Engineering Practices: Use a systematic problem-solving process | Explore the properties and uses of materials | Evaluate designs and iterate | Balance criteria and constraints that require trade-offs | Envision multiple solutions

*Please note that any one of these practices can be the focus for this activity. It is not recommended that you attempt to highlight all of these practices in one session.

ENGINEERING DESGIN CHALLENGE: BEAR CHAIR

Apply the engineering design process as you design a chair for a favorite stuffed bear or toy.

Grade Level: All ages (including adults)

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Grouping: Work in teams of 2-4 learners or individually

Activity Time: 30-60 minutes Allow time for design, building, testing, and iteration – Adjust as needed

Objective(s): Learners will experience applying engineering practices and the engineering design process as they complete the Bear Chair design challenge.

Materials

- For each team: A small bear, doll, or other toy that can easily bend and sit on its' bottom, approximately 6" tall.

Building materials:

- Craft sticks or other craft supplies
- Cardboard or other recyclables
- Miscellaneous household or classroom items

Materials for quickly connecting building materials

- Tape
- Binder Clips or paper clips
- Pipe Cleaners or yarn

Optionally, you can build chairs using materials that self-connect (e.g., LEGO, K'nex, etc.).

Design Challenge

Think about the toy as you design the chair. What does the toy need to sit up right? What does the toy need to feel comfortable? How do you make sure the toy will fit in the seat of the chair?

Activity Directions

1. If needed, adapt the design challenge to emphasize the engineering design practice you will focus on in this activity.
2. Divide learners into teams.
3. Present the design challenge and how much time teams will have to build.
    - Think about the toy as you design the chair. What does the toy need to sit up right? What does the toy need to feel comfortable? How do you make sure the toy will fit in the seat of the chair?
4. You will test you design against 3 criteria – the Fit Test, the Sit Test and the Ankle Drop Test.
    - Fit Test – Your toy fits comfortably in the chair.
    - Sit Test – The chair keeps your toy seated upright (no beds or lounge chairs).
    - Ankle Drop Test – Your chair (without your toy seated in it) needs to survive a drop from your ankle (or knees for adult participants). That means no pieces can fall off.
5. When learners are done building and testing their chair, have them share their designs (e.g., show-and-tell, turn-and-share, gallery walk, etc.).
6. Guide reflection on how the applied the engineering practice that you chose to focus on.
    - What materials did you use to build your bear chair?
    - Did your final product reflect what you had originally imagined? If not, how was it different?
    - What were some of the challenges you encountered in building?
    - Did your Bear Chair meet the three criteria?
    - If you were going to make this again or improve on your current design, what would you do different?

Examples