

THE STEM CLUB

FIX-IT CHALLENGE

75 Real Problems from Your School — Investigate, Design, and Actually Solve Them.



For Primary Grade



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Investigate, Design, and Actually Solve Them



<https://pagenest.in/>

Welcome Letter from Mr. Okonkwo

"Dear STEM Club Member,

Congratulations! You're holding the most unusual textbook you'll ever own. Why? Because every problem in here is REAL.

I'm Mr. Okonkwo, and I teach 5th grade science at Riverside Elementary. When I took over the STEM club this year, I decided to try something different. Instead of doing the same old science fair projects, I walked around our school with a notebook and wrote down every problem I could find.

Broken things. Annoying things. Wasteful things. Mysteries no one could explain.

I found 75 of them.

Then I brought the list to Principal Hayes and said, "What if my STEM club tried to solve these?" She laughed and said, "If your kids can fix even FIVE of these problems, I'll give you whatever budget you want next year."

Challenge accepted.

Here's how this works: You pick a problem that bugs you. You investigate it like a detective. You test solutions like an inventor. You collect data like a scientist. And if your solution works? We might actually implement it in our school.

This isn't busy work. This is real problem-solving. And I think you're going to love it.

Let's go fix some stuff.

— Mr. O"

How to Use This Field Guide

What's Inside:

- 75 real problems from schools just like yours
- Step-by-step investigation guides
- Data collection sheets
- Space to sketch your ideas
- Tips from Q-Bit (your field guide mascot)

How It Works:

1. **Pick a Problem** - Flip through and find one that bugs YOU
2. **Investigate** - Follow the mission guide to figure out what's really happening
3. **Test Solutions** - Try different approaches, collect data
4. **Present Your Findings** - Share what you learned (even if you didn't "solve" it)
5. **Level Up** - Try the bonus challenges

You Don't Have to Do Them in Order!

- Start with problems you've noticed in YOUR school
- Skip ones that don't apply to you
- Come back to harder ones later

What You'll Need:

- Basic household items (we list them for each mission)
- A notebook for extra observations
- A camera or phone (for documenting)
- Curious brain (you already have this)



Meet Q-Bit

[Illustration of Q-Bit - a friendly robot mascot with a lightbulb head]

"Hi! I'm Q-Bit, your field guide companion. I'll be giving you tips, asking you questions, and celebrating your wins throughout this book. Think of me as your STEM club buddy who's always ready to help you think like an engineer!"

Q-Bit's Investigation Rules:

1. There's no such thing as failure — only data
2. If your first solution doesn't work, that's just Step 1
3. The best questions start with "Why?" and "What if?"
4. Write everything down (even weird observations)
5. Always measure twice (or three times)

Problem Tracker

1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
11 ☐	12 ☐	13 ☐	14 ☐	15 ☐	16 ☐	17 ☐	18 ☐	19 ☐	20 ☐
21 ☐	22 ☐	23 ☐	24 ☐	25 ☐	26 ☐	27 ☐	28 ☐	29 ☐	30 ☐
31 ☐	32 ☐	33 ☐	34 ☐	35 ☐	36 ☐	37 ☐	38 ☐	39 ☐	40 ☐
41 ☐	42 ☐	43 ☐	44 ☐	45 ☐	46 ☐	47 ☐	48 ☐	49 ☐	50 ☐
51 ☐	52 ☐	53 ☐	54 ☐	55 ☐	56 ☐	57 ☐	58 ☐	59 ☐	60 ☐
61 ☐	62 ☐	63 ☐	64 ☐	65 ☐	66 ☐	67 ☐	68 ☐	69 ☐	70 ☐
71 ☐	72 ☐	73 ☐	74 ☐	75 ☐					

Check off missions as you complete them. Try to complete at least one from each category!

Your Goals:

- ☐ Complete 10 missions (Bronze Level)
- ☐ Complete 25 missions (Silver Level)
- ☐ Complete 50 missions (Gold Level)
- ☐ Complete ALL 75 missions (Legendary Status)

The 75 Problems - Quick Reference

[Table of contents organized by category, showing mission numbers and titles only]

CATEGORY 1: BROKEN & ANNOYING (Missions 1-15) Things that don't work right and drive everyone crazy

CATEGORY 2: WASTE & INEFFICIENCY (Missions 16-30) Things that waste time, money, materials, or energy

CATEGORY 3: SAFETY & COMFORT (Missions 31-45) Things that could be dangerous or uncomfortable

CATEGORY 4: ACCESSIBILITY & FAIRNESS (Missions 46-57) Things that don't work well for everyone

CATEGORY 5: MYSTERY PROBLEMS (Missions 58-69) Weird things no one understands

CATEGORY 6: FUTURE-PROOFING (Missions 70-75) What if emergencies happen?

