Unit Map 2011-2012

Hampshire Regional School District

Collaboration / Technology PK* (D) / PreK (District Elementary School)

Wednesday, May 23, 2012, 10:06AM

Unit: Introduction to BeeBots (Week 18, 7 Weeks)

Enduring Understandings	Essential Questions
Special machines called robots can be programmed to do different things.	How can make your BeeBot move in different ways? Can you make it count? Add? Follow a piece of tape? Make different letters?

Curriculum Frameworks and Learning Standards

MA: Mathematics (2011), MA: Pre-K, Mathematical Practice
The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- 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.

MA: Mathematics (2011), MA: Pre-K, Counting & Cardinality
PK.CC Know number names and the counting sequence

- MA.1. Listen to and say the names of numbers in meaningful contexts.
- MA.2. Recognize and name written numerals 0–10.

PK.CC Count to tell the number of objects.

- MA.3. Understand the relationships between numerals and quantities up to ten.

PK.CC Compare numbers.

- MA.4. Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

MA: Mathematics (2011), MA: Pre-K, Geometry
PK.G Identify and describe shapes (squares, circles, triangles, rectangles).

- MA.1. Identify relative positions of objects in space, and use appropriate language (e.g., beside, inside, next to, close to, above, below, apart).

MA: Preschool Learning Experiences, MA: Preschool , English Language Arts
Language

- 5. Listen to and use formal and informal language.

Reading & Literature

- 7. Develop familiarity with the forms of alphabet letters, awareness of print, and letter forms.

MA: Science and Technology/Engineering, MA: PreK - 2 , Physical Sci (Chemistry & Physics)
Position and Motion of Objects

- 3. Describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.

MA: Science and Technology/Engineering, MA: PreK - 2 , Science Inquiry Skills
Skills of Inquiry

- Ask questions about objects, organisms, and events in the environment.
- Tell about why and what would happen if?
- Make predictions based on observed patterns.
- Discuss observations with others.

Content	Skills
The different buttons on the BeeBot make the BeeBot move in different ways. Numbers go from 0 to 10 on a number line. Numbers can be added together to make a bigger number. Letters have specific shapes and can be recognized.	Program the BeeBot to move forward, back, left, right and go in different combination to accomplish specific tasks. Reset the previous BeeBot program by using the Clear button.

Assessments

Task Observation
Formative: Performance: Authentic Task
Students will be observed in the various tasks to see that they understand each task and will be given help if they are having difficulty.

Learning Activities	Resources
BeeBot Free Play - students are shown what the 4 directional buttons do and can explore their use. BeeBot Counting - using laminated number lines around the room, students "teach" their BeeBot each number by programming it to go forward that many steps. BeeBot Adding - using laminated number lines around the room, students "teach" their BeeBot to add by programming it to go forward the first number, then the second number, and seeing where the BeeBot ends up. BeeBot Race - students program their BeeBot to go across a start line to a finish line and race their BeeBots across the course. BeetBot Letter Recognition - using block letters made from masking tape, students "teach" their BeeBot to recognize different letters. Each letter should be made from an whole multiple of BeeBot steps. For PK, letters should not need to back track or turn around. Students may need to be taught to "act out" what their BeeBot is doing as they program it. BeeBot Make 10 - Students roll a die and make their BeeBot go that number of steps forward. Then predict how many more it will take to get to ten. They keep rolling and programming until their BeeBot is at or	Laminated BeeBot number lines Masking tape BeeBots - one for each pair of students Extra AA batteries Large dice Terrapin Logo Website

Unit Map 2011-2012

Hampshire Regional School District

Collaboration / Technology K* (D) / Kindergarten (District Elementary School)

Wednesday, May 23, 2012, 10:05AM

Unit: BeeBot Robotics with ELA and Math (Week 14, 7 Weeks)

Enduring Understandings	Essential Questions
Special machines called robots can be programmed to do different things. You can estimate the distance between 2 objects.	How can make your BeeBot move in different ways? Can you make a robot count? Add? Follow a piece of tape? Make different letters? Can you estimate (or guess) how far apart 2 objects are?

