

DOWELS AND RUBBER BANDS II

Duration: 15-30 minutes (could last much longer with prompts)

Institution: COSI

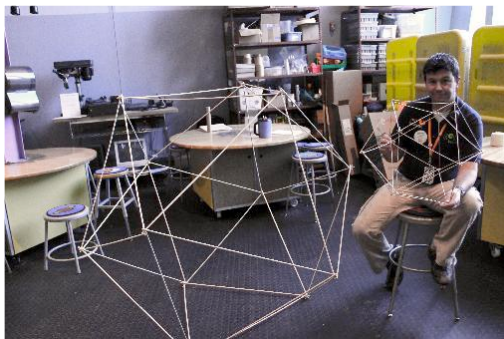
Skill level/Age Level: 6 years and up

Group size: Varies based on materials and facilitators, although is flexible.

Seems to work well with both small and large groups

INTRODUCTION

Participants will use the engineering design process to create structures made of 3-foot dowel rods and rubber bands.



KEY CONCEPTS AND/OR SUBJECT AREA

Encourage guest to build a structure with dowel rods and rubber bands. The design is determined by the guests, as is the method for attaching dowel rods together. Facilitators may use prompts to direct the design process: i.e. can you build a structure within which you can stand?

MATERIALS AND TOOLS

- 3-foot dowel rods
- Rubber bands (3 1/2" x 1/4" work well)

HOW TO OR STEP-BY-STEP

Set Up

Assemble organized (ideally separate) bins of dowel rods and rubber bands for guest to grab (or be handed) at start of activity.

1. When guests enter space, provide them with dowel rods and rubber bands
 - a. Usually a handful of rubber bands and ten dowel rods is a good start but it depends on your prompt
2. Provide guests with a prompt. Can be a variety of things, such as:

- a. Can you build a structure within which you can stand? That can fit the tallest person in your group?
 - b. Can you build a structure that uses _____ (triangles, squares, etc.)
 - c. Can you build a structure that has multiple levels? (good for groups)
3. If guests are doing well, needing a challenge, and/or enjoying the process, consider removing materials to alter the prompt
- a. Saying something like “Oh no, there is a budget shortage...we need to take 3 of your dowel rods” is a good way of introducing this additional challenge.

FACILITATION TIPS

- We used the following series of prompts to get our participants started;
 - With these 12 rods and a handful of rubber bands, build a structure you can fit inside.
 - With free access to more materials, can you make your structure taller than the tallest participant?
 - Can you combine your structure with another group’s into a “superstructure” that you can all fit inside?
 - Supply shortage! Can you achieve your current challenge without receiving any more materials? Check for unnecessary redundancies and places where rods or bands could be removed for re-use without weakening the structure.
- We also considered implementing a budget system as a constraint to design. In this system, rods would be worth \$X, bands would be worth \$Y, and each person would have a budget of \$Z to accomplish their goal. This would push the design and planning aspect to the fore, as participants would need to carefully consider their design while being budget minded.
- Another idea we did not get to experiment with was adding stress testing. Using a force gauge/spring scale suspended from the central point of the structure, we would add weight until the structure either failed, or was in imminent danger of doing so.

WHY THIS EXPERIENCE?

- This experiment will be a perfect fit for design based learning because it: (1) is open ended (2) works well with both small and large groups (3) requires minimal consumables (rubber bands and dowel rods can usually be reused after activity) (4) allows participants to alter only a few variables, which can lead to very different results.
- Collaboration will occur as participants study each other’s designs, and improve upon them to make their own.

FACILITATION TIPSClean up:

- Make sure broken dowel rods and rubber bands are discarded
- Return all materials to their bins and boxes.

MATERIALS SOURCES

Woodworks Ltd. (<http://www.craftparts.com/>) is a good source for dowel rods
Rubber bands can be found through various sources (3 1/2" x 1/4" work well)

KEYWORDS

Engineering
Simple, open-ended
Indoor/outdoor activity
Needs a lot of space