

### Visible Elements in Photo



- Golden-brown breaded/fried protein pieces (approximately 8–10 pieces visible)
- Green leafy lettuce base in a black container
- Diced white onion scattered throughout
- Sliced orange and purple vegetables (carrots and red cabbage)
- Visible textured coating on the protein with black pepper specks
- All components arranged in a single-use disposable tray

### Reasonable Inferences

- From breaded coating: The coating protects the inner food while creating a crispy outer layer—suggesting a structural engineering problem of protecting something delicate with a durable shell.
- From mixed vegetables and base: Multiple materials are layered and held together in one container, implying a need for structural stability and organization under conditions (transport, stacking).
- From the tray itself: The container must support weight, resist moisture, and prevent tipping or separation of contents.

### Engineering Task

#### K-2 Challenge:

Design a "crunchy coat" for a snack! Your job is to create a crispy, protective shell around a soft pretzel or marshmallow using only bread crumbs, crushed crackers, or cereal. Test whether your coating stays stuck when you gently shake it in a bag. Which coating material sticks best and stays crunchiest?

#### 3-5 Challenge:

Design a protective breading system for a delicate food item. Your coating must:

- Adhere completely to a soft center (use a marshmallow or soft clay shape as your "food")
- Remain intact after 10 shakes in a sealed plastic bag
- Be less than 3mm thick
- Use only natural or food-safe adhesive (egg white, water, or flour paste)

Test three different coating materials (panko, crushed crackers, crushed cereal) and measure which one has the best adhesion and crispness retention after the shake test. Record your findings in a data table.

### EDP Phase Targeted

Create / Test

Why this phase fits: The photo shows a finished food product with a visible engineered solution (the breaded coating). Students can immediately experiment with materials and coating techniques, test their designs through physical trials (shaking), and iterate by comparing coating adhesion and durability. This is hands-on making, not abstract problem-finding.

### Suggested Materials

1. Marshmallows or air-dry clay shapes (soft "food" to coat)
2. Panko breadcrumbs, crushed saltines, and crushed cereal (three coating options)
3. Egg white or flour-water paste (adhesives)
4. Resealable plastic bags (for shake-test trials)
5. Ruler and data recording sheet

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### Estimated Time

30–45 minutes (single session: 10 min. prep, 15 min. coating and drying, 10 min. testing, 5 min. comparison and cleanup)

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### Why This Works for Teachers

This challenge directly addresses NGSS ETS1.B (Developing Possible Solutions) by requiring students to test competing material combinations and evaluate which design best meets the dual criteria of adhesion and durability—mirroring real food engineering decisions.