ORIGINS – Species

QUEST 1: Animal, Mineral, Vegetable... Robot?

Teacher notes

Curriculum links:

Science (Interactions and independencies and Cells and organisation), DT
Zone relevance: Origins

Description:

In the first part of this activity, students are given an opportunity to explore the definitions of abiotic and biotic. In the second part, students will use extensions to build a robotic hand and research biological reinnervation.

Background:

Like all living organisms, human beings are composed of organic materials, water and cells. Like other creatures we are born, we grow, we can reproduce and eventually we die. As homo sapiens we are bipeds with a powerful brain. Psychologically we have a complex level of intelligence, a strong awareness of self and full range of emotions. As research and technology progress we are able to build robots that exhibit the very characteristics we use to define ourselves as living humans, making the line between human and robot ever blurrier. Luckily the line between abiotic and biotic is well defined, and for now, can help us distinguish between robot and human.

Abiotic: refers to the non-living things in an ecosystem.

Biotic: refers to the living things in an ecosystem (that need water, food etc)

Reinnervation: the line between human and robot is becoming difficult to define. A new method of surgery known as targeted reinnervation allows us to attach a prosthetic limb to the remaining nerve endings at the site of an amputation, a process once seen only in science fiction and fantasy films.

Activity 1:

C-3PO is a translation protocol Droid. He makes the lives of *Star Wars* characters easier by interpreting languages for them. Ask your students whether they can think of any examples of robots in their lives. How do they make our lives easier?

Activity 2:

a. Create a set of cards with a picture and brief description of different robots, organisms and complex machines (not necessarily robots) and give these cards to your students. Now ask them to divide them into three groups: living organisms, robots and other (see ideas for cards below). You can either make the cards ahead of time, or have students make the cards as part of the activity.

b. Ask students to explain the definitions they used to organise their objects. What are the differences between the groups? Do any objects in different groups have similarities?

c. Using your students' responses, come up with a class definition of abiotic, biotic and robot.

Ideas for cards:

- **Robonaut:** NASA's humanoid robot that works with astronauts on the International Space Station and tweets from space!
- **Asimo:** Honda's talking humanoid robot that can play soccer and go upstairs on its own.
- **Luke Skywalker:** A human Jedi Knight with a mechanical hand.
- **Darth Vader:** A former Jedi Knight with mechanical lungs, arms and legs. Darth Vader cannot live without the mechanical armour composing most of his body.
- **Darth Maul:** A Sith warrior with mechanical legs.
- **Jar Jar Binks:** A well-meaning if clumsy *Star Wars* character whose image was created in part using a computer.
- **General Grievous:** Now, more metal than flesh, it is hard to tell if this character lacks compassion because of his artificial metal body or because he comes from a species that sees compassion as a weakness.
- **C-3PO:** An uptight protocol Droid who has a lifelong friendship with R2-D2.
- **R2-D2:** A spirited and mischievous astromech Droid with personality to spare!
- **Roomba:** A vacuum that can clean your floors on its own.
- **Thermostat:** A device that surveys its environment and then reacts to those environment readings.
- **Artificial Brain**: Developed by Google, when this artificial brain was given autonomous access to the entire internet the first thing it looked up was cat videos.
- **Motion sensor lights:** Gathers and responds to data taken in through motion sensors.

Activity 3

a) After losing his hand in a lightsaber dual with Darth Vader, Luke Skywalker is fitted with a mechanical hand. Using the instructions on the Student worksheet, ask your group to build their own robot hands.

b) Ask students if Luke's robotic hand makes him a robot. Does having part of his body be mechanical, change his status as abiotic or biotic? Challenge students further by asking them if General Grievous, who is more metal than flesh is still a living organism.

Extension activities:

Ask if any of the following factors should be considered when deciding if a something is a robot or human:

- looks (humanoid vs non-humanoid robots)
- personality displays (C-3PO and R2-D2 have an abundance of personality and feelings)
- composition (flesh vs metal, do the two ever mix?)

