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WEEK 03 – June 27, 2005 - continue with robots in the real world, bots for younger students, energy alternatives, microbots and nanobots, androids, gears, assessing bots

1. Print the energy alternatives worksheet – visit two of the four links and complete two of the four items http://www.geocities.com/ponotoc2/energy_alternative_wrksht.pdf

2. Build a windmill from gears/gears/gears

3. The balloon powered bot: Younger students, and some students with special needs, are not able to connect motors, wires, or insert batteries without quite a bit of help. Even if some are capable of doing so, unless it would be a one–on-one project, it would be difficult for both student and teacher.

The balloon-powered car is an excellent way for younger students to create an object that does something, goes somewhere, and uses energy of some sort.

There are CDs and diskettes of the balloon car builder
- Install the program to your desktop.
- Open the program on your desktop and click on **'design a virtual car'** - try different variations to see how far you can make the car go – **take notes! You're going to do the same thing with a bot that you build shortly.**
- Get back to the main menu on the web site and click on **'build a real car'** to learn how to create this car for almost nothing.

Build a balloon powered Nanorover bot:
- After the car is complete time it to the finish line
  - Compare and contrast activity: is the web site correct?
  - Try putting larger and smaller wheels on the bot and time it
  - Put larger axles on the car and time it

Troubleshooting a balloon powered bot:
- Check that the wheels spin properly – they must rotate freely on the axle but not too freely so that they won't move the axle - try to strike a happy medium
  - give the wheels a spin with your finger, if they don't spin freely then enlarge the holes in the chassis by inserting the end of a pencil or pen and rotate
  - if the wheels spin too freely, and the axle doesn't 'follow' the wheels, then apply some tape to the axle and put the wheels over the tape or try a different dowel rod

4. Gear kits – choose two - create both and demo one

5. Microbots and Nanotechnology

a) Nanotechnology http://www.sciencefriday.com/kids/sfkc20030926-2.html

b) Palm sized bots http://mobilemag.com/content/100/102/C1547/

6. Androids

a) Androids today - http://www.androidworld.com/
b) Androids in the movies – http://www.androidworld.com/prod07.htm

7. Assessing the finished product

- is it working
- is the curriculum you chose working
- problems
- solutions

Activity:

- Choose a bot that you made
- Create a rubric or checklist to assess the bot including design, function, aesthetics
- Use the items below or add to the list your own
- In the rubric or checklist create a scoring guide (i.e., 1 to 10 with 10 being the best)
- Think: is the subject that you chose to incorporate into robotics working – how can you tell?

Items to consider:

- what it is supposed to do
- does it do what it's supposed to
- does it complete the task (complete what it is supposed to do)
- are the pieces to the bot placed appropriately
- does the bot stay together or does it fall apart as its running
- are the axels moving with the wheels, are the wheels aligned
- is it aesthetically pleasing or is it just slapped together
- are the gears turning
- if working in groups did members contribute equally
- were all members cooperative

- Sample rubrics: (also click on the class photos) http://www.renfrew.edu.on.ca/grassroots/gr_alx/Rubrics.htm

Kindergarten very basic sample rubric:

4 – WOW – The student exceeded the expectations for the science framework addressed, usually by doing extra work beyond the GOT IT requirements.

3 – GOT IT – The student fully meets the expectations for the science framework addressed.

2 – NOT YET – The student's work indicates understanding but the work does not meet all the requirements for the science framework addressed.

1 – TRY AGAIN – The student's work does not indicate understanding.

0 – NO EFFORT – Absent, Nothing turned in, etc.

7. Standards - MoSTEP not ISTE NETS

- Correctly use numbers, number systems, and equivalent forms including words, objects, and graphics, to represent theoretical and practical situations.
- Compute, measure, convert, and estimate to solve theoretical and practical problems using appropriate tools, including modern technology such as calculators, rulers, and computers.
- Apply the concepts of patterns, functions, and relations to solve theoretical and practical problems.
- Formulate and solve problems and communicate the mathematical processes used and the reasons for use

8. Learning outcomes / goals / objectives

- Students will analyze information to solve a given problem related to physics and robotics including torque, revolutions, fulcrum, push, pull, and rpms.
- Students will analyze the history of robots and create a time line
- Students will build and explain how simple structures and mechanisms work together to make an object move
- Students will communicate the procedures and results of investigations
- Students will compare various types of robots including artificial intelligence and androids
- Students will convert, analyze, estimate, and compare and contrast measurements in both metric and English unit of measurements
- Students will create a time line displaying important key events in the study of robotics.
- Students will define a lever as a rod or arm that tilts around a pivot to produce useful motion.
- Students will define a pulley as a wheel with a grooved rim for a belt or cord, which can transfer force or speed.
- Students will demonstrate an understanding of the factors that affect the stability of objects
- Students will demonstrate the ability to scale models of robots in both metric and Imperial measurements
- Students will describe the fulcrum, effort, and load (or resistance) of a lever
- Students will design a method for analyzing and evaluating a finished product
- Students will design and create a working chassis-based robot
- Students will design and demonstrate knowledge of a pulley and gear system
- Students will develop an understanding of the attributes and engineering of design and basic electronics and mechanical, including high and low torque, power, gears, gear teeth, gear rotations, and gear ratios, axels, chassis, turning force, simple machines, gear transmissions, gear stacks, sensors, control devices, pneumatics, components, pumps, valves, levers, pulleys, artificial intelligence, solar panels, batteries, wires, motors, and revolutions
- Students will discuss and evaluate Mars pathfinder and Mars Exploration Rover missions in relation to chassis, wheels, and gears
- Students will experiment and evaluate using problem-solving skills in regards to attachments to robots and robot movements (i.e. attach a laptop with a webcam to a robot and move around the building or playground to record events)

- Students will explain the value of robots
- Students will explain, define, and demonstrate the purpose of gears - , how to use gears to increase speed and force, how to use gears as a toothed wheel, which meshes with another toothed wheel to transfer force or speed, i.e.
- Students will identify and label parts of a robot
- Students will identify and use appropriate tools necessary to assemble a robot
- Students will investigate how motion is transferred from one system to another
- Students will investigate, explore, plan, predict, hypothesize, and design a robot
- Students will journal, write essays, or present oral reports and demonstrations on the results of their experiments from a robot that they built
- Students will make decisions and use critical thinking skills to problem solve unique robot designs by determining functions of their robot
- Students will recognize situations that call for division and interpret the answer correctly
- Students will synthesize robotics technology into many discipline areas
- Students will test the reliability, strength, and performance of a robot
- Students will understand geological terms related to landforms and terrain of Earth and other planets that involve the Mars Rover for example
- Students will use appropriate vocabulary to describe their investigation