Quick-Start Guide

Never Done This Before? Start Here:

Easy Missions for Beginners:

- Mission 3: The Pathetic Water Fountain
- Mission 11: The Pencil Sharpener That Eats Pencils
- Mission 22: The Paper Towel Waste

Missions You Can Do at Home:

- Mission 41: The Oven Called Room 305 (test at home first)
- Mission 68: The 3-Hour Blackout Plan
- Mission 29: The Lunch Box Heat Problem

Missions That Need a Team:

- Mission 19: The Cafeteria Food Waste Mountain
 - Mission 37: The Mystery of Room 212
 - Mission 48: The Unreachable Garden
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THE 75 MISSIONS

CATEGORY 1: BROKEN & ANNOYING (Missions 1-15)

Things that don't work right and drive everyone crazy

MISSION 01: The Door That Slams

THE PROBLEM: The art room door slams shut so loudly it startles everyone and has dented the wall. Teachers have complained for years, but no one's fixed it.

WHY IT MATTERS:

- Disrupts classes next door
- Damaged wall costs money to repair
- Could hurt someone's fingers

YOUR CHALLENGE: Design a solution that slows the door down without breaking fire safety codes or requiring expensive repairs.

WHAT YOU'LL NEED:

- Stopwatch
- Measuring tape
- Various cushioning materials (foam, felt, rubber bands)
- Spring scale (or makeshift weight tester)
- Camera to document

INVESTIGATION STEPS:

Step 1: Measure the Problem

- Time how fast the door closes from different angles (90°, 45°, fully open)
- Measure the force of impact (use spring scale or bathroom scale method)
- Document existing damage

Step 2: Research Door Closers

- Look up how hydraulic door closers work
- Research fire code requirements (doors must close automatically)
- Find out cost of professional door closer installation

Step 3: Test Cheap Solutions

- Foam strips on door frame?
- Rubber band speed brake?
- Adjustable friction hinge? Test each and measure impact force reduction

Step 4: Collect Data

Solution Tested	Cost	Time to Close	Impact Force	Fire Code OK?	Rating (1-5)
Foam strip					
Rubber bands					
Door stop					

THINK ABOUT IT:

- Why do doors slam? (Physics: momentum, gravity, hinges)
- What's the right balance between "closes automatically" and "doesn't slam"?
- Could your solution work on other doors in the school?

PRESENT YOUR FINDINGS: Show Mr. Okonkwo (or principal):

- Your measurements (before and after)
- Photos/videos of solutions tested
- Cost comparison: your solution vs. professional repair
- Your recommendation with reasoning

LEVEL UP:

- Design an automatic system that adjusts closing speed based on how hard someone pushes
- Calculate how much energy is wasted by doors slamming (convert force to work)
- Survey students: How often does the slam startle them?

Q-BIT'S TIP: *"The best engineering solutions are sometimes the simplest ones. A \$2 foam strip might work better than a \$200 hydraulic closer!"*

MISSION 02: The Squeaky Floor

THE PROBLEM: There's a spot in the hallway near Room 104 that SQUEAKS so loud you can hear it from three classrooms away. Everyone tries to avoid stepping on it.

WHY IT MATTERS:

- Disrupts classes constantly
- Makes sneaking to the bathroom impossible
- Could indicate structural problem

YOUR CHALLENGE: Investigate WHY it squeaks and determine if it's fixable or needs professional help.

WHAT YOU'LL NEED:

- Chalk or tape (to mark the spot)
- Measuring tape
- Your body weight
- A friend (for comparison)
- Notebook for observations
- If possible: stethoscope or cup (to listen closely)

INVESTIGATION STEPS:**Step 1: Map the Squeak Zone**

- Mark exactly where it squeaks
- How big is the area? (measure it)
- Test with different weights (you, a teacher, a kindergartener)
- Does it squeak more at certain times of day?

Step 2: Investigate the Cause Research what causes floor squeaks:

- Loose floorboards rubbing together?
- Nails pulling out?
- Gap between floor and subfloor?
- Moisture problems?

Step 3: Listen Carefully

- Put your ear close (or use stethoscope)
- What does the squeak sound like? (high-pitched = metal/metal, low = wood/wood)
- Does it happen when you push down or lift up?

Step 4: Document Everything**Squeak Data Log:**

Person	Weight	Squeak Volume (1-10)	Time of Day	Weather
You				
Friend				
Teacher				

THINK ABOUT IT:

- What forces cause squeaking? (Physics: friction, pressure, vibration)
- Why might it squeak more in the morning than afternoon? (Temperature? Humidity?)
- Is this a safety issue or just annoying?

PRESENT YOUR FINDINGS:

- Show your map and measurements

- Explain your theory about what's causing it
- Recommend: Can STEM club fix it? Or does it need the janitor/contractor?
- Estimated cost if fixable

LEVEL UP:

- Record the squeak and analyze the frequency (use phone app)
- Research "squeaky floor" solutions and test one (with permission)
- Calculate: If 500 students walk over this spot daily, how many disruptions per week?

Q-BIT'S TIP: *"Sometimes the investigation IS the solution. Just mapping the problem might help the janitor fix it faster!"*

MISSION 03: The Pathetic Water Fountain

THE PROBLEM: The water fountain on the 2nd floor barely produces water. It dribbles out so weakly that you have to bend down and practically kiss the spout to get a drink. Everyone avoids it.

