

DESIGN CHALLENGE: TROPHY TRIATHLON

TROPHY TRIATHLON:

Can you design, test and build a trophy to hold up a soccer, tennis or bowling ball?

GOAL:

Working in small teams, students design, build and test a trophy to hold up a sporting ball.

TIME:

20 minutes for activity plus 10 minutes for set up and 10 minutes for clean up.

Materials:

Conical spools (1)
Cardboard tubes, various sizes (1)
Interlocking plastic blocks (4)
Tennis, soccer and bowling (6#) balls
Newspaper
Cardboard (less than 12" per side)
Straws
Thin, short dowels
Paper clips
Old CDs (e.g. AOL, etc.)
Pieces of sponge or foam
Masking tape (12 inches)
Other odds and ends

DIRECTIONS

1

ASK: Divide students into teams of two or three. Explain the challenge to them from the student worksheet. Make sure students understand the material restrictions and the minimum height requirements.

2

IMAGINE: Ask each team to choose which ball they will try to hold up. (Teams can attempt another challenge, or a multisport trophy as well after they have succeeded at their first trophy.) Have students explore the materials, but not collect any yet. Students should brainstorm features they think are most important. (e.g. a wide base, strong connections/joints, alignment under center of gravity)

3

PLAN: Ask each team to sketch their trophy. They should discuss their ideas and then sketch. If they need to measure materials, they may, but they should not start building. Make sure they keep in mind the height and material requirements.

TROPHY TRIATHLON: DIRECTIONS CONTINUED

4

CREATE: Students should collect materials and then go back to their workspaces and build their trophies according to their plans. Once they have completed construction, they should bring their trophies to the testing station. If students need to make modifications while they are building and before they test, they should be sure to update their sketches.

5

IMPROVE: Students should test their designs with the ball they selected. If they are successful, they may choose to test their trophy with any balls that have a shorter height requirement. If the test is not successful, students should redesign their trophy, update their sketch, rebuild, and retest. Once students have built a successful trophy, they may try to make their trophy taller, try to build a different type of trophy, or add features to their first trophy.

FACILITATION TIPS

● Measure out the tape and give each group a piece. Once students have their tape, they may not have more, even if they need to redesign. This requirement encourages planning ahead.

● Before testing with the bowling ball, test a trophy with the soccer ball. Since it is about the same size, you can test the trophy's center of gravity without crushing it under the weight of the bowling ball.

● Monitor the balls so that students don't start tossing them around. For younger students, a teacher should place the bowling ball on top of the trophies.

● Ask students to consider the shapes of materials (e.g. rolled up newspaper vs. flat), combining materials, and center of gravity. Is tape necessary or will gravity hold their structures together?

● Emphasize the necessity of sketching a plan for a model. Drafts and drawings are essential in the engineering field, and act as "blueprints" to make sure that teams are all on the same page.