SMILE Robotics – First Semester Plan

Welcome to robotics. During this first semester SMILE groups will learn to build and program a basic robot and have fun completing some basic challenges. This work is in preparation for more advanced programming and a final year-end challenge that will happen in the second semester. In order for the February workshop to work, we need all clubs to compete the 6 lessons describe below. Each lesson is designed to be finished in one club meeting. However, some clubs may want to spend more time on some activities because of student interest. Groups that really get excited about robotics are welcome to do the extra activities described below or move on to building robots of their own design and programming them to accomplish tasks. We will have a sharing session at the February workshop for each school that has gone beyond the 6 lessons (or to share lessons learned during the first 6). If you have any questions please feel free to contact Cori Hall or Rozeanne Steckler (steckler@nacse.org) at Oregon State University.

Six required lessons:

1. The first session should be devoted to introducing robotics, setting up the equipment, and building a basic robot – the Tankbot.
    a. Introduction to robotics: This can be done using the robotics game enclosed in this packet or through other activities of your choosing.
    b. Setting up equipment: If the software isn't already installed by your tech support, have each student team install the software. As part of this step, have the teams connect the IR tower, install batteries in the RCX and download the firmware into the RCX.
    c. Building the Tankbot: A very basic, sturdy robot to start with is the Tankbot. Step-by-step building instructions are included on the Robotics Educator CD. Have the students build as they follow along with the slide show. These robots should be saved for the following week.
2. The second session will concentrate on introductory programming of the Tankbot.

a. The first assignment is programming the robot to move forward for 4 seconds and then stop. Students will need to be shown how to open Robolab and select Inventor level 4, drag icons, and download a program.

b. Moving forward and reverse: program the Tankbot to go forward for 4 seconds, stop for 2 seconds, and then go in reverse for 4 seconds and stopping.

c. Point turns: point turns are turns 180° turns made in place. To do this, simply have one motor go forward and one go in reverse. The amount of turn is determined by how long the motors are allowed to run.

d. Introduce students to modifiers.

e. Programming Challenge: use these skills to follow a course drawn on paper. (include instruction on modifiers and loops)

3. Loops and Touch sensors

   a. Loops: Introduce to students the concepts of loops in programs. Program the Tankbot to go around a square using a loop. (This can be included in session 2 if there is time.)

   b. Touch Sensor: so far the robot has not been programmed to react to its environment using sensors. True robots make decision based on input they receive. Students will learn how to program their Tankbot to react to collisions with walls.

      i. Build the touch sensor bumper for the Tankbot. A Step-by-step instruction slide show is included on the Robotics Educator CD.

      ii. Guide the students through a first program – have the Tankbot move forward until the touch sensor is pushed (hits a wall) and then backup and then make a point turn of a random duration.

      iii. Program challenge – program the Tankbot to bounce around inside a box

4. Light sensor

   a. Build light sensor mount for the Tankbot. A Step-by-step instruction slide show is included on the Robotics Educator CD.

b. Thresholds: Discuss the behavior of a light sensor and how to determine a threshold.
c. Program the Tankbot to go to a black line and then stop.
d. Programming Challenge: program the Tankbot to follow a curved black line. You can draw your own course using a sharpie or use the mats that come with the Team Challenge Sets. Another alternative is to draw an oval track on butcher paper and program the Tankbot to go around the track.

5. Advanced Programming – containers, subroutines.
   a. Discuss the use of containers for the storage of variables.
   b. Program challenge: Traveling a distance to a black line and then pausing and returning back to starting point – only using a light sensor.
6. Mouse and cheese challenge.
   a. For this activity students should be given as few hints as possible. Creativity is encouraged and there will be multiple correct programs. You can either draw the maze on white butcher paper or make a sturdier maze using foam core – available at most art or craft stores. Sharpies are also available in a poster size and work great for drawing wide black lines.

Students need to get through all 6 of these activities by the February meeting.

If groups want to move on – then try:

1. Rotation sensors
2. Playing sounds
3. Temperature probe

Challenges:

There are many challenges given on the Robotics Educator CD. Feel free to have the students do any of them.