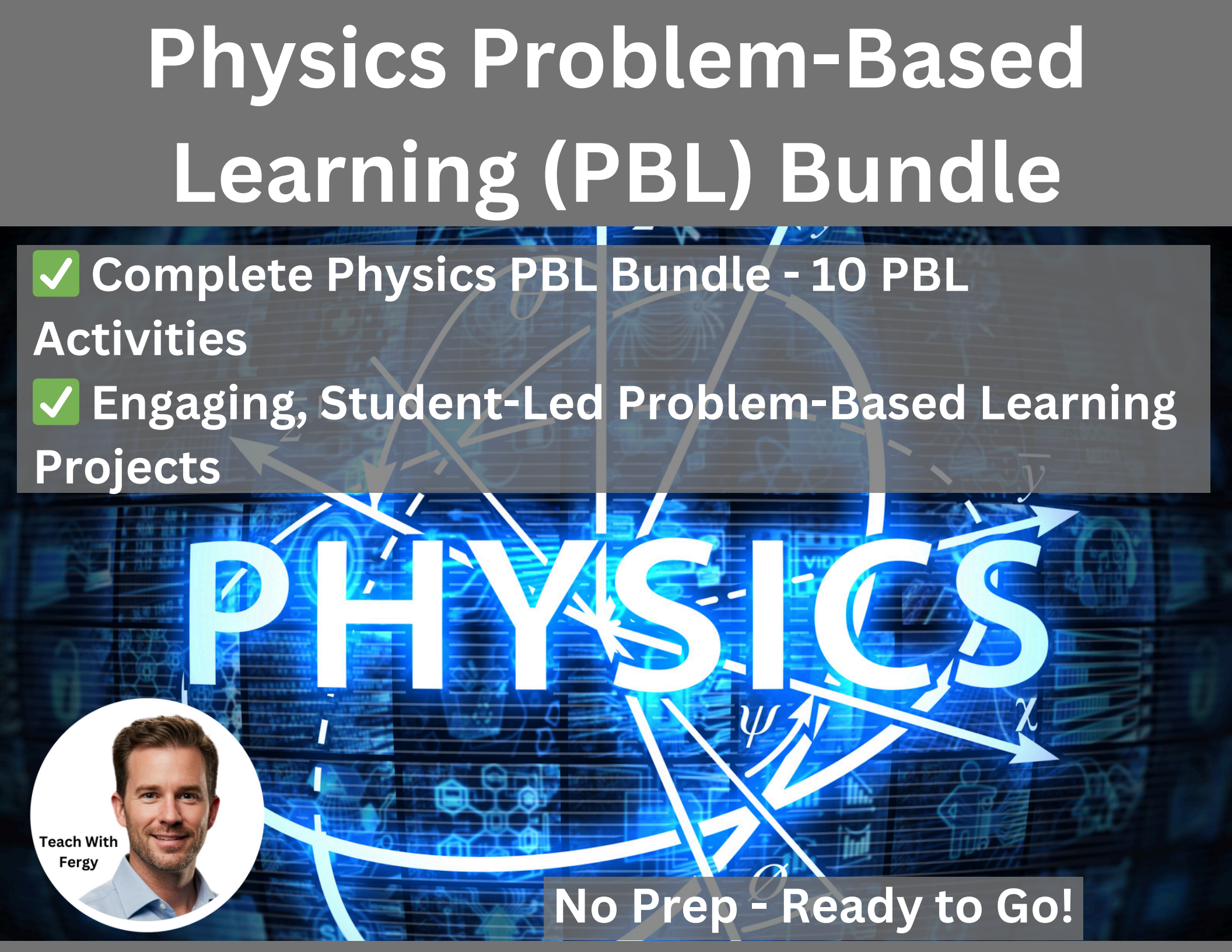


Physics Problem-Based Learning (PBL) Bundle

- ✓ Complete Physics PBL Bundle - 10 PBL Activities
- ✓ Engaging, Student-Led Problem-Based Learning Projects

PHYSICS

The background is a dark blue field filled with various physics-related graphics. It includes a large, faint compass rose, several white arrows pointing in different directions, and various mathematical symbols such as ψ , χ , θ , and γ . There are also faint outlines of molecular structures and technical drawings.

No Prep - Ready to Go!

10 Complete PBL Activities

- **PBL – Bright Ideas- Wire a Mini-Room with Series & Parallel**
- **PBL – Coaster Physics- Marble Roller Coaster Optimization**
- **PBL – Crash Cushion- Packaging for a Safe Landing**
- **PBL – Electromagnet Lifter- Maximize Pick-Up Strength**
- **PBL – Energy Audit- Cut Classroom Power Waste**
- **PBL – Light Work- Build a Periscope or Camera Obscura**
- **PBL – Motion Mapper - Design Safe Crosswalk Timing**
- **PBL – Pendulum Timekeeper- Build & Calibrate**
- **PBL – Sound Studio- Design and Tune a Cardboard Instrument**
- **PBL – Strong Span- Build & Test a Paper Bridge**

All PBLs include

- Background for Students
- Full Instructions Sets
- Guiding Questions

PBL – Motion Mapper: Design Safe Crosswalk Timing

Driving Question

How long should a pedestrian light stay green so people of different walking speeds can cross safely?

