**At Home: Tennis, Anyone?**

A picture containing drawing, food

Description automatically generated

**Student Instructions:**

**Challenge**

Design a racket out of everyday materials and use it to hit target or play with another person.

**Suggested Materials**

Substitutions can be made for almost any of these materials:

* String
* Yarn
* Straws
* Tape
* Paper Towel Tubes
* Balloons
* Rubber bands
* Glue
* Tinfoil
* Paper clips
* Plastic wrap
* Paper & pens
* Bendable wire
* Small bouncy ball

1. **Identify the Problem**

* The most critical step of any engineering challenge is to **understand the** **problem** you are trying to solve.
* The problem you are trying to solve is to make a racket out of everyday materials that reliably and accurately hits a target**.**

1. **Collect Materials**

* Start collecting materials for your racket.
* Don’t have all of the items on the list? That’s okay – you don’t need all of them. Look around and see if there are other materials you can use instead or do without.

1. **Brainstorm Designs**

* Look at pictures of a tennis racket online. What do you notice about them? Why do rackets have mesh (crossed strings) instead of a solid surface?
* Did you know that the crossed strings of a tennis racket create an elastic surface that moves slightly with the ball? Rackets with higher tension (less elastic strings) gives a player more control on where the ball goes. Rackets with lower tension (more elastic strings) gives the player more power to make the ball go farther or faster.
* As you design your racket, think about:
  + How fine or loosely spaced should the weave of your mesh be?
  + What materials can you make the mesh out of? Try out different materials.
  + How can you attach the mesh to your racket frame so it doesn’t pull apart when you the hit the ball?
  + Does the surface area of your mesh matter? Why or why not?
  + What’s the best thickness for the handle?

1. **Build It**

* Start building! If possible, take pictures of the materials as you build. Maybe one at the beginning, one during the process, and one at the end.

1. **Test It**

* How far you can hit a ball with your racket?
* Make a target. Tape a piece of paper of paper to a wall or door. Can you hit the target?
* Add a bullseye to your target – can you hit that?
* Do you have a partner to play with? Can you volley a ball back and forth with your rackets?

1. **Share Results**

* Share your results and your design with your teacher or parents.
* Did it work like you thought it would?
* What design changes would you make?

1. **Make Changes and Try Again!**