TECH:Artificial Limbs & Robotics - Diagnostic (HST)

Summary

Students work in teams of 2-3 to design and build a mechanism to retrieve wrapped candy through a small hole (e.g. through the top of a water cooler jug). As a result of participating in this activity, students will gain an appreciation for the challenges faced by people who have lost the use of their limbs. Students will have the opportunity to explore their own creativity and personal interests in problem solving, design, and therapeutic health care careers. Students may also draw comparisons between the design of robotics and prosthetics.

Time Frame

4 class periods of 45 minutes each

Group Size

Large Groups

Materials

1- Assorted "scrap materials" such as wire, coat hangers, dowels, 1/4 inch square sticks, hinges, string, rubber bands, tape, assorted wood, metal, PVC pipe or plastic scraps.
2- Empty water cooler jug or large bottle with an opening of at least 2 inches, and a quantity of various sized wrapped candy.
3- Video - TLC II Medical Systems Tech Module "Artificial Arm & Hand". One copy per school provided by the Utah State Office of Education.

Background for Teachers

There are three careers from the diagnostic pathway which fit this unit including the orthotist, prothetist, and the exercise physiologist.
An **Exercise Physiologist** is a person with an academic degree who help identify the body mechanisms associated with physical activity. They help to analyze, improve, and maintain health and fitness. They also provide professional guidance to athletes and sports trainers.
An **Orthotist** provides a range of splints, braces, and special footwear to help movement, correct deformity, and relieve pain.
A **Prothetist** provides artificial limbs for people who are missing body parts at birth or who have lost body parts due to trauma and disease processes.

Intended Learning Outcomes

1- Demonstrate technological applications as it relates to health care.
2- Utilize creativity and problem-solving in exploring the design of robotics and prosthetics.

Instructional Procedures

DAY ONE:
Students will view the TLC II Medical Systems Tech Module "Artificial Arm & Hand" video as an introduction to the activity and to obtain project details.
Students will discuss the following points from the video and examine the water jug.
1- Review the steps in the engineering process.
2- Define the problem.
3- Identify the limitations.
4- Optional Activity: Restrict a thumb or an arm and have the student try to tie their shoes, hammer a

nail, put a nut on a bolt, or something of your own creation. Conduct a competition between students. Summarize class discussion in their working groups and begin brain storming possible solutions.
1-Types of grabbing mechanisms, simple machines
2- Types of transfer mechanisms, i.e., cables, hydraulic hoses, electric motors
3- Talk about health care and engineering careers that might be associated with the development of artificial limbs and commercial robotics.
DAY TWO
Working in their groups, students will brainstorm, evaluate and select the best solution to the problem. They then design the solution on paper, identify required materials, and begin to build their artificial arm and hand.
DAY THREE
Working in their groups, the students will continue to construct, test, modify, and improve their artificial arm and hand.
DAY FOUR
Working in their groups, the students will demonstrate how their artificial arm and hand functions.
SUGGESTED ADDITIONAL ACTIVITIES -
At the conclusion of the activity, each student should complete an activity evaluation report to include the following information:
a. Four (4) things they learned from the activity.
b. Three (3) things that surprised them as they experienced the activity.
c. Two (2) things they think everyone should know from what they learned from the activity.
d. One (1) related career that they want to learn more about.
Note: Some information literacy programs and English Departments use this 4-3-2-1 format for extra credit reports. If done well, the students may be able to submit a copy of their evaluation reports for this project to gain extra credit in other classes.
Have the students discuss the "Para Olympics" and identify the technical advancements in artificial limbs and other enabling devices that are used by the athletes.

Extensions

Interested students should be encouraged to explore careers related to prosthetics and other engineering, manufacturing, and design careers. Examples may include: Engineers (including Biomedical, Genetic, Human Factors), Drafters, Medical Lab Technicians and Technologists, Machinists, Occupational Therapists

Authors

Denise Abbott