Curriculum Frameworks and Learning Standards

MA: Mathematics (2011), MA: Kindergarten, Mathematical Practice
The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- 1. Make sense of problems and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- 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.

MA: Mathematics (2011), MA: Kindergarten, Counting & Cardinality
K.CC: Know number names and the count sequence.

- 1. Count to 100 by ones and by tens.
- 3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).

K.CC: Count to tell the number of objects.

- 4. Understand the relationship between numbers and quantities; connect counting to cardinality.
- 4a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
- 4c. Understand that each successive number name refers to a quantity that is one larger.
- 5. Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.

MA: Mathematics (2011), MA: Kindergarten, Operations & Algebraic Thinking
K.OA Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

- 1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
- 5. Fluently add and subtract within 5.

MA: Mathematics (2011), MA: Kindergarten, Measurement & Data
K.MD Describe and compare measurable attributes.

- 1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

MA: Mathematics (2011), MA: Kindergarten, Geometry

these objects using terms such as above, below, beside, in front of, behind, and next to.

MA: Kindergarten Learning Experiences, MA: Kindergarten, English Language Arts
Structure and Origins of Modern English

- K.L.5.3: Students will identify correct capitalization for names and places (Janet, I, George Washington, Springfield), and correct capitalization and commas in dates (February 24, 2001).
  Kindergarten children can demonstrate understanding and knowledge of the alphabet and printed letters, differentiate between some upper- and lowercase letters, and recognize that names begin with capital letters.

MA: Science and Technology/Engineering, MA: PreK - 2 , Physical Sci (Chemistry & Physics)
Position and Motion of Objects

- 3. Describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.

MA: Science and Technology/Engineering, MA: PreK - 2 , Science Inquiry Skills
Skills of Inquiry

- Ask questions about objects, organisms, and events in the environment.
- Tell about why and what would happen if?
- Make predictions based on observed patterns.
- Record observations and data with pictures, numbers, or written statements.
- Discuss observations with others.

Content	Skills
The different buttons on the BeeBot make the BeeBot move in different ways. Numbers go from 0 to 10 on a number line. Numbers can be added together to make a bigger number. Letters have specific shapes and can be recognized.	Program the BeeBot to move forward, back, left, right and go in different combination to accomplish specific tasks. Reset the previous BeeBot program by using the Clear button.

Assessments

Observation Assessment
Formative: Performance: Authentic Task
Teacher(s) will observe students as they work and also check worksheets from those activities that have them. Students will be given extra help as needed.

Learning Activities	Resources
BeeBot Free Play - students are shown what the 4 directional buttons do and can explore their use. BeeBot Estimation and Measurement - Using taped "courses" around the room, students estimate the number of BeeBot steps to get from the Start to the Finish. They then measure the actual number of steps needed. BeeBot Adding - using laminated number lines around the room, students "teach" their BeeBot to add by by	Laminated BeeBot number lines Masking tape BeeBots - one for each pair of students Extra AA batteries Estimation Worksheet (Word)

BeeBot Subtracting - using laminated number lines around the room, students "teach" their BeeBot to subtract by by programming it to go forward the first number, then backwards the second number of steps, and seeing where the BeeBot ends up. BeetBot Letter Recognition - using block letters made from masking tape, students "teach" their BeeBot to recognize different letters. Each letter should be made from an whole multiple of BeeBot steps. Letters can include letters like F, H, and R that need backtracking. Students should be taught the math technique of "acting out" where the move their BeeBot manually as they program their BeeBot. BeeBot Race - students program their BeeBot to go across a start line to a finish line and race their BeeBots across the course.	

