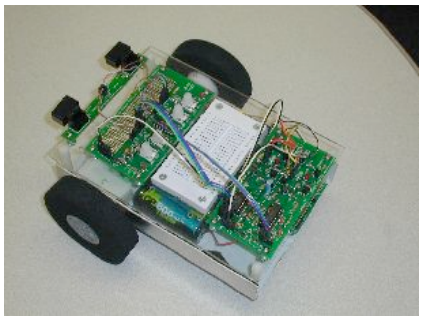

The SPIRIT Project

Educational Robotics

Lesson Building Block Template

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Grade Level: ____ Date: _____

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 *Weather's impact on you, electricity and temperature, chemical reactions and temperature*

II. Standards
The impact of weather

III. Learning Activity Context (Describe the overall context for the learning activity)

Context: __ *Moving TekBot* __ *Building a TekBot* __ *Engineering / Notebook* x_ *Other*

Abstract: Car won't start on a cold day? Cold temperatures can slow up the chemical reactions that occur in a battery to produce the flow of electrons. *The tekbot is placed in an area where the temperature is lower and then tested against a tekbot that remained at room temperature.*

Left in the Cold:
At least two tekbots should be fully charged. Students should record the speed of the two tekbots to be sure they both have about the same performance to begin with.
Place one tekbot in a plastic bag (to protect from moisture) and place it outside on a cold day. The other tekbot will remain inside as the control for the experiment. The tekbot placed outside is the experimental.
After several hours, the students should again record the speed of each tekbot to determine if the being left in the cold had any impact on the tekbot. Students experiment with turning the tekbot and moving it through a maze to determine if the temperature has any impact on overall performance as well as speed. Students should record their observations of both tekbots.

IV. Teacher and Student Suggestions/Tips

Be sure to protect the tekbot from moisture.

V. Teacher Questions

How will cold temperatures affect the performance of the tekbot?

What are the variables in this experiment? (Why did we need to leave the control off the charger as long as we left the experimental tekbot off the charger?)

Suggest a hypothesis for the experiment?

VI. Assessment Ideas

Teacher will assess student understanding of the process of science by their response to questions. If students write a hypothesis, the instructor should be sure that the students correctly identified the independent variable (temperature) and the dependent variable (performance of the tekbot).

VII. Other Information

A teacher could use liquid nitrogen or dry ice to lower the temperature of a battery attached to an LED. The brightness of the light will diminish as the temperature decreases.

Web Sites:
http://chemistry.about.com/library/weekly/blbattery.htm
http://www.howstuffworks.com/battery.htm
http://www.usc.edu/CSSF/History/2003/Projects/J0715.pdf

VIII. Materials List

Left Out in the Cold!

Materials: 2 tekbots, cold weather or freezer, meter stick, timer

I. Concepts *Weather's impact on you, electricity and temperature, chemical reactions and temperature*

II. Standards

The impact of weather

III. Learning Activity Context (Describe the overall context for the learning activity)

Context: __ *Moving TekBot* __ *Building a TekBot* __ *Engineering / Notebook* *x_ Other*

Abstract: Car won't start on a cold day? Cold temperatures can slow up the chemical reactions that occur in a battery to produce the flow of electrons. *The tekbot is placed in an area where the temperature is lower and then tested against a tekbot that remained at room temperature.*

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Be sure to protect the tekbot from moisture.

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Teacher will assess student understanding of the process of science by their response to questions. If students write a hypothesis, the instructor should be sure that the students correctly identified the independent variable (temperature) and the dependent variable (performance of the tekbot).

VII. Other Information

A teacher could use liquid nitrogen or dry ice to lower the temperature of a battery attached to an LED. The brightness of the light will diminish as the temperature decreases. (A dramatic display!)

Web Sites:
http://chemistry.about.com/library/weekly/blbattery.htm
http://www.howstuffworks.com/battery.htm
http://www.usc.edu/CSSF/History/2003/Projects/J0715.pdf

Title: Slip Sliding Away!!

Materials: TekBots, goggles, sand paper, wax paper or smooth vinyl, ramps, access to computer

I. Concepts: Weather safety
II. Standards
CONTENT STANDARD A:
As a result of activities in grades K-4, all students should develop

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

CONTENT STANDARD B:
As a result of the activities in grades K-4, all students should develop an understanding of

- Properties of objects and materials
- Position and motion of objects

CONTENT STANDARD E:
As a result of activities in grades K-4, all students should develop

- Abilities of technological design
- Understanding about science and technology

CONTENT STANDARD F:
As a result of activities in grades K-4, all students should develop understanding of

- **Personal health**
- **Changes in environments**
- **Science and technology in local challenges**

III. Learning Activity Context (Describe the overall context for the learning activity)
Context: _X_ *Moving TekBot* __ *Building a TekBot* __ *Engineering / Notebook* __ *Other*
Abstract: *(Give a 1 paragraph abstract of the activity)*

Good road conditions are important for safe travel; snow and ice make roads slippery and create hazardous driving conditions. Human beings must use common sense in balancing the need to travel with the need to stay safe. When winter storm warnings are issued, travel should be avoided. Modern technology has made it relatively simple to monitor both weather and road conditions.

The goal of this activity is to show students how dangerous slippery roads can be and why the roads must be treated in the winter. The salt used on streets to melt ice is not good for the environment and contributes to rust on automobiles and sometimes, even damages the roads themselves (although technological advances in road construction and materials have reduced this problem). Sand is less damaging to the environment but still creates problems and must be removed from the streets after winter. Still, human safety and environmental considerations often collide. Since most accidents occur in the winter, we have to decide how best to keep the roads safe.

IV. Teacher and Student Suggestions/Tips

Using frozen water would be bad role modeling since it is never a good idea to have water near any electric device. Therefore, the teacher should experiment with using other materials to simulate ice such as a wax paper cover over a wooden ramp or a smooth vinyl flooring on an incline. After the teacher shows students how difficult the car is to control on a slippery surface by having students perform driving operations on an incline, a ramp covered in sandpaper can be used to show students how sand can improve traction.

Students should record the amount of time it takes to move the car up a slippery slope vs. a slope covered in sand.

The teacher could place a TekBot in sand with its forward motion impeded to show students what happens when a vehicle is stuck (the tires dig further into the substance such as sand, mud or snow).

Prepare petri dishes with about .5 mm of ice. Place a small amount of salt on top of the ice to show students that the salt does lower the freezing point and melt the ice.

V. Teacher Questions

How does the TekBot respond when it tries to start moving uphill on the slippery ramp?

If you cannot drive your TekBot up the hill, you will need to drive it backwards down the ramp (just as a driver would need to reverse down a hill). Is driving down the slippery hill difficult or dangerous?

How difficult is it to control the car if you continue moving at the same speed even after the car begins to slip on the hill?

If you do get stuck in a car in a winter storm, what should you do?

VI. Assessment Ideas

Students should write about how road conditions might impact travel safety.

Students should show the instructor that they have the ability to locate local weather information on the Internet to determine if travel is recommended.

Students should state what kind of equipment should be kept in an automobile in the winter in case the motorist becomes stranded.

VII. Other Information

http://www.weather.com/activities/driving/drivingsafetytips/snow.html?from=iForecast

http://www.ctre.iastate.edu/pubs/Tech_News/2004/nov-dec/winter_driving.htm

http://www.ccohs.ca/oshanswers/safety_haz/icesnow.html

http://www.weather.com/

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