



Unit Map 2011-2012
Hampshire Regional School District
Heffernan, John / Technology 4 / Grade 4 (District Elementary School)

Friday, October 21, 2011, 9:58AM



Unit: Soccer Robots with Math (Week 24, 9 Weeks)  

Enduring Understandings	Essential Questions
<p>The students will understand that...</p> <p>You can predict how machines will operate and then test your predictions.</p> <p>The students will understand that sensors enable robot to interact with the world in intelligent ways when so programmed.</p> <p>Robots can be created and programmed to do human like activities.</p> <p>Simple machines are used to make work easier.</p> <p>Energy can be transformed and transmitted in different ways using motors and mechanical devices.</p> <p>Mathematics is used in engineering.</p>	<p>How can math be used to help in building things?</p> <p>How can machines transfer and move energy to accomplish a task?</p> <p>Can you build a robot to do a human activity like playing soccer?</p>
<p>Curriculum Frameworks and Learning Standards</p>	
<p>MA: Mathematics (2011), MA: Grade 3 , Measurement & Data 3.MD Represent and interpret data.</p> <ul style="list-style-type: none"> • 3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. <p>MA: Mathematics (2011), MA: Grade 4 , Mathematical Practice The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.</p> <ul style="list-style-type: none"> • 1. Make sense of problems and persevere in solving them. • 2. Reason abstractly and quantitatively. • 3. Construct viable arguments and critique the reasoning of others. • 4. Model with mathematics. • 5. Use appropriate tools strategically. • 6. Attend to precision. • 7. Look for and make use of structure. • 8. Look for and express regularity in repeated reasoning. <p>MA: Mathematics (2011), MA: Grade 4 , Number & Operations in Base Ten</p>	

4.NBT Use place value understanding and properties of operations to perform multi-digit arithmetic.

- 4. Fluently add and subtract multi-digit whole numbers using the standard algorithm.

MA: Science and Technology/Engineering, MA: Grades 3 - 5 , Physical Sci (Chemistry & Physics)

Properties of Objects and Materials

- 1. Differentiate between properties of objects (e.g., size, shape, weight) and properties of materials (e.g., color, texture, hardness).

Forms of Energy

- 4. Identify the basic forms of energy (light, sound, heat, electrical, and magnetic). Recognize that energy is the ability to cause motion or create change.
- 5. Give examples of how energy can be transferred from one form to another.

Electrical Energy

- 6. Recognize that electricity in circuits requires a complete loop through which an electrical current can pass, and that electricity can produce light, heat, and sound.

MA: Science and Technology/Engineering, MA: Grades 3 - 5 , Technology/Engineering

1. Materials and Tools

- 1.1 Identify materials used to accomplish a design task based on a specific property, i.e., weight, strength, hardness, and flexibility.
- 1.2 Identify and explain the appropriate materials and tools (e.g., hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) to construct a given prototype safely.
- 1.3 Identify and explain the difference between simple and complex machines, e.g., hand can opener that includes multiple gears, wheel, wedge gear, and lever.

2. Engineering Design

- 2.1 Identify a problem that reflects the need for shelter, storage, or convenience.
- 2.2 Describe different ways in which a problem can be represented, e.g., sketches, diagrams, graphic organizers, and lists.
- 2.3 Identify relevant design features (e.g., size, shape, weight) for building a prototype of a solution to a given problem.
- 2.4 Compare natural systems with mechanical systems that are designed to serve similar purposes, e.g., a bird's wings as compared to an airplane's wings.

MA: Science and Technology/Engineering, MA: Grades 3 - 5 , Science Inquiry Skills

Skills of Inquiry

- Ask questions and make predictions that can be tested.
- Select and use appropriate tools and technology (e.g., calculators, computers, balances, scales, meter sticks, graduated cylinders) in order to extend observations.
- Keep accurate records while conducting simple investigations or experiments.
- Conduct multiple trials to test a prediction. Compare the result of an investigation or experiment with the prediction.
- Recognize simple patterns in data and use data to create a reasonable explanation for the results of an investigation or experiment.
- Record data and communicate findings to others using graphs, charts, maps, models,

and oral and written reports.

MA: Technology Literacy, MA: Grades 3 - 5 , Computer Proficiency

Standard 1. Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, and connectivity.

Basic Operations

- G3-5: 1.1 Demonstrate basic steps in using available hardware and applications (e.g., log into a computer, connect/disconnect peripherals, upload files from peripherals).

Internet, Networking, and Online Communication

- G3-5: 1.15 Save, retrieve, and delete electronic files on a hard drive or school network.

MA: Technology Literacy, MA: Grades 6 - 8 , Computer Proficiency

Standard 1. Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, and connectivity.

Basic Operations

- G6-8: 1.2 Identify successful troubleshooting strategies for minor hardware and software issues/problems (e.g., "frozen screen").
- G6-8: 1.3 Independently operate peripheral equipment (e.g., scanner, digital camera, camcorder), if available.

Content	Skills
<p>Friction has a slowing effect on moving objects.</p> <p>You can use numbers to measure and score qualitative characteristics as well as the performance of a machine.</p> <p>Levers, belts and pulleys, am cams are used for accomplish different tasks in machines.</p> <p>Computers are used to program robots to perform different tasks.</p>	<p>Language Communicate in spoken and written form using the appropriate vocabulary. Participate as knowledgeable, reflective members of the group and class.</p> <p>Science Trace the transmission of motion and transfer of energy through each machine. Identify the simple machines at work in the model.</p> <p>Technology Create a programmable model to demonstrate the knowledge and operation of digital tools and technological systems.</p> <p>Engineering Build and test the goal keeper, goal kicker, and cheerful fan. Improve the goal kicker by adding a motion sensor.</p> <p>Mathematics Measure time in seconds and tenths of a second.</p>

Understand and use numbers to measure and score qualitative characteristics.
 Estimate and measure the distance in centimeters or inches that paper balls are kicked.
 Understand and use numbers in programming operations to control the timing of the motor.
 Count blocks, misses, and goals.
 Measure time in seconds and tenths of a second.
 Understand the concept of randomness and use it in a programming operation.
 Understand and use numbers in programming operations to create an automatic scoring system.

Assessments

Observation of Robots

Formative: Performance: Authentic Task

Teacher(s) will observe and evaluate robots in their given task. Also, worksheets that go with each robots will be collected and checked as well as checking during the activity.

Learning Activities

In this robotics soccer unit, students first make each of the 3 soccer robots: Goal Kicker, Goal Keeper, and Cheerful Fans. They then put them together to make up teams and have a complete soccer game with one of each type of robot on a team. [You can have multiple Goal Kickers.]

For each robots, there is a corresponding math activity. For the Goal Kicker, students predict and measure how far their kicker can kick a paper or ping pong ball. For the Goal Keeper, students keep track of goals, misses, and blocks to see how effective their robot is. For the Cheerful Fan, students make their Cheerful Fan as interesting as possible. Then students go around the room and rate each robot on various dimensions.

The lesson plans and math activity sheets are fully documented in the LEGO Education WeDo Teacher's Guide.

Additional graphing not included in the Teacher's Guide, can be added such as graphing the complete results of the Goal Kickers in the class.

Resources

Wads of paper, meter sticks
 Lego Education WeDo Teacher's Guide
 Lego Education WeDo Robotics Kits
 Laptops with WeDo software installed

 [Kids Engineer Web Site](#)

