

Index card structure challenge – Basic Template

- **The challenge:** Can you build a stable structure using index cards, in order to display a small stuffed animal (or, hold a bag of beans or pennies)?
- **The criteria:**
 - the structure must be as tall as possible
 - it must be freestanding
 - it must hold a small stuffed animal (or other objects such as a bag of 20 pennies)
- **The constraints:**
 - you can only use 2 feet of tape, and up to 100 index cards per team
 - you will have 5 minutes (adjust as appropriate for grade level, available time) to build

This can be done as a “free build” activity, or extended into a formal lesson with time to discuss each of the steps and include writing/drawing in science notebooks and/or time for discussion with peers. Ideally this is done in groups of 2-4 students.

For each of the “steps” of the engineering design process, some suggestions:

ASK:

- This is when students are presented with a challenge:
CAN YOU BUILD AN INDEX CARD TOWER TO DISPLAY THE STUFFED ANIMAL?
- In the design process this is where a problem or challenge is identified by an engineer...
(e.g. “how can I make this _____ work better, more efficiently etc?” “How can I make this _____ stronger, taller, smaller?”)

IMAGINE:

- This is the brainstorming phase
- Independent brainstorming initially
Encourage students to DRAW ideas!
The pictures don't have to look real, as long as they know what they mean...
- Use questions to prompt thinking:
 - What are the constraints and criteria?
 - What shapes are good for building?
 - What designs might work? What won't work?
 - What kind of base will you use?
 - How will you give your structure stability?

PLAN:

- Look at your brainstorm ideas and sketches.
- Which one seems like the best idea to try?
Provide productive discussion prompts for your students. Choosing between ideas and compromising can be difficult!
- Choose one idea, or synthesize multiple ideas
- How will you begin? How will you accomplish your goal within the constraints given?

CREATE & TEST:

- Build! Then, test. Adapt your building as you go. Measure your structure.
- Does your structure hold (the designated object)?
- What worked? What didn't?
- Discuss successes and failures with the class –important to discuss the value of failure.

IMPROVE:

- What else could you try or do differently?
- Imagine, plan, and build a new structure, or adapt the structure you already built. Can you improve it?