

Design Challenge: Creating a Cup Tower

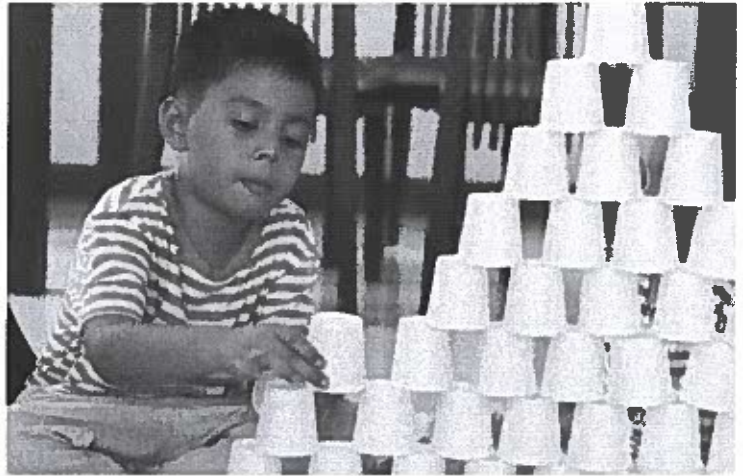
In this activity, your child will be challenged to make a tower using only one material: paper cups! The purpose of this challenge is to teach your child design thinking strategies so that they can maximize their tower's height.

What You Need:

- Paper cups
- Ruler, tape measure, or yardstick
- Pen and paper for taking notes

What You Do:

1. First, fully explain the prompt of this challenge to your child. Explain that their task is to create a cup tower and emphasize the purpose of the tower: to be as tall as possible. Tell your child that in order to achieve this, they will need to make at least a couple designs and compare their heights.
2. After your child understands the prompt, ask them to begin **brainstorming** different ways they can create their tower. Have them write or draw their ideas on a piece of paper (or you can draw their ideas while they explain them to you).
3. After your child has come up with a few design ideas, ask them to pick one that will work best. Be sure to ask them why they think this design is best and reiterate the purpose of the tower (height).
 - This is an important step of the design thinking process because it teaches your child to prioritize the purpose of their prototype (design) over their personal preferences. This will also prevent your child from getting too emotionally invested in one design.
4. Once your child has identified the prototype they think will be the tallest, give them the paper cups and allow them to **build**. We suggest allowing your child to work independently through any challenges, but be sure to supervise and help out wherever you see fit.
5. After your child has finished building, it's time to **test** their prototype. Measure the tower's height and have your child record the height on a piece of paper.
6. Since the purpose of this challenge is to build the tallest tower possible, your child will need to create at least one more prototype and compare its height with the first tower. Ask your child some of the following questions so that they can reflect on their first design:
 - a. What worked well in building this tower?
 - b. What didn't work well?
 - c. What could you change about this tower to make it taller?
7. After you and your child have come up with some modifications, explain to your child that they can now use their ideas to make a new, taller tower.
8. Once again, ask your child to **brainstorm** different designs that will hopefully create a taller tower than their first one. Then, ask them to pick the one they think will be best.
9. Next, allow your child to **build** their design. Once again, allow them to work independently as much as possible.
10. After your child has finished building, it's time to **test** their new prototype. Again, measure and record the height of their tower and compare it to the first one.
 - a. If your child's second tower is taller, ask them some of the following questions: What worked well in your second design? What didn't work well? What specific adjustment to your first design made the second tower taller? What could you change about the second design to make it even taller?
 - b. If your child's second tower is shorter than their first, ask them some of the following questions: What worked well in your second design? What didn't work well? Why do you think your second tower was shorter than the first? What could you change about this design to make it taller?
11. You and your child can continue repeating this process and attempting to create a taller tower for as long as you'd like. Be sure to cover each step of the design thinking process since repetition will reinforce these core ideas!



Constraints for Craft Stick Towers 1

- The cups cannot touch each other.
- Rows of cups and sticks **can** look the same.

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Constraints for Craft Stick Towers 2

- The cups cannot touch each other.
- Adjacent rows of cups and sticks **cannot** look the same.

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Constraints for Craft Stick Towers 2

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Constraints for Craft Stick Towers 3

- The cups cannot touch each other.
- Rows of cups and sticks **must all look different.**

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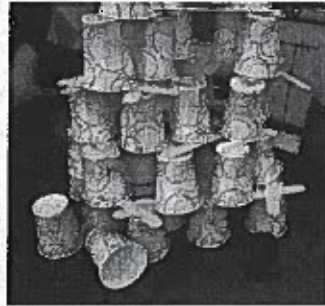
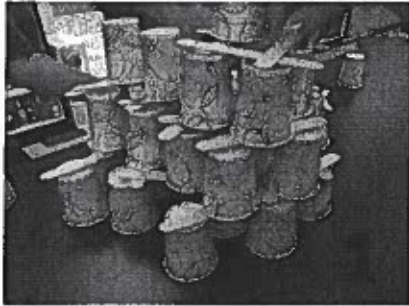
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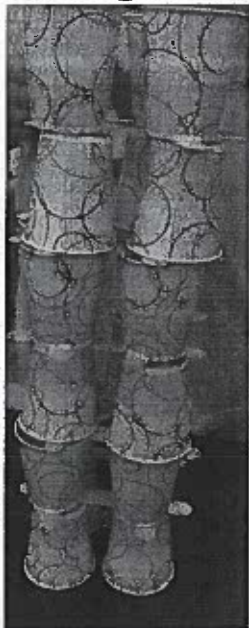
Photographs

Third grade – with Constraints 1



Photos 1 and 2 show some cups just in piles with little thought to making the tower tall and some misuse of the craft sticks (using too many). It didn't take long for the kids (all age groups) to learn that wider towers or large arrangements limited the height. They also learned to be more frugal with the sticks. In photo 3 the group has started using single sticks between rows of cups. Photo 4 has a tower that worked by having a great base and then getting more narrow. Photos 5 and 6 are similar, but notice the craft sticks all in a row in photo 6! Photo 7 is the tallest tower of the third graders at 127 cm.

Fourth grade – with Constraints 2



The 4th graders used the constraint that allowed for rows to be the same, but not adjacent rows. They very quickly caught on to making the square or triangular base arrangement and then going up with cups either facing up or down and just repeating this. More 4th grade photos on the next page.