🍬 Lesson Title: "One-at-a-Time: The Candy Dispenser Challenge"

Design a dispenser that delivers the perfect portion — one serving at a time.

🎯 Learning Objectives:

Students will:

- Apply the Engineering Design Process to solve a real-world challenge.
- Build a functional dispenser that releases a *standard serving size* of small items (plastic beads or similar).
- Practice iteration, teamwork, and communication.
- Explore volume estimation, mechanisms, and real-world application.

🕒 Time Required:

3–4 class periods (80 minutes each)
Flexible depending on depth of exploration and presentations.

🛠️ Materials (per group of 2–3 students):

- Cardboard (various sizes, recycled is great)
- Scissors or craft knives (teacher-supervised)
- Tape (masking, duct, or clear)
- Glue (sticks or hot glue, depending on setup)
- Popsicle sticks, paper straws, and rubber bands
- Small plastic cups or lids (for the reservoir and catch area)
- Plastic beads (substitute for candy) – all groups get the same kind
- Measuring spoon or small scale to define a *serving size* (e.g., 1 teaspoon = 1 serving)
- Rulers or measuring tape
- Markers, sticky notes, and cardboard tubes (optional for decoration or function)

📏 **Background:**

Start by asking:
“What is a serving size of candy, and why does it matter?”

Discuss:

- Health and nutrition labels
- Portion control in vending machines
- Engineering behind real dispensers (gumball machines, cereal dispensers)

Then introduce the challenge:
“Your team will design a dispenser that releases exactly one serving size of candy per use. We’ll use beads for testing, but your design should work for Skittles, M&Ms, or other small round candy.”

🧩 **The Challenge:**

Design, build, and test a candy dispenser that releases a single serving size of candy (measured by volume).

🪛 **Lesson Breakdown:**

🔹 **Day 1: Introduce & Plan (80 min)**

Warm-Up (10 min)

- What makes a good dispenser?
- Why is precision important?
- Explore simple machines (levers, sliders, gates).

Project Launch (15 min)

- Present challenge and constraints.
- Show sample dispensers (images or prototypes).
- Set serving size: ex. 1 teaspoon of beads = 1 serving.

Design Phase (45 min)

- Students sketch ideas and brainstorm mechanisms.

- Teacher checks in on feasibility and encourages multiple ideas.
- Students gather materials and assign roles.

🔹 **Day 2: Build & Test (80 min)**

Build Phase (60 min)

- Construct the dispenser frame and mechanism.
- Test with beads.
- Measure: Does it dispense the correct amount?

Mini Checkpoint (10 min)

- Record how close the serving size was (under/over).
- Teams reflect on what's working and what's not.

Revise & Iterate (10 min)

- Make quick changes and prep for final build phase.

🔹 **Day 3: Final Build & Presentation (80 min)**

Finish Builds (30 min)

- Final touches, decoration, name the dispenser.
- Practice consistent use (e.g., how hard to press or slide).

Presentation & Testing (40 min)

- Each group explains:
    - How their mechanism works.
    - How they calculated the serving size.
    - Design challenges they overcame.
- Test live: Does it dispense one serving per use?

Gallery Walk (10 min)

- Students leave feedback on sticky notes or a rubric.
- Optional: award categories like Most Precise, Most Creative, or Best Overall.

🧠 Wrap-Up & Reflection:

Discussion:

- How close did your design come to a perfect serving?
- What would you do differently?
- Where else do you see these ideas in real life?

Written Reflection (or journal):

- What role did iteration play in your design?
- How did your team collaborate?
- What did you learn about engineering through this project?

📝 Assessment Options:

- Group Presentation Rubric (creativity, functionality, teamwork)
- Accuracy score (how close to one serving)
- Design journal or exit ticket reflection
- Peer feedback form (simple +/Δ format)

📎 Extensions & Ideas:

- Use actual candy in a final test round.
- Introduce cost estimation: build a “vending” machine.
- Use Scratch or MakeyMakey to add a button-trigger.
- Convert to an **automatic dispenser** with LEGO Spike Prime or a motor.

📄 Project Sheet: Candy Dispenser Challenge

Project Title: *One-at-a-Time: The Candy Dispenser Challenge*
Class: _____
Group Members: _____
Date: _____

🧠 The Challenge

Can your team design and build a working **candy dispenser** that releases exactly **one serving size** of candy (we'll use **plastic beads** for testing)?

Your dispenser must:

- Hold at least **10 servings** of beads
- Dispense **1 serving (1 tsp)** at a time
- Use a **manual mechanism** (pull, push, slide, twist, etc.)
- Be **safe**, **sturdy**, and **repeatable**

🧰 Materials You Can Use:

✅ Cardboard
✅ Tape or glue
✅ Scissors or craft knives (supervised)
✅ Popsicle sticks, paper straws, rubber bands
✅ Small plastic cups or containers
✅ Plastic beads (test candy)
✅ Ruler, pencil, markers
✅ Other classroom-safe items (ask your teacher!)

📐 Design Plan

1. Sketch your dispenser design:
Draw and label the major parts of your design. Show where the beads go in, how they come out, and how it works!

✍️ Sketch Box:

🔁 Testing & Iteration

First Test:
How much does your dispenser release?

- 🌟 Goal: 1 teaspoon per use
- 📏 Measured Output: _____

Changes/Improvements We Made:

🎤 Final Build Reflection

Our mechanism works by:

Our biggest design challenge was:

One thing we're proud of:

✅ Checklist Before Presenting:

- ☐ Holds 10+ servings
- ☐ Dispenses 1 serving consistently
- ☐ Manual mechanism works
- ☐ Safe & sturdy
- ☐ Group can explain how it works
- ☐ Neatly decorated & named