Engineering Communication

Summary: Three variations on a building activity with Tinker Toys to help students understand the importance and challenges of technical communication.

Target age group: High school, First year undergraduates

Time: 45-75 minutes

Materials:
- Tinker toys
- Gallon-sized Ziploc bags
- Paper
- Writing utensils

Activity: Divide the students into groups of three or four. Distribute a bag of random tinker toy pieces to each group. Give them time to build something. The only rules are that the whole group must work together to build a single object, and it must use all the pieces in the bag. After about ten minutes, explain to the students that communication skills are vitally important in engineering. It doesn’t matter how good your design is if you can’t communicate clearly about it to your co-workers or to a customer. Give each group a piece of paper and a pen or pencil. Tell them they have 15-20 minutes to write out instructions for building their design. (Decide whether they are allowed to use sketches in their instructions, either of the individual pieces or the entire object.) Once each group is finished (or, more likely, some groups are finished and you decide that the time is up), have the groups disassemble their creations and put all the pieces back into the bag along with the instructions. Redistribute the bags to different tables and have the groups attempt to rebuild the designs from the written instructions. Have the groups check each other for accuracy. Facilitate a discussion about what worked well in the instructions, what didn’t work, and what they would do differently next time. Would they have built their structure differently if they’d known what they activity was going to be? Common observations are that writing clear instructions is difficult, and requires a lot of detail and time. Remind students that revision is an important part of the engineering process.

Variation #1: Divide students into groups of exactly three. If there are one or two students left over, give them the job of Model Builders. Give each group the same collection of Tinker Toy pieces (~15 total sticks and connectors). Send Model Builders (or a volunteer group of three) across the hall to another room (or down the hall and around a corner) and instruct them to build anything they want out of their pieces. This structure will be the Model. Once they’ve left, tell the remaining groups that their job is to exactly recreate the Model from across the hall. However, there is a catch. Each group member is limited in their movement, depending on their assigned role.

Source: Amber Genau, University of Alabama at Birmingham (2020) https://nanohub.org/resources/33801
• Observer: Can move between the room with the model and the hallway. Their job is to describe the model to the Relayer.
• Relayer: Can move between the hallway and the room with the Builder. Their job is to relay the description from the Observer to the Builder.
• Builder: Must stay seated in the original room and attempt to exactly recreate the Model. They are the only one who can touch the blocks.

Once each group has determined who will fulfill which role, take the Observers into the room with the model, position the Relayers in the hallway, and let them loose. The student(s) responsible for creating the original model can move back and forth through all areas, ready to check for correctness when a team thinks they’ve recreated the model (and also keeping an eye out for cheating). No phones or writing allowed! Afterwards, lead a discussion about what made this task difficult and what strategies the teams used to accomplish it. What role was the easiest or hardest? How did they originally assign roles? In what ways does this parallel engineering communication in the real world? (Examples: In large companies, it is common for engineers to work with team members all over the world in many different time zones, and communicate mostly by email. People in technical sales positions often serve as the go-between between the engineers who designed the product and the consumers who buy or use the product.)

Variation #2: Divide students into groups of three and give each group a bag of random Tinker Toys. Have the group sort through the bag to create two sets of identical pieces. Any remaining pieces can go back in the bag. Instruct team members #1 and #2 to sit facing away from each other, each with one set of the building pieces. As team member #1 begins to build something, team member #3 describes it to #2, who tries to recreate the design. Team members #1 and #2 are not allowed to speak. You can increase the challenge level by forbidding #3 from looking at #2 as #2 tries to follow #3’s instructions. When the groups have finished, have them rotate positions and repeat, so everyone gets to try each role. At the end, discuss. What was easy about the different roles? What was difficult? What did they learn about clear communication?

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