Berkeley Engineers and Mentors

Title: Marshmallow Challenge
Lesson Type: Construction/Process
Target Grade: Elementary/High School
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Challenge:
Build the tallest structure using spaghetti and masking tape. The structure must support one large marshmallow.

Teaching Goals:
- Prototyping
- Supporting structures

Agenda:
- Introduce the challenge (~10 min)
    - Perhaps talk about what makes a good structure. Have someone prepare to pass out materials.
- Start challenge (~20 min/30 min for variation)
    - Have mentors help if necessary, give basic advice if asked. Answer questions. Mainly let the students roam free. Give groups time warnings in 5 minutes intervals and at 3 minutes, 1 minutes remaining.
- Decide winner (~5 min)
- Do challenge again if running challenge twice (~20 min)
- Decide winner (~5 min)
- Discussion (~10 min)
    - Talk about the challenge, what worked, what did not, etc.

Materials:
Per group of 3-5 students:
- 20-30 strands of uncooked spaghetti
- 1 large marshmallow

For mentors:
- Tape measure
- Masking Tape

Procedure/Rules:
- Work in teams of 3 - 5 to build the tallest structure

- Structure must support the weight of one marshmallow placed at the top, must use whole marshmallows
- May or may not want to impose a tape limit (around 1 yard/3 feet is a good amount, or 5 ft)
- Spaghetti can of course be broken into smaller pieces by the students if they want
- Spaghetti can be taped to table
- Marshmallow is given to students at the beginning of challenge
- Each team gets 20-30 spaghetti (depends on # of students/materials available)
- Time limit of 20 minutes for elementary and high school students (or use variation below)
- **Variation for high school students:** Make the tallest structure that will support the most marshmallows. Will probably need to bump # of spaghetti up to 30-40 and time limit up to 30-40 minutes. Use a point system (#inches of structure x #marshmallows supported) to decide winner, one marshmallow is given at the beginning as a tester. You can also use other variations you think of.
- If time permits, run the challenge twice.
    - First run: marshmallow is put on at the end of the building phase.
    - Second run: marshmallow is given to students at beginning and students are allowed to test as they build
    - What does this show about the design/building process? (Prototyping)

Material to Teach:

- Tape several spaghetti noodles together to build stronger “beams”, triangles are nice and stable
- Design a structure that has a wide base and evenly distributes weight toward ground
- Prototyping - trying a design and then adjusting it to be better instead of planning for one final design without

Questions to ask the students:

- Did your group prototype as you built? Would that have helped or not?
- What kind of base did you use for your structure? What would make a good base?
- What about the supporting sides of the structure? What kind of shapes reinforce the structure? What shapes do not?

Reference:

- http://marshmallowchallenge.com/Welcome.html