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ITEEA *STEL* LESSON PLAN

Lesson Title: Lesson 17: Responding to the Environment

STEL: Standards for Technological and Engineering Literacy: The Role of Technology and Engineering in STEM Education
KSB: Knowledge and Skill Builder

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***STEL* Context(s):** Computation, Automation, Artificial Intelligence, and Robotics

Name of Course: *TEEMS Grade 6*

Intended for In-School or At-Home: In-School

Grade Level: 6

Lesson Overview:

Students use control structures like if-then-else and repeat to use sensors to control devices and sprite using Scratch.

Purpose of Lesson: In Visual Programmer, the sensor block permitted the computer to make decisions based on sensor values. With Scratch, a more generic conditional structure allows decisions to be made with any values, not just sensor values. For example, keyboard input or calculated values.
In this lesson, students will start to see the effect of computer timing. The computer operates very quickly, faster than human response time. This fact may create problems when students try to capture a value, if they do account for it.

Instructional Time: 2 Hours

STANDARDS/BENCHMARKS

Standards for Technological and Engineering Literacy (STEL)	
STEL-7W.	Determine the best approach by evaluating the purpose of the design. Cognitive: Analyze Affective: Psychomotor:
STEL-7BB.	Implement the best possible solution to a design. Cognitive: Create Affective: Valuing Psychomotor:
Next Generation Science Standards (NGSS) Benchmarks	
Common Core Mathematics Standards (CCSS Math) Benchmarks	
Common Core English Language Arts Standards (CCSS-ELA) Benchmarks	

Applicable *STEL* Practices: Systems Thinking, Collaboration, Making and Doing, Critical Thinking

Learning Objectives: In this learning cycle, students will be able to:

- Students will use the loop or iterative structure (repeat, repeat until, forever) in Scratch. [*STL*F, H; *STL* 17.H, I, K]
- Students will use conditional structures (if-then, if-then-else) with the sensor input, enabling them to use the sensor to control the sprite (physical-digital connection) as well as devices (automation). [*STL*F, H; *STL* 17.H, I, K]

6E MODEL LEARNING HIGHLIGHTS

ENGAGE: (experience, question, stimulate)

EXPLORE: (predict, experiment, observe, discover, record, retest, discuss)
EXPLAIN: (develop, progress, grow)
eNGINEER: (apply, conceptualize, informed design, modeling, create)
ENRICH: (interact, question, hypothesize, experiments, record observations, draw conclusions)
EVALUATE: (analysis, synthesis, re-visit)

TEACHER RESOURCES

Teacher Preparations:

- It is highly recommended that you do the activities in the SOP and MiniLabs ahead of time, especially regarding the timing to "catch" the conditional situation.
- Gather materials and copies.

Teacher Procedures:

1. Frame the activity: When we started learning about Scratch, we said it was so we could have more sophisticated control over our devices. For example, we talked about having the knob have three settings (e.g., off-low-high) for the motor instead of just two (off-on).

2. Scratch has a control structure called conditionals that can help us. This activity introduces you to the basic if-then structure and then shows you typical ways this is used to make decisions, monitor the environment, or wait for instructions.

3. SOP: Scratch-Conditionals and have students go through them.

4. Hand out Mini Lab: Conditionals

Extensions: Invite students to try other expressions in the conditional. In particular, there is a way to use conditionals and loops to make the sprite move around the screen and "bounce" when it hits the edge of the screen.

Activity Files:
EDN Checklist
Mini Lab
SOP Scratch-Conditionals

Required Tools/Materials/Equipment:

- Computer with preloaded items including BirdBrain Robot Server, Adobe Air, and Scratch 2.0 Offline Editor, and Hummingbird Extension File (one per group of students)
- Hummingbird Kit (one per group of students)
- Copies of handouts (one per student): o Mini-Lab: Conditionals o SOP: Scratch-Conditionals
- Engineering Design Notebooks
- Engineering Design Notebook and Mini-Lab: Conditionals Checklist of Required Elements (one per student)

Lab/Classroom Safety and Conduct:
The Hummingbird Robotics Kit is not a toy. Adult supervision is required when used by children 15 and under.
• Do not touch or hold any Hummingbird moving parts while they are operating.
• Keep non-kit conductive materials away from the Hummingbird.
• Always turn off the Hummingbird controller when you are finished using it. Do not leave the controller powered or unattended.
• Hummingbird kit parts should never be used in or near any liquid or in any extremely hot or cold environments.
• Discontinue use of any Hummingbird parts that malfunction. Reinforce with students the following generic safety guidelines when working with electricity and electronics:
• Maintain an organized work space free of clutter and only using the materials needed to conduct the activity.
• Wear eye protection, clothing, and shoes.
• Perform activities on a non-conductive surface (e.g., desks, tables, and chairs with metal trim or surfaces should not be used).
• Use components and tools for their intended purposes.
• Follow all verbal and written directions to ensure a safe working environment.

Assessments: Checklist Assessment for Engineering Design Notebook and Mini Lab: Conditionals

Supporting Files:
Include attachments as both Word and PDF files.
Include a Design Brief