Create a Venn diagram of abiotic, biotic and robot characteristics.

Student worksheet

Make a robot hand

You will need:

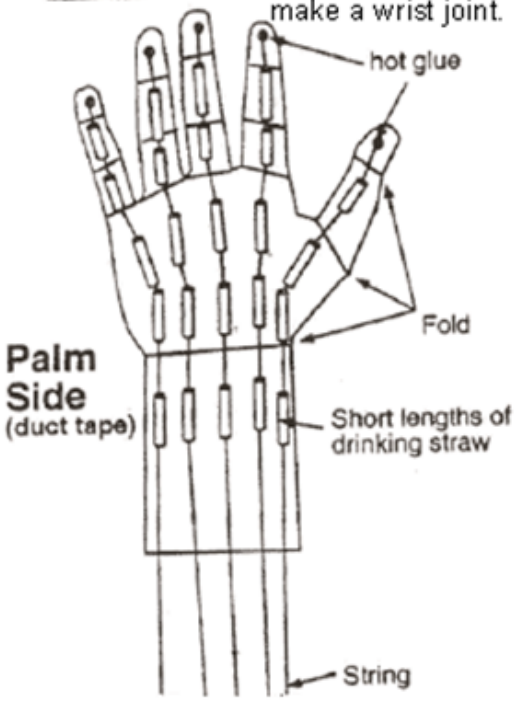
- Polystyrene food trays
- white glue
- markers
- rubber bands
- duct tape
- straws
- scissors
- ballpoint pens
- string

Robot Hand
(End Effector)

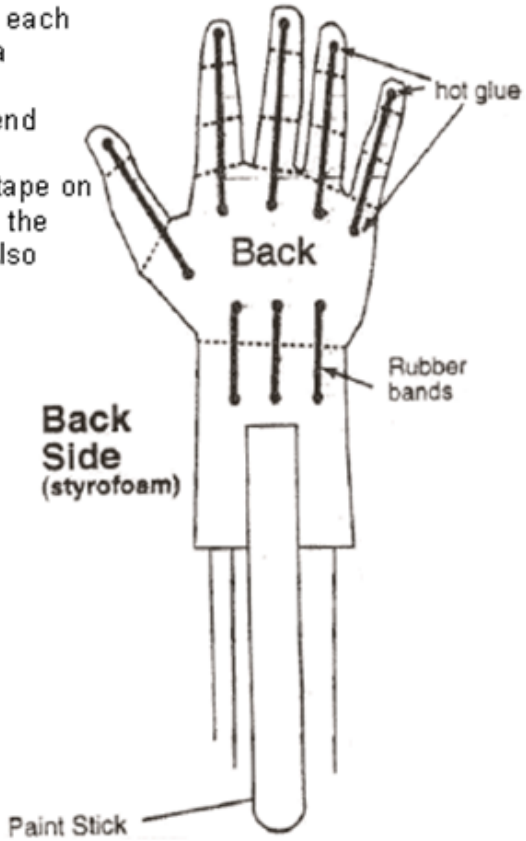
Instructions

1. Place your hand with fingers spread on the smooth side of a Styrofoam food tray. Use a marker pen to trace your hand.
2. Cover the tracing of your hand with duct tape and press it smooth.
3. Trace your hand again on the duct tape and cut it out with scissors.

4. Turn the hand over and score the Styrofoam on each finger with the point of a ballpoint pen where the knuckles should be. Bend each joint gently, the Styrofoam "pops." The tape on the other side becomes the hinge on the knuckle. Also make a wrist joint.



5. Glue short lengths of straw on palm side of hand where indicated on a diagram.
6. Knot 5 pieces of string on one end and glue knots to fingertips. Run the other end of the strings through the straws as shown.
7. Glue a paint stick to the forearm.
8. Glue pieces of rubber bands across each knuckle joint on the Styrofoam side to serve as muscles and tendons. The rubber bands must be stretched enough so that all the fingers on the hand will open automatically.
9. Work the hand by pulling on the strings.



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