"Be a Medical Doctor"

Job Task:
You are a medical doctor! You have been asked to collaborate with engineers to develop prosthesis to help your patients. Given the materials listed, how can you develop the best prosthesis considering strength, stability, durability, longevity, shock absorption, lifelikeness, and comfort?

Timeframe: 1 – 2 hours

Materials List:

- yardstick, ruler or tape measure, for measuring scissors
- 1 type of prosthetic structural material with which to create a prototype
- 1 roll duct tape
- Prosthesis structural material resources. Suggestions: For leg structure: toilet plungers (unused), plastic pipes, metal pipes, metal strips, cardboard tube (from wrapping paper roll), wooden "2 x 4," thin metal duct material (to be rolled and taped into a tube shape), all generally 1.5 ft (or .46 m) long For comfort: large sponges, scrap bubble wrap, scrap cardboard, etc. For lifelikeness: bath towels, pairs of pants, shoes (use students') For body attachment: string, rope, twine (about 30 ft. [or 10 m])

Procedure:

1. Divide the class into enough teams so each has a different structural prosthetic material.
2. Lead a pre-activity discussion and brainstorming session so students have a good understanding of the various prosthetic requirements and material resources to meet these needs.
3. Assign teams different material resources with which to construct their prostheses. Make available other materials for the students to consider incorporating into their design.
4. Have students discuss ideas within their groups and write them down.
5. Have each group choose one teammate for whom to make the prosthesis. So that the prosthesis fits him/her, measure that student's lower leg from where it bends at the knee.
6. Students design and create their own prosthetic lower legs, choosing and combining materials to achieve structural, stability, comfort and lifelikeness requirements.
7. Have students collect other materials, such as tape and string, and begin creating their prototypes, creatively addressing the requirements of strength, stability, durability, longevity, shock absorption, lifelikeness, comfort, etc.
8. After all teams are finished, have each group present its prosthesis to the rest of the class, explaining the design concepts and material choices, as well as demonstrating the prototype's strength by having the teammate use it to walk (while bending his/her knee and wearing the prosthesis). See post-activity presentation suggestions in the Assessment section.

Adapted from: "Prosthesis Party" from Teach Engineering