

Soda Straws, Masking Tape, Tennis Balls and About 300 Sixth Graders

Harry T. Roman—Retired Engineer/Inventor

The Basics

It took four days to gather about 300 sixth graders into teams and administer a simple design challenge. Using only soda straws and about 36 inches of masking tape, build a tower, as high as you can, that can support a tennis ball. [See the rules for this activity at the end of the article.]

Some of you may have tried this activity or a variant of it with your class; but here are some fascinating statistics with a large population of students containing mixed classes of high, medium, and low performing students, as well as special education students.

Each team was composed typically of 3 students, so with about 300 students, there were 100 teams. In the final analysis, 72 teams were successful in building a measurable tower, leaving 28 teams unsuccessful.

Of the successful teams, a frequency histogram shows the heights of the towers built.

Observations

The typically under-performing and special ed teams did a terrific job of building towers – maintaining high enthusiasm, and keen competitive spirit.

Many sturdy and tall towers were built by girl teams. The tallest one topping out at 91 cm was built by two underperforming girls and another girl who, according to her teacher, had become disengaged over the last few weeks.

Harry Roman talked about invention, and engineering for about 15-20 minutes prior to the build activity to motivate the teams about not being afraid of failure and constantly improving one's idea. The time allotted to the actual build process was about 45-50 minutes. During the first half, most of the teams plodded along, with a second half explosion of rapid progress. Teachers Kornoelje, and Vanloon, and Roman circulated among the teams offering encouragement, asking questions, and measuring tower heights.

Teams that failed or were not producing robust towers had a variety of problems:

- One student dominating the design challenge – turning other team members off
- Over analyzing the challenge and afraid to start doing something different
- Turned-off students – lack of interest
- Poor spatial visualization – not able to visualize the third dimension
- Lack of appreciation of building structures and supporting loads
- Over emphasis on building some sort of straw assembly to hold the ball.

There was no clear cut defining difference between gifted and traditional students, or their teams in performance.

I would like to acknowledge science teachers Joanne Kornoelje and Martha Vanloon of the Thomas Edison Middle Six School in West Orange, NJ for supporting this activity. I have had the privilege of working with these fine teachers for about 8 years, enjoying every minute of it.

Rules for the building activity.....

Straw Tower Challenge

DESCRIPTION: To build the tallest free-standing tower out of up to 50 straws that will hold a designated load (tennis ball) for 5 seconds.

The tallest tower that supports the load at the highest point in the tower will be ranked the most successful tower.

MATERIALS PROVIDED: up to 50 drinking straws, 1 meter of masking tape, tennis ball, and meter stick
You will not be given any extra materials. Use your materials wisely and do not be wasteful.

Optional Materials: Scissors and a pencil

Event Parameters:

1. The tower must be constructed and built using only the drinking straws and masking tape.
2. Be mindful of using the masking tape; what purpose will the tape serve? *Tape may not be used to secure the tower to a table, base, ceiling or surface.*
4. The tower must hold and balance a standard tennis ball for five seconds.

Measuring and Testing the Success of Team Structure:

1. Remember to test the stability of your tower during the construction process.
2. The height of the tower will be measured once the tennis ball is placed on the structure. Use a flat surface to test the structure.
3. The tower that supports the load at the highest point in the tower will be ranked the most successful tower.

Frequency Histogram for Tower Building Activity Height measured in centimeters [cm] 72 Teams Total

<u>Height</u>	<u>Frequency</u>
0-9	1
10-19	10
20-29	14
30-39	14
40-49	18
50-59	8
60-69	4
70-79	1
80-89	1
90-99	1
Total	72