Background

Average walking speeds vary with age, carrying loads, and crowding. Using distance–time measurements, you'll model typical and slower walking speeds, compute required crossing times with safety margins and propose data-based timing.

Materials (or simple substitutes)

- Measuring tape, cones/tape to mark distance (e.g., 10–20 m)
- Stopwatches or phones (timer only)
- Clipboards, data tables, calculator, graph paper or spreadsheets

Instructions

Step 1: Plan: Choose a safe testing area and a crossing width to simulate (e.g., 12 m). Define timing accuracy and trial count.
Step 2: Collect: Time walkers across the set distance (at least 10 trials, include backpacks/varied paces).
Step 3: Analyze: Compute average, slowest quartile, and add a safety buffer. Graph distance–time and velocity distributions.
Step 4: Recommend: Propose signal timing and signage; justify with your slowest-safe calculations.

Final Product

- One-page technical brief with graphs and recommended timing.
- Community-facing infographic for the school's safety board.

Rubric (20 points)

Criteria	Excellent (4)	Good (3)	Fair (2)	Needs Work (1)
Data Collection	Sufficient diverse trials; precise timing	Adequate trials; minor gaps	Limited trials; inconsistent	Insufficient/unsafe testing
Graphing & Models	Clear d-t and v analyses with correct units	Mostly correct graphs	Basic graphs; unit issues	Incorrect/missing
Calculations	Accurate averages, percentiles, buffers	Mostly accurate	Some errors	Incorrect/omitted
Recommendation	Specific, feasible, data-justified	Reasonable but general	Weak support	Unsupported
Communication	Well-formatted brief & infographic	Clear overall	Some clutter	Hard to follow

PBL – Coaster Physics: Marble Roller Coaster Optimization

Driving Question

How can we design a marble coaster that completes the course smoothly while maximizing speed at the finish?

Background

Potential energy converts to kinetic energy; losses from friction and air resistance reduce speed. Track geometry (drop, loops, banking) influences energy transfer and normal force to prevent stalls.

Materials (or simple substitutes)

- Foam pipe insulation or cardstock tubes, tape, scissors
- Marbles, meter tape, stopwatch/phone camera (slow-motion optional)
- Supports (books, boxes)

Instructions

Step 1: Criteria: Define success (finish speed, time, number of features).
Step 2: Prototype Elements: Test drops, curves, and loops; adjust radii to prevent derailment.
Step 3: Build Course: Minimize sudden kinks; ensure stable supports.
Step 4: Test & Iterate: Record times; analyze where energy losses occur; refine.

Final Product

- Course diagram with elevations and radii.
- Performance table and explanation of energy losses.

Rubric (20 points)

Criteria	Excellent (4)	Good (3)	Fair (2)	Needs Work (1)
Design & Geometry	Smooth radii; thoughtful banking	Mostly smooth	Some kinks	Unstable/unsafe
Testing	Repeat trials; time data; video evidence	Some repeats	Limited data	Sparse
Energy Reasoning	Accurate PE→KE analysis; loss sources	Mostly accurate	Basic	Incorrect
Performance	Completes reliably with high finish speed	Reliable finish	Occasional stalls	Frequent stalls
Communication	Clear diagram & tables	Mostly clear	Some confusion	Unclear

PBL – Energy Audit: Cut Classroom Power Waste

Driving Question

Where is energy wasted in our classroom and what changes will measurably reduce consumption?

Background

Energy cannot be created or destroyed, but devices convert electrical energy into light, heat, or motion—often inefficiently. By measuring usage and modeling potential savings, you'll propose a realistic conservation plan.

Materials

- Device list, power ratings (labels) or plug-in watt meter (if available)
- Thermometer/IR thermometer (optional), light meters (optional)
- Spreadsheets for calculations; poster/slides

Instructions

Step 1: Inventory: List devices and their power (W). Estimate daily usage time.
Step 2: Calculate: Compute daily/weekly energy (kWh) and rank biggest users.
Step 3: Prototype Change: Test one intervention (LED bulb swap, power strip timers) and model savings.
Step 4: Plan: Create a stepwise proposal with cost, savings, and behavior changes.

Final Product

- Energy dashboard (charts/tables) with top 5 actions.
- One-page proposal to administration with ROI estimates.

Rubric (20 points)

Criteria	Excellent (4)	Good (3)	Fair (2)	Needs Work (1)
Data & Assumptions	Transparent, realistic, sourced	Mostly clear	Loose/unclear	Unsupported
Analysis	Correct kWh and savings calculations	Minor errors only	Several errors	Incorrect
Feasibility	Actions specific and doable	Mostly feasible	Partly feasible	Unrealistic
Communication	Polished visuals and summary	Clear overall	Some clutter	Hard to follow
Impact	Substantial savings projected	Moderate	Limited	Minimal

Marking Rubrics

Who is it for?

- **Physics 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

