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?