WHY IT MATTERS:

- Kids get dehydrated
- Forces students to use plastic bottles (waste)
- Other fountains get overcrowded

YOUR CHALLENGE: Investigate WHY the water pressure is so low and determine if it's fixable without calling a plumber.

WHAT YOU'LL NEED:

- Stopwatch
- Measuring cup
- Ruler
- Notebook
- Camera
- Comparison: working water fountain

INVESTIGATION STEPS:

Step 1: Measure the Flow

Water Fountain Comparison Chart:

Fountain Location	Water Height (inches)	Volume in 10 sec (ml)	Observations
2nd floor (bad)			
1st floor (good)			

3rd floor			
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How to measure:

- Height: How high does water shoot? (measure from spout to top of arc)
- Volume: Hold cup under stream for 10 seconds, measure how much water collected
- Observe: Is water clear? Any weird sounds? Slow start?

Step 2: Look for Clues

- Is the button harder to press on the weak fountain?
- Look at the spout: Is it clogged with mineral deposits?
- Compare to strong fountains: Does it look different?
- Ask janitor: When was it last serviced?

Step 3: Research Possible Causes Why might water pressure be low?

- Clogged aerator (the screen at the spout)?
- Valve partially closed?
- Leak somewhere in the pipe?
- Lower water pressure on that floor?
- Air bubble trapped in the line?

Step 4: Test Simple Fixes (get permission first!)

- Clean the aerator screen (unscrew, rinse, screw back)
- Run water for 60 seconds straight (clear air bubbles?)
- Check if there's a shutoff valve (could be partially closed)

THINK ABOUT IT:

- How does water pressure work? (Physics: gravity, pumps, pipe diameter)
- Why might the 2nd floor have different pressure than 1st floor?
- Math challenge: If a good fountain flows at 100ml/10sec, how much water does the bad one waste per day?

PRESENT YOUR FINDINGS:**Your Report Should Include:**

1. Data comparison (good vs. bad fountain)
2. Photos of the problem fountain
3. Your theory about what's wrong
4. What you tried (if anything)
5. Recommendation: Simple fix or call plumber?
6. Cost estimate if replacement needed

LEVEL UP:

- Map ALL water fountains in school and rate them
- Calculate water wasted if students skip this fountain and use plastic bottles instead
- Design a "fountain health checklist" for janitors

Q-BIT'S TIP: *"Sometimes the fix is literally just unscrewing and cleaning the screen. Always try the simplest solution first!"*

MISSION 04: The Pencil Sharpener That Eats Pencils

THE PROBLEM: The electric pencil sharpener in Room 207 devours pencils. You put in a full-size pencil, and it grinds it down to a 2-inch nub before you can stop it.

WHY IT MATTERS:

- Students waste money replacing pencils constantly
- Sharpener overheats and breaks
- Creates mountains of pencil shavings

YOUR CHALLENGE: Figure out WHY it over-sharpens and design a solution (repair or replacement strategy).

WHAT YOU'LL NEED:

- 5 identical pencils (for testing)
- Ruler
- Stopwatch
- Scale (to weigh shavings)
- Camera
- Access to different pencil sharpeners for comparison

INVESTIGATION STEPS:**Step 1: Document the Problem****Sharpening Test Data:**

Sharpener	Pencil Start Length	Time to Sharp	Final Length	Shavings Weight	Quality (1-5)
Room 207 (bad)					
Room 101 (good)					
Hand sharpener					

Step 2: Investigate the Sharpener

- How old is it? (ask teacher)
- How does it work? (Manual? Electric? What mechanism?)
- Look inside (with permission): Are blades dull? Clogged with shavings?
- Does it have an auto-stop feature? (should stop when sharp)

Step 3: Test Different Variables

- Does it over-sharpen ALL pencils or just certain types? (test wooden vs. plastic-coated)
- Does it happen when shaving bin is full vs. empty?
- Does it overheat? (run for 30 seconds, feel the case)

Step 4: Research Sharpener Mechanics

- How do auto-stop sharpeners work? (pressure sensors? blade resistance?)
- What breaks most often?
- Cost of repair vs. replacement?

THINK ABOUT IT:

- What's the "perfect" pencil point? (sharp enough to write, strong enough not to break)
- How much of a pencil is wasted when over-sharpened? (Calculate volume of shavings vs. useful pencil)
- Is it more wasteful to replace a broken sharpener or keep using one that eats pencils?

PRESENT YOUR FINDINGS:

Your Recommendation Should Include:

1. Test data (before/after comparisons)
2. Root cause analysis (what's broken?)
3. Cost analysis:
 - Cost of wasted pencils per month
 - Cost of new sharpener
 - Payback period if replaced
4. Your recommendation: Fix, replace, or switch to hand sharpeners?

LEVEL UP:

- Survey class: How many pencils do they go through per month because of this sharpener?
- Design a "sharpener maintenance schedule" to prevent future problems
- Calculate school-wide pencil waste if every classroom has one bad sharpener

Q-BIT'S TIP: *"Engineering is often about trade-offs. Sometimes the 'worse' technology (hand sharpener) is actually better because it's more reliable!"*
