



WAYNE STATE UNIVERSITY

STEM Day Lesson Plan

Title: Tower Building Challenge

Subject Area: Engineering

Learning Activity Description:

Students will use Chenille stems to build the tallest, freestanding tower.

Lesson Activity Objective:

To expose students to challenges inherent in real design and building projects.

Materials/Supplies Listed: 15 Chenille stems per team.

Tip: Wrap a Chenille stem around a bundle of 14 for easy prep.

Room set-up: Tables for groups of 3-4

Teacher Procedures:

1. Group students into teams of 3 - 4.
2. Pass out bundles of 15 pipe-cleaners to each group.
3. Instruct students that each engineering team is tasked to build the "tallest free-standing structure" with the materials provided. Teams will have about 15 minutes. Free-standing means the structure can not be held, taped, wedged between desks, etc. Ask for any clarification.
4. After working for 3-5 minutes: tell students to freeze. "Your team had an unexpected budget cut, and one of your resources has been depleted. Each team member must now put one arm behind his/her back!"
5. 3-5 more minutes: freeze again. "Your engineering company realized that the loss in resources were detrimental to the product. The manager has decided to expand your operations globally to bring in more business. Your team now operates in (insert favorite country here) allowing you to use both arms again. But now you are unable to speak the same language. Continue the task without any speaking!"
6. 3-5 minute: "Business is booming, and your company has hired translators. Complete the task with all your resources! One minute left!"
7. Count down from ten and stop the activity.

Tips

- Adjust the time depending on how quickly students are working.
- Younger students may become paralyzed by the planning stage. Help them focus on building a sturdy foundation.
- Some teams will ignore the rules. Take away pipe-cleaners as a consequence!

Closing:

Walk around the room and note the different shapes and designs of the towers. Determine the tallest tower and allow the team to explain their successful design.

Discuss how the constraints imposed during the challenge affected their teamwork.

C² Pipeline Activity Plan

Subject area: Engineering

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| Activity Title | The Tallest Tower Challenge | |
| Driving Question | How can a free standing tower be constructed using only paper and tape? | |
| Activity Objective | <ul style="list-style-type: none"> • TLW become familiar with the following terms: structural stability, shear strength, tensile strength, compression strength, beam (I-Beam), column, brace, truss, foundation, load bearing • TLW construct a free standing tower as tall as possible using only the materials given | |
| Supplies Needed | Per Team: <ul style="list-style-type: none"> • 1 paper plate • 8 sheets of 8 ½ x 11 paper • 48 inches of masking tape • Scissors • Ruler | Optional additional materials: <ul style="list-style-type: none"> Ⓟ 1 paper bag Ⓟ 4 paper clips Ⓟ 4 drinking straws Ⓟ 4 Pipe cleaners Ⓟ 4 Popsicle sticks |
| Step By Step Activities | <p>**Important Concepts to Know: the tower should be wider at the base and narrowed at the top. This can be demonstrated by have the tallest student stand in the front of the class with their feet together and then pushing them lightly on the shoulder. Do the same with their feet apart.</p> <p>**Folding or rolling paper gives it strength</p> <ol style="list-style-type: none"> 1. Divide class into teams of 2 to 4 2. Each team will work together to build a tower out of the materials provided. They have 45 minutes. The tower must be built on the paper plate and cannot be taped to the table or floor. The tower must stand freely for at least 30 seconds without falling over. The tallest tower wins. 3. Have all teams check their materials before the clock starts. 4. As students are working ask questions like: <ol style="list-style-type: none"> a. What is working well in this design? b. What can be improved? c. How can you make this more structurally stable. 5. Be sure to measure each tower and record height throughout the activity. 6. After the clock stops review each tower with the class. Ask the class to theorize why certain aspects worked and what could be improved. 7. Remind everyone the engineering process is about improving and learning from what doesn't work is just as important to the process. | |

C² Pipeline Activity Plan

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| <p>- Runner up titles can be awarded: most innovative, most stable structure, best use of materials, craftsmanship, most creative, best planning process....</p> | |
| <p>Student Reflection Activities</p> | <p>Clean up and facilitate the following discussion:</p> <ul style="list-style-type: none"> -What ideas do you have to improve your tower? -How can they improve the team design and build process? <p>Try the project again on a later date and compare the results.</p> |

