Activity M – Es-Car-Go Design Team

Performance Task For Youth

You will plan and design a rover with a gear train to make it go really slow and climb a ramp.

Success Indicator

Youth will design a plan for using gears in a slow-moving rover vehicle.

List of Materials Needed

- Robotics Notebook
- Trunk of Junk
- Activity Supplies
  - Sets of gears – use the gear train built in Activity L
  - Axles – straws, nails, coat hangers, paper brads, dowels
  - Toy motors, 1.5 to 6 volt
  - Structure parts – drilled craft sticks or similar items
  - Rubber bands
  - Wheels – various round objects such as bottle caps, toy wheels, or disks of different materials, diameters, widths, treads, and center holes

Activity Timeline and Getting Ready

- Activity will take approximately 20 minutes.
- Divide youth into groups of two to four.
- If desired, use constraint of costs and adapt by adding budget, supplies, and inventory as in Module 1, Activities 1-C and 1-D.

Experiencing

1. Lead discussion with the entire group about using available materials to make a robot that will move under its own power.
   a. Have youth share what they know about robots.
   b. Ask youth about what they know/don't know about robot movement.
   c. Ask participants to give examples of rovers.
2. Have youth form Design Teams of two to four. The teams will design a robot rover that will:
   a. Be powered by a motor and battery (full power).
   b. Use a drive train of gears (may use gear set built in Activity L).
   c. Move slowly (go as slow as youth can make it, like a snail).
   d. Climb a cardboard ramp at an incline.
3. Display materials to be used for this activity. Design Teams may look at but not touch or play with items in this design stage except for the gear train they built in Activity L. Designs are restricted only by the supplies you provide or that are available to them.
4. Have the Design Teams use their Robotics Notebook to plan their ideas. The teams should make sketches of their plans.

Sharing and Processing

As the facilitator, help guide youth as they question, share, and compare their observations. Before they share with the group, have youth reflect on the activity in their Robotics Notebook. Use more targeted questions as prompts to get to particular points. There is no one right answer.

- Ask each group to share its design.
- Why do you think your robot will work?
- How do you plan to get the power to move your robot?
- What other parts might make it easier to use or build this robot?

Generalizing and Applying

- How do you plan to use the gear train you made in Activity L? What types of modifications will you have to make?
- What other information would be helpful to complete your design or plan?
- Share where you will try to reduce friction and where you will try to increase friction.
- Youth can apply what they have designed in Activity N.

Activity N – Es-Car-Go Build Team

Performance Task For Youth

You will build a rover that can go as slow as an "Es-Car-Go" (snail) and is able to climb a ramp.

Success Indicator

Youth will construct a rover that uses a set of gears (gear train) to move slowly with good traction.

List of Materials Needed

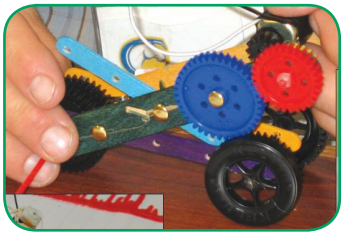
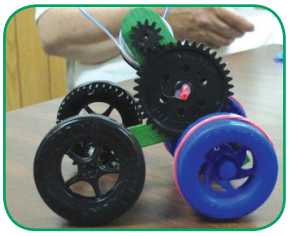
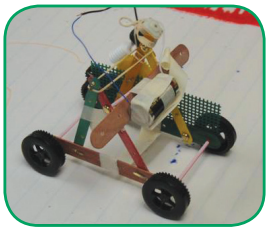
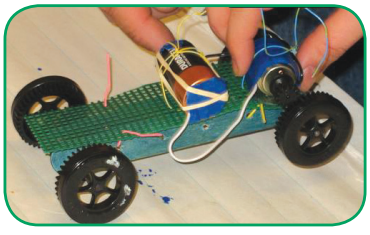
- Robotics Notebook
- Trunk of Junk
- Activity Supplies
  - Sets of gears – use the gear train built in Activity L
  - Axles (e.g., straws, nails, coat hangers, paper brads, dowels)
  - Toy motors, 1.5 to 12 volt
  - Structure parts (drilled craft sticks), or similar items
  - Wheels – various round objects, bottle caps, toy wheels, or disks of different materials, diameters, width, tread, and center holes
  - Rubber bands of various sizes, some that fit around the wheels
- Toolbox
  - Low-temperature glue gun
  - Wires and batteries
  - Tape
  - Saw, pliers, scissors
  - Drill bits and hand drill or hole punch

Activity Timeline and Getting Ready

- Activity will take approximately 30 minutes.
- Use the same teams from Activity M, Es-Car-Go Design Team.

Experiencing

1. Have participants build the Es-Car-Go they designed in Activity M, using the following criteria:
   a. The vehicle must be powered by motor and battery (full power).
   b. The vehicle must use a drive train of gears (may use gear train built in Activity L).
   c. The vehicle must move slowly (go as slow as the team can make it, like a snail).
   d. The vehicle must climb a cardboard ramp at an incline.
2. Have teams share and demonstrate the completed vehicles.

Sharing and Processing

As the facilitator, help guide youth as they question, share, and compare their observations. Before they share with the group, have youth reflect on the activity in their Robotics Notebook. Use more targeted questions as prompts to get to particular points. There is no one right answer.

- Describe what you observed as you built the rover for this activity.
- How did the robots use different types of parts or amounts of parts?
- How did the robots differ from each other?
- What functions do the different parts serve? (Gears? Axles? Plates? Wheels?)

Generalizing and Applying

- How do engineers create robots?
- How do engineers determine the design for their robots?
- How do engineers select the materials to be used in their robots?
- Additional challenges:
  - Add a switch to control the robot's movement in turning, stopping, and going forward and backward.
  - Try using an old flashlight to make a rover.
- Youth can apply what they have learned in Module 4.