

Do try this at home!

Who says all the fun has to happen at The Tech? This DIY engineering activity can be put together with inexpensive store-bought materials or objects you find around the house

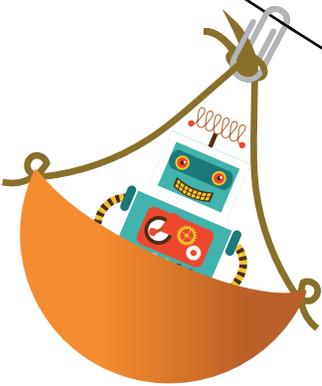
Zipline

Subject:

Engineering design challenge

Ages: 6-12**Key concepts:**

Balance, weight distribution, friction

**Introduction**

In this classic design challenge, you will be creating a vehicle to transport a passenger, such as a small toy, from one end of a zipline to the other. These activities are versatile, making them a favorite design challenge at The Tech. Zipline vehicles make a great activity for ages 6+ and work well for small and large groups alike.

Materials

Zipline contraptions can be built from all types of materials. Explore your junk drawer or garage to find unique items. Use the table on the next page as a guide to help you pick out the best tools and materials for your version of the activity. Keep in mind that vehicles may fall from a height during testing, so make sure to use things that are durable or disposable.



Things you can use

Don't limit yourself to the items on this list. Use whatever you have on hand — be creative!

For attaching to the zipline

- Plastic laundry hooks
- Paper clips
- Binder clips
- Straws
- Hair clips and accessories
- Spools
- Chopsticks
- Silverware



Easy-to-remove attachment pieces

- Pipe cleaners
- Rubber bands
- Clothespins
- Plastic clips
- Twist ties



For your passenger to sit in

- Cups and bowls
- Empty food containers (yogurt, hummus, etc.)
- Cardboard
- Fabric
- Coffee filters



Tools and peripherals

- Your passenger: small toy or other item
- Scissors
- Hole puncher
- Smooth string for zipline (such as fishing line or clothesline)
- Masking tape (optional)
- Standing fan with multiple speeds (optional)



Setup

One of the reasons we love this activity is it's so flexible! Friction is always part of the zipline exploration, but your setup can expand the learning goals of the activity. If you're interested in exploring balance, use two parallel lines. Gravity? Set up descent lines at different angles. Harnessing power? Set up horizontal lines and a fan, then use the wind to travel.

We use steel cable at The Tech, but all you need is sturdy string or nylon cord and something to tie it to. It's also important for your testing zone to be large and open, and for lines to be marked clearly to ensure testing is as safe as possible.

Next, think about how you would like to set up the building materials. Setting out the materials on a table buffet-style, with no step-by-step directions on how to assemble the vehicle, gives builders a chance to explore and experiment while they build.

Building and testing

How do you build a zipline contraption? There are a million ways to engineer a successful device. As you begin to build, consider your load. Will the vehicle be carrying a light plastic figure or a heavy toy? Is it tiny or large? Is your load inanimate, or does it represent a living thing that needs to be comfortable during its ride? Remember that whatever your device is carrying needs to be safe as it travels down the zipline. Balance, weight and friction are also used differently depending upon how the testing area was set up.

Once you have engineered your contraption, it's time to test it out! Place the load inside the vehicle, position it on the zipline and observe what happens. Was the ride bumpy or smooth? Did the vehicle reach its destination or did it get stuck on the line? How does the weight distribution affect the ride? Use what you observed to make changes to your design, then keep testing, observing and reiterating.



Extra Credit

Consider adding an interesting narrative twist, like challenging the builders to develop a car for an amusement park ride or zipline a piano through a window of a multi-story building.

Adding a story or scenario does not just add fun to a design challenge, it can also add empathy. Scenarios can help builders focus their goal and think about who they are engineering the vehicle for. Ask them to think about their load, and if they would have liked to have been the passenger.

If there are several people participating, try inviting each builder to design a unique contraption so the group can compare designs. For an added layer of fun and complexity, use challenge cards limiting participants to certain quantities or types of materials.