SAMPLE LESSON PLANS

FOR YOUNG CHILDREN

This lesson is suitable for students who have not yet developed or have only limited reading ability.

Teacher Introduces RB5X

1. Ask students to identify what the robot is, without naming it.

2. After it is correctly identified, ask students what they think the robot can do. Explain why the robot cannot do the things students suggest that are beyond its capabilities. This explanation can take the form of more questioning. Ask questions such as, "What would the robot need before it could do _____? Does it have this?"

3. Add an explanation of any capabilities that students did not name.

4. Explain how the robot does each thing named. Some of these can be compared to the five senses.
   A. It moves with wheels driven by motors.
   B. It "sees" by using its sonar.
   C. It "hears" from the computer.

D. It "feels" with its bumpers.
E. It talks with the voice card, but we have to teach it to say each sound.
F. It gets energy from its battery.

5. Allow students to see RB5X's undercarriage and to identify the parts that have been explained. Take the uppers shell off the robot and have students look inside to see the other parts.

Discuss How RB5X Learns

1. Ask students how RB5X learns what we want it to do.

2. Explain that we type instructions into the computer. Once we think the instructions are right, we tell the computer to send the instructions to RB5X. When the robot has received all of the instructions, it tries to do what it was told. If our instructions are right, the robot does just what we told it. If something is wrong with the instructions, the robot only does what it can figure out.

3. Explain that once RB5X has received the instructions, it does not need to be fastened to the computer.

NOTE: This lesson may be ended at this point. If the lesson is divided into two parts, have the students review what RB5X can do and how it does these things. Use questioning as a means of review.

Pose the Problem

1. Suggest to the students that today, we just want the robot to move around.

2. Ask the students what kinds of words or commands we might give RB5X to get it to move. Whenever a student comes close to the correct robot vocabulary to be used for the lesson (for example, MOVE BACK), tell the students that this is right, but add that we use MOVE BACKWARD. List all correct commands on the chalkboard or an experience tablet as students suggest them. These are used later to help students develop one- or two-keystroke commands to be ASSOCIATEd with the regular robot vocabulary. Have students explain what they think each command tells the robot do.

3. Ask students to help identify letters that would be the most logical to use to enter commands. Have students look at the printed words, and find and name the beginning letter or letters of each command. Once letters are selected, ASSOCIATE these letters with each command.

Brainstorming for a Solution

1. Ask students to decide what they want RB5X to do first from the list of possible commands. Accept the majority opinion, asking students if each selection is OK. List on the chalkboard the abbreviated commands in the order the students suggest.

2. Once the robot task is long enough to illustrate a solution to the problem, suggest that it is time to try out the solution. (Do not be concerned if the program is really correct or not. Students will discover this when the robot executes the program. Here is where the real learning begins to occur.)

3. Select two or three "typists" to enter the program. (Be sure that, over time, all students have had equal opportunity to be "robot secretaries.")

Entering the Program

1. Once the typists are selected, designate the rest of the group as "prompters" to help the typists know what to enter next. Let the prompters give the typists each entry in order.

2. Remember to have students include the commands from the general command section in the robot task (i.e., PREPARE THE ROBOT).

3. Once the program has been entered and the students have checked to be sure it is what they want, have the typists tell the computer to BUILD AND LOAD the program.

4. Have students check to make sure that the RS-232 cable is connected to RB5X and to the computer, and that RB5X is switched on. Observe to see if they know how to handle the equipment and offer suggestions if needed.

5. While the computer loads the program into RB5X, have the students review what the program is intended to do and have them predict what they expect RB5X to do. Students can imitate the actions or patterns they expect RB5X to execute.

Testing the Program

1. Before the program has been completely loaded, remind the students that they must watch RB5X closely to see if the robot does what they want.

2. RB5X begins to execute the program once it has been successfully loaded. (Remember to pay close enough attention to RB5X to unfasten the RS-232 cable as soon as the program is loaded and the robot starts to move.)

Evaluating RB5X's Performance

1. Once RB5X executes the program, ask the students if the robot did what they expected it to do. Ask if that is what they wanted it to do. If the students are unsure, have the typist LOAD the program again and ask students to watch closely.

