

Spaghetti Skyscrapers

#MAETskyscrapers

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Learning Objective

At our booth, students will learn about the design process (in Sarah's elementary classroom it is: Ask, Explore, Model, Evaluate, Explain) and about engineering principles (including [trusses](#) and [cross braces](#)). They will have the opportunity to build a tower using spaghetti and marshmallows, and will be able to build and rebuild, if they want to improve their design.

Essential Question:

- How can I create a tall and stable structure out of spaghetti and marshmallows?
(remixed from [Dorothy Hains Elementary Straw Tower Challenge](#))

Making Objective (aka 'The Challenge')

Participants will make a structure using only spaghetti and marshmallows. Their maker movement experience will involve hands-on making. It will focus on process, not on product. In other words, it is the time spent at our booth, learning and making, that is important; not a thing they are going to take with them. We will ask participants at our booth to leave the materials that they build with.

Prompt from our [table placard](#):

Architecture firm Skidmore, Owings & Merrill (builder of the Burj Khalifa in Dubai), is looking for engineers for their newest skyscraper project. They've decided to hire three people, and will make their choice based on who creates the tallest of each model: the triangle tower, the rectangle tower, and the square tower. Using the supplies provided, build the

tallest possible freestanding tower that you can. If you manage to hold first place by the end of the Faire, you might very well find yourself with a new job!

Materials/Resources Needed

Materials

- small marshmallows
- spaghetti
- 2 tape measures
- 1 roll masking tape
- 6 tins or boxes or bins for supplies on the tables
- 1 computer
- 6 [What to Do placards](#) - 2 each for 3 tables
- 3 tables

Resources & related notes

- We will have 3 tables. On each one, we will mark out 4 shapes - 4 triangle bases on one table, 4 square bases on the second table, and 4 rectangle bases on the third table.
- We will have one container of spaghetti & one container of marshmallows on each table
- We will ask students to leave supplies in our area, so that we can reuse them and they don't end up all over the library. Our used supplies will go in the garbage at the library, and unopened marshmallows and spaghetti (if any) will go back to Erickson at the end of the event.
- Our supplies are light enough to carry to and from the library ourselves the day of the event.

Leaderboard

- We will use our hashtag #MAETskyscrapers to Tweet out leaders in all three categories - triangle base, square base, and rectangle base
- Kate created a Google Sheet that she will share for anyone with the link to view. She created a [shortened URL, using bitly](#). We will update it regularly during the event, and we will Tweet the updates using #MAETskyscrapers.
- Kate will use her computer on the day of the event to broadcast the leaderboard at our station.

Step-by-Step Directions for How to Create Our Booth

1. Find and/or buy all [materials](#) (marshmallows, spaghetti, tape measures, masking tape, boxes or bins for supplies on the tables, table placard, tables)
2. Using masking tape, outline your shapes on the table(s) you are using. Feel free to mix and match your shapes across tables, or keep similar shapes on each table.
3. Place 1 container of marshmallows and 1 container of spaghetti on each table.
4. Place 1 to 2 placards on each table.
5. Make sure you have a tape measure handy (around the neck is a good spot!).
6. If cleanliness is a concern, cover floor below tables with dropcloth or cardboard.
7. Invite students to come build at the tables, reminding them politely to mind their marshmallows and clean up once they've finished.
8. Once students are done, clean up any leftover messes on the tables and floor.
9. Clean storage bins and put away.
10. Remove tape from the tables and throw away.

Introduction to Our Booth

Our booth is about problem solving, using engineering concepts and the design process to make a tower. The only constraints that will be placed on our participants are:

- They may use only spaghetti and marshmallows.
- The base of the tower must fit on the template we mark out for them.
- The tower must be able to stand on its own to get measured for the contest.

According to the theory of [constructivism](#), students construct new knowledge based on prior knowledge, either through direct instruction, or through [inquiry-based learning](#) ("Constructivism," 2016). In other words, when learners hear, see, or try something, they build new knowledge on prior knowledge.

As people approach our booth, we will encourage them to build independently (alone or with a partner). If they get stuck or appear to struggle, we may ask some guiding questions or provide a little guidance to help them along. According to Bransford, Brown, & Cocking (2000), after a period of active struggle, learners are ready for teaching by telling. We are going to try to avoid telling too much, though.

We anticipate having guests of all ages come to our booth. Because we initially planned to use straws instead of spaghetti, we will bring those with us, too. If we have a participant who is preschool age, we will differentiate by offering straws to the parents instead of spaghetti. This will allow those children to use the same design thinking skills, but with less of the struggle that comes from using the spaghetti, which is very brittle.

Outline of the Activity

As participants arrive at our booth, they will see the three tables, the [placards](#), and the spaghetti and marshmallows laid out on each table. We will guide them to read the placard, if they are able to read, and we will verbally introduce them to our activity.

