Introduce a Kid to Engineering Day
Protect a Chip

Welcome WCPSS students! We know this is a challenging and unusual time for all of you so our Introduce a Kid to Engineering Day team from the Society of Women Engineers (SWE) wants to help you have a bit of fun with STEM at home. This is in support of John Deere Inspire, our global STEM program.

Since we can't bring your schools to our facilities right now for these fun activities, we are going to come to you! Each week for the next several weeks we will be sending out a fun STEM project that you can do at home with items that you probably have laying around the house or in your yard. The activities will have variations for elementary, middle, and high school students. If you don't have an item on the list, it's ok to substitute with something similar. For example, if we say you need masking tape, any kind of tape will work. We will give you alternative suggestions where we can. Overall, we want you to have fun learning something new and inspire you to get involved with STEM.

This week's activity is Protect a Chip.

PROTECT A CHIP

Objective
John Deere and its suppliers ship thousands of parts every day to factories and dealers across the globe. It is important for these parts to arrive undamaged and ready for use. Your job is to design a shipping device that will protect chips for shipment to John Deere Turf Care factory.

Build Time
30 minutes

Materials

1. 5 sheets of construction / copy / notebook paper
2. 4 feet of masking tape or any tape you may have
3. 1 chip (elementary) / 3 chips (middle) / 5 chips (high school) - chips can be corn / tortilla / pringle or crackers or a dried leaf (that's undamaged) if you'd prefer not to use food. You want an item that is relatively flat and easily broken.
4. Scissors (optional)
5. Test materials – 1 textbook / or large book and spray bottle with water.

Instructions

1. Brainstorm possible shipping devices to transport chips from your school to John Deere Turf Care.
2. Construct a shipping device using the given materials.
3. Test your shipping device, there will be three tests for your device.
4. Analyze your test results to determine if your design is robust enough to protect the chips.

Requirements

1. The device must be able to hold between 1 and 5 chips, (1 for elementary, 3 for middle, and 5 for high school) and be able to safely transport the chips regardless of the number of chips being carried in the shipping container.
2. The device must be able to be used for multiple shipments. You need to be able to open and close the device to add or remove chips

Testing

1. The tests are as follows:
    a. Test 1 – Shake, Rattle and Roll Shipments
        i. Two people should stand 5 feet apart
        ii. Throw the device back and forth between two people 10 times
            1. This will simulate the bumps of the road and movement during shipping
        iii. Open the container **–** The chips / item must not have any cracks, dents or pieces missing after the test
    b. Test 2 – Squash Test
        i. Place a textbook on top of the largest section of the device and leave it there for 10 seconds
            1. This will simulate containers being stacked on each other as well as containers falling on top of each other
        ii. Open the container **–** The chips must not have any cracks, dents or pieces missing after the test
    c. Test 3 – Spray + Squash Test
        i. Spray the device with the spray bottle three time in three locations (if you don't have a spray bottle sprinkle some water on the device with your hands)
        ii. Then place a book on top of the largest part and leave it there for 10 seconds
            1. This will simulate shipping containers being exposed to adverse weather conditions and shipping damage
        iii. Open the container **–** The chips must not have any cracks, dents or pieces missing after the test and remain dry

Key Points / Questions to Consider / Future Ideas

- In engineering, you don't always know what your customer will do to your product.
- You need to learn about your customer.
- Test engineers design tests that we think will prove that our product is good enough.
- Challenges and communication problems happen frequently. You have to be able to adapt and solve problems
- What types of things would damage the chips during shipment?
    - How would you protect against these things?
- The tests your device will be subjected to are unknown - what type of tests would you perform to simulate the damage the corn chip could incur during transport?
- There's a shortage! Remove ½ of the unused materials.

What’s John Deere Inspire? John Deere Inspire is the company's global STEM (science, Technology, Engineering and Mathematics) program, currently reaching over 140,000 youth in John Deere home communities in seven countries. Since its launch in 2011, the program has strived to increase the number of talented young women and men from diverse backgrounds who pursue STEM-related education and careers, particularly engineering, IT, and manufacturing. And Introduce a Kid to Engineering Day gives a students a chance to experience what it’s like to be an engineer with fun, hands-on engineering challenges. Link to further information