2. When students have thoroughly observed RB5X's performance, ask what changes, if any, are needed to have the robot perform the task correctly. Note these changes on the chalkboard so they can be changed in the computer program and tested again. If the program is changed, students must tell the computer to BUILD AND LOAD again.

3. When the robot has successfully performed the task, ask the students how RB5X's performance could be improved. Have the students suggest the changes to the computer program. Students may then try the new program or save the testing for another time.

Prepare for the Next Activity

1. Describe to the students what problems the next activity contains so that the students can think about possible solutions.

2. Ask the students to review what RB5X did and what commands were used.

NOTE: Future lessons should follow the same format, starting at the section titled "Pose the Problem."

FOR A LARGE GROUP

This lesson is suitable for students who have adequate reading skills and experience working on their own.

The introductory part of the lesson follows the same format as the first two sections of the previous lesson plan, with vocabulary and explanations adjusted to the age level of the students.

The third section, "Pose the Problem," is similar to the previous lesson plan with the following differences: Students may or may not choose to abbreviate the robot commands using the ASSOCIATE command. This depends on the typing skill and wishes of the students.

In the fourth section, "Brainstorming for a Solution," have the large group divide into several, smaller groups. Each of these groups should work out a possible solution on paper. Then have the smaller groups come back together to share their solutions and to work out a composite solution.

All of the other sections remain the same.

FOR SMALL GROUPS

A small group can proceed in the same manner as the large group, with minimal assistance from the teacher. The teacher should only give instructions when students request them or when students are obviously unable to proceed on their own. The small groups should be structured to include students of varying ability levels. The one rule that is important for the group to observe is that of democracy.

FOR INDIVIDUAL STUDENTS

If a student is working independently with the robot, the following approach is suggested:

1. After the student is familiar with how RB5X works, have the student examine the appropriate robot vocabulary.

2. Let the student identify the problem and the framework or parameters that the vocabulary addresses.

3. Have the student develop an outline or flow chart of the proposed solution on paper.

4. The student should then write the program, enter it on the computer keyboard, and evaluate its effectiveness.

5. If the program needs changes or improvements, have the student modify the flow chart. Once the flow chart looks right, the student can enter the changes.

6. When the student is satisfied that RB5X performs the task well enough, have the student demonstrate this performance to the class, and explain both the problem and the solution.

POINTS TO REMEMBER

For technical aspects of RB5X, refer either to the RB5X Reference Manual for physical capabilities or to the RCL Tutorial and RCL Programmer's Manual for robot vocabulary information.

Be flexible. Let the students take charge wherever possible. Their ideas lead them to the most meaningful and long-lasting learning.

Allow student control. The power of the robot rests largely in the students' perception of their own control over the final outcomes of the robot's behavior. Think about these implications. If you want to try your hand with the robot, do it when the students are not there.

RB5X is suitable for all types of students. It may stimulate the student who is doing poorly in other subject areas as well as the talented student who needs another challenge. RB5X can be used to foster student learning, interest, and good behavior, to name only a few of the possibilities.

DO NOT save working with the robot for a reward. It is a powerful teaching tool for ALL students and should be used as such.

Always encourage students to predict the outcome of the program before they see the robot execute the task. Encourage students to remember points they believe may or may not allow the robot to perform its assigned task. This is a great aid toward developing evaluation and problem-solving skills.

If you have more computers than robots, many student groups can develop programs simultaneously using duplicates of the RCL diskette and their own data diskettes. Then each group can try out their robot task using a computer equipped with an RS-232 interface. Given this situation, students can be more productive and have the experience of more direct control.

Determining and directing ancillary learning is your job. The learning occurs, but the transfer to other subject areas can be greatly facilitated by the teacher. Whenever a student shares an insight with the teacher or with the group, this is an opportunity to allow many students to form valuable generalizations. Questioning best serves this purpose. Asking questions of the class -- "If this occurs here, how can the same ideas be used there?" -- helps students learn how both to generalize information and to improve learning strategies.