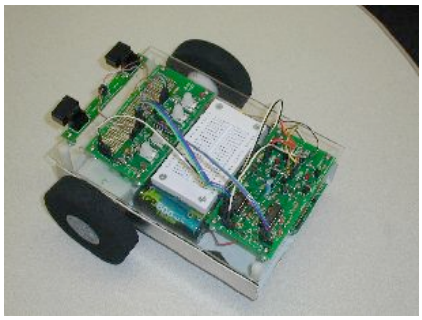

The SPIRIT Project

Educational Robotics

Lesson Building Block Template

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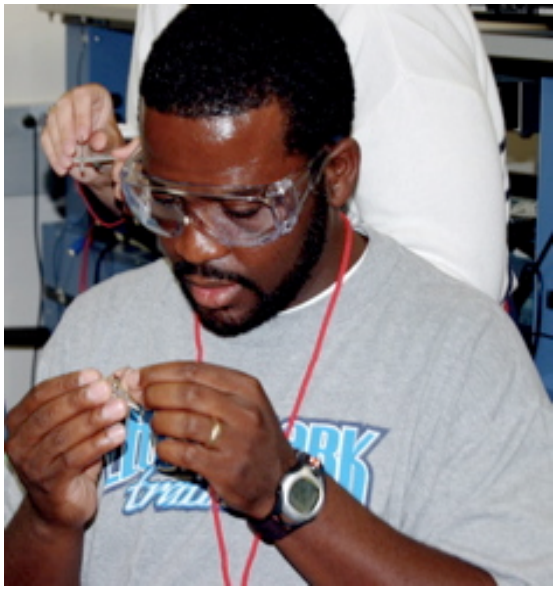
Grade Level: 8__ Date: __Aug 1, 2006__

Directions: Directions: Definition of a Lesson Building Block: This is a "Lesson Building Block" from the SPIRIT educational robotics institute. A 'lesson building block' is in essence an educational activity that might be later turned into a more formal classroom lesson by a creative teacher. The SPIRIT Institute is striving to put a variety of "lesson building blocks" up on the web for the potential use of teachers as they try to prepare more formal educational lessons using the TekBot robotics platform.



I. Concepts *(Give a list of one or more concepts that might be taught using this activity)*
Physics concepts: speed, velocity, acceleration.
Mathematics concepts: graphing: dependent and independent variables, line graphs, bar graphs, plotting ordered pairs.

II. Standards: *(Standards for Technological Literacy)*
Physics concepts: speed, velocity, acceleration.
Mathematics concepts: graphing: dependent and independent variables, line graphs, bar graphs, plotting ordered pairs.

III. Learning Activity Context (Describe the overall context for the learning activity)
Context: Moving TekBot
Abstract: In this activity, students will be working in cooperative groups to investigate the speed of a moving TekBot in a variety of ways. Groups will construct mazes that vary with regards to turn formations, inclines and degrees of difficulty. Groups will then traverse the maze using the TekBot gathering data throughout the course. Data to be collected may include: total distance of the course, distance between five course points, total time expired, time travel expired between course points, etc. Students will then use this data to calculate and visually represent findings relating to speed.

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IV. Teacher and Student Suggestions/Tips

- Guide groups to construct mazes with a variety of obstacles, inclines, turns as well as a section that is flat and straight.
- Have a variety of materials on-hand for maze construction.
- Students should have prior experience working with the formulas for speed and velocity as well as experience with constructing a bar graph and line graph given a set of data.
- Students should use a notebook to record ideas, data, and calculations regarding to the experience.

V. Teacher Questions

(Give a list of questions that teachers might ask students during the activity)

1. Construct a data table that allows you to record the following information: name of racer, distance traveled, time expired, and speed.
2. Construct a multiple line graph representing each member of your group and their speed. What is the dependent variable? Independent?
3. Construct a data table that allows you to record the following information: distance between start and point A (A and B, B and C, C and D, and D and E), time expired between start and point A (A and B, B and C, C and D, and D and E)
4. Construct a line graph that represents your incremental speed as the TekBot traverses the course. What is the dependent variable? Independent?
5. What factors affected your speed? What parts of the course were the fastest? Slowest?
6. What modifications could you make to the course to allow for increased speed? How does this relate to automobiles and the courses that we travel?
7. Ask students to provide real-world examples related to the factors that they suggest for question 5.
8. What portions of the course allow you to gain speed? Lose speed? How would we calculate acceleration during these portions of the course?
9. Relate answers for question 8 to races such as Indy 500 or Tour de France.

VI. Assessment Ideas

(Give an idea or two about how the lesson activity might be assessed)

Students could be assessed on their ability:

- to construct and organize a data table.
- to calculate speed given authentic data.
- to construct graphs given authentic data.
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VII. Other Information

(Give any other information that might be useful or a visual or two)

This lesson provides student with an authentic experience that allows them the opportunity to work with a hands-on device to gather and organize data, use mathematical formulas and to then tie their understanding to real-world applications. The activity is a springboard that provides for discussion and extension beyond what we have included in this lesson.

VIII. List of materials

1 working TekBot per lab group, masking tape, a variety of wood planks/blocks, 1 stop watch per lab group, a variety of objects to use for obstacles, plenty of floor space for maze construction, meter sticks/metric rulers