LEGO WeDO and SCRATCH – CONNECTING WITH THE PHYSICAL WORLD

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BACKGROUND:

My grant allowed me to purchase 4 LEGO WeDo 2.0 robotic kits along with a selection of extra power packs to use with our free SCRATCH 2.0 computer programming language. My goal was to help students use both the LEGOS and Scratch to create an interactive "Virtual" computer game called **Space Junk**. After trial and error we had modest success but learned lots and had a ton of fun – this is only the beginning! Thank you for the generous opportunity!

PROCESS:

I planned around three phases: the *explore* phase connected students to the real-world problem they would be asked to solve (building a 3-D rocket ship that can sense and avoid obstacles presented in a computer game.). In the *create* phase, students built and modified their rocket designs and created a "scrolling" type Scratch video game featuring outer space backgrounds and moving hazards. The program would need to incorporate WeDo technology to connect the LEGO rocket to the programming blocks in the program as well. Lastly, in the *share* phase students documented and presented their findings to their peers. For example:

> Our Family Science Night was held at the end of April, and featured a variety of stations for parents and students to visit. The Coding/ Robotics centers were a big hit! Students invited to "virtually" interact with our Scratch **"Space Junk"** computer program.

This program was designed to allow a virtual rocket ship to "fly" through outer space. Its mission? To get as far as possible without colliding with a variety of identified and unidentified flying objects (an asteroid, alien, wrench, and space station). We programmed differing speeds and locations for the" space junk" so that they came from random directions and at random speeds, and to allow for a different amount of points being awarded for each one missed.   We also did research into the history of space technology and how rockets are designed so we knew what the final designs should look like and how they should behave. We discussed and voted on the most likely (or most silly) obstacles a rocket

ship might encounter in space – this was a lot of fun because proponents of each obstacle had to give a justification about why it would be a good "design element" to include in the game. During game creation, LEGO bricks, motors and sensors were used to construct a rocket ship which players held in their hands to avoid the projectiles. So, instead of using an arrow key, students physically moved the rocket ship around to avoid targets.

In my Gifted class, my own students are also being instructed in the following techniques:

- Making a simple LEGO machine move when the WeDo **distance sensor** detects a certain distance.
- Waving your hand to change the size of a sprite when the LEGO WeDo **distance sensor** detects a certain distance.
- Using the **motor** to spin attached objects.
- Using the **distance sensor'** *to control the speed of the motor*.'

Because I will have most of the same group next year, we will be continuing with our VIRTUAL classes in August with the following project:

Students will build a lunar lander than must land on the moon while dealing with gravity and inertia. The purpose of this project will be to teach students how to use recursion or "nesting loops" in Scratch for programming abstract concepts like gravity and inertia. We will use a WeDo Lego motion sensor to build a joystick that controls the lander. Sounds exciting, no?

CONCLUSIONS:

I found that projects took more time to complete than I originally thought. Also, I found I needed to make the concept of how to connect LEGO WeDo to Scratch easier to understand. To do that, I developed and used a series of simple tutorials.

All in all, I found the grant to be richly rewarding – students were able to think a concept straight through to the end!