

Redesign for Limited Hand Strength

Difficulty Intermediate	Time 2 class periods	Type Engineering Challenge
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Background

A user can understand a classroom product but has difficulty gripping, twisting, or pressing it because of limited hand strength.

Engineering Problem

Redesign an approved classroom product to reduce required grip force or improve control without removing its core function.

Learning Objectives

- Identify user needs through empathy and evidence
- Translate needs into measurable requirements
- Generate accessible concepts
- Evaluate a human-centered prototype

Materials

- Approved classroom product
- User-needs interview sheet
- Sketching materials
- Cardboard, foam, clay, or other prototype materials
- Force gauge if available

Procedure

1. Select a product with a grip, cap, button, lever, or control.
2. Create a respectful user profile based on limited hand strength; do not simulate a disability in an unsafe way.
3. Observe the product and identify at least three barriers.
4. Convert barriers into measurable requirements such as diameter, force, reach, or texture.
5. Sketch three concepts and collect feedback from a peer acting as a reviewer.
6. Build a low-fidelity prototype of the selected concept.
7. Run a usability test using the same task for the original and redesign.
8. Document feedback and make one revision.

Engineering Requirements

- Address at least two identified user barriers
- Include at least three measurable requirements
- Preserve the product's core function
- Avoid a design that creates a new safety hazard
- Collect and respond to user feedback

Constraints & Safety

- Use respectful, person-centered language

- Do not ask a student to imitate pain or injury
- Prototype materials must be safe and reversible
- Do not permanently modify school property

Deliverables

- User profile and needs
- Barrier observations
- Three concept sketches
- Requirements list
- Prototype
- Original/redesign usability comparison
- Revision summary

Reflection Questions

1. Which user need was hardest to convert into a requirement?
2. What feedback changed your design?
3. Did improving accessibility help other users too?
4. What would require additional real-user testing?

Engineering Tip

Ask what task is difficult and why. Avoid assuming the solution before understanding the user.

Common Mistake

Making a handle larger is not automatically accessible; reach, force, texture, feedback, and context all matter.

Stretch Goal

Redesign the product for one additional user need without reducing the first improvement.

Career Connection

Human factors and accessibility engineers design controls, tools, interiors, and equipment for a wide range of users.