The only constraint we will place on our participants is that they must build the base of their tower on the template that we mark out on the tables. One table will have rectangles, one table will have triangles, and one table will have squares.

As people arrive at our booth, we will say:

Welcome to the Straw Skyscrapers table! We have three tables. One of the tables has four squares marked out, one has four rectangles, and one has four triangles. Your goal is to build the tallest tower you can using only spaghetti and marshmallows. You can build independently or with a partner. All the supplies you will need are on the tables. The only rules are that you have to start your tower so that it is within the shape we marked with tape, and it has to be able to stand on its own without someone holding it. When you're finished, and the tower is standing on its own, come and get one of the people running the booth. We will measure how tall your tower is, and put you on the leaderboard. If you build the tallest tower today, you might even get hired by the architecture firm that built the [Burj Khalifa in Dubai](#). Now just pick a spot, and you can get started.

As people are working, if we notice they are struggling and stuck (which often happens when there is not a cross brace, and the tower is tipping over):

I see your tower is tipping. Is there anything you could do to make it stronger, more stable? (At this point, we may guide them toward considering a cross brace.)

When people first say they are finished, we will say something like:

Okay, I'm happy to measure how tall that is. Are you sure you don't want to try to build it taller? If you like, I can measure it now, and you can keep trying to build it taller.

When people say they are finished, we will ask:

How did you use the materials?

What did you do well?

If you built another tower, what would you do differently?

If children get frustrated at having to leave behind their towers, we will remind them that our challenge is about getting to do the building activity and think about what they are doing (process), not about building something to take with them (product).

Other Information About Our Booth

[Leaderboard](#)

[Planning Document](#)

References for poster ideas, objectives, etc.

[Destination Imagination, South Dakota](#)

[Destination Imagination, Texas](#)

[Dorothy Hains Elementary](#)


[TinkerLAB](#)

Image of our table placard:

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The Challenge

Architecture firm Skidmore, Owings & Merrill (builder of the Burj Khalifa in Dubai), is looking for engineers for their newest skyscraper project. They've decided to hire three people, and will make their choice based on who creates the tallest of each model: the triangle tower, the rectangle tower, and the square tower. Using the supplies provided, build the tallest possible freestanding tower that you can. If you manage to hold first place by the end of the Faire, you might very well find yourself with a new job!

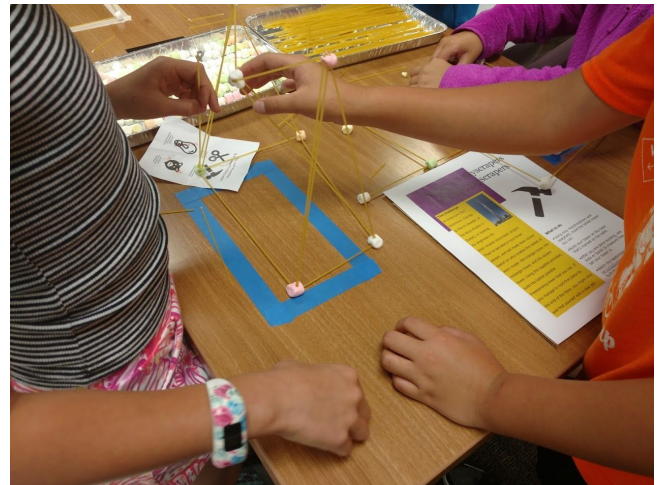
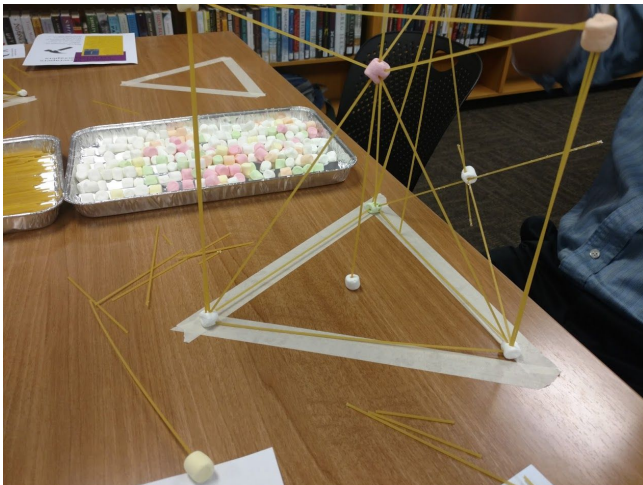




What to do

- Using only marshmallows and spaghetti, build the tallest tower you can.
- Build your tower on the base that's marked on the table.
- After you are done building, ask Kate or Sarah to measure how tall your tower is.
- Watch the leaderboard at bit.ly/2uDuqPA to see who has built the tallest tower.

Images of our setup the day of:



References

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (2000). *How people learn: Brain, mind, experience, and school: Expanded edition*. Washington, DC: National Academy Press.

Constructivism. (2016, September 08). Retrieved from <https://www.learning-theories.com/constructivism.html>