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Unit Map 2011-2012

Hampshire Regional School District

Heffernan, John / Technology K / Kindergarten (District Elementary School)

Friday, October 21, 2011, 9:54AM

Unit: BeeBot Engineering Challenge (Week 21, 5 Weeks)

Enduring Understandings	Essential Questions
The students will understand that robot can be programmed to move in different ways to accomplish a task. It helps to plan a route before going on a journey.	Can you program a mobile robot (BeeBot) to go around an obstacle? "Can you make your BeeBot find the honey?"

Curriculum Frameworks and Learning Standards

MA: Mathematics (2011), MA: Kindergarten, Mathematical Practice
The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- 1. Make sense of problems and persevere in solving them.
- 4. Model with mathematics.

MA: Mathematics (2011), MA: Kindergarten, Geometry
K.G Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

- 1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.

MA: Science and Technology/Engineering, MA: PreK - 2 , Physical Sci (Chemistry & Physics)
Position and Motion of Objects

- 3. Describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.

MA: Science and Technology/Engineering, MA: PreK - 2 , Science Inquiry Skills
Skills of Inquiry

- Ask questions about objects, organisms, and events in the environment.
- Tell about why and what would happen if?
- Make predictions based on observed patterns.
- Name and use simple equipment and tools (e.g., rulers, meter sticks, thermometers, hand lenses, and balances) to gather data and extend the senses.
- Record observations and data with pictures, numbers, or written statements.
- Discuss observations with others.

Content	Skills
There are different ways to get from a starting point to an end point going around an obstacle. Different methods, such as tracing paths, or acting out can be used to plan a route.	Program a robot (BeeBot) using forward, back, left, right, and go buttons to take a complex route from a starting point to an end point going around an obstacle. Use methods to help accomplish the above task: visual projection, projecting a route with rulers, or acting out.

Assessments

Perform the Task
Formative: Performance: Authentic Task
Watch the child's attempts and final solution to the task. The children draw their solution after they solve the problem.

Learning Activities	Resources
Students are giving the assignment of teaching their BeeBots to go from the hive to the flower around on obstacle. Students previously did the same task without an obstacle. If needed, demonstrate how to use BeeBot rulers to plan a route. You can also demonstrate how to act out the route with the BeeBot. Students draw their route at the end. As an extension, they can program the BeeBot to also come back to the hive.	Wooden blocks, 12 inches long, or other obstacles. 6 inch wooden blocks with a flower picture on them (optional) Laminated beehive graphic (optional) BeeBots, one for each pair of students Extra AA batteries BeeBot rulers. Oak tag cut into 15 cm lengths to use for route planning Bee Hive Image (JPEG) Flower Image (JPEG) Map (Word)

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Unit Map 2011-2012

Hampshire Regional School District

Heffernan, John / Technology 1 / Grade 1 (District Elementary School)

Friday, October 21, 2011, 9:55AM

Unit: Introduction to Lego WeDo Robotics (Week 10, 6 Weeks)

Enduring Understandings	Essential Questions
Students will understand that... Computers are used to program robots. Gears transfer mechanical energy from place to place. Belts and pulleys transfer mechanical energy from place to place and can go longer distances than gears.	How can you use the computer to make your robot do different things? What's a gear used for? What are belts and pulleys used for?

Curriculum Frameworks and Learning Standards

MA: Science and Technology/Engineering, MA: PreK - 2 , Physical Sci (Chemistry & Physics)
Position and Motion of Objects

- 3. Describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.
- 4. Demonstrate that the way to change the motion of an object is to apply a force (give it a push or a pull). The greater the force, the greater the change in the motion of the object.

MA: Science and Technology/Engineering, MA: PreK - 2 , Technology/Engineering
2. Engineering Design

- 2.1 Identify tools and simple machines used for a specific purpose, e.g., ramp, wheel, pulley, lever.

MA: Technology Literacy, MA: PreK - 2 , 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

- K-2: 1.1 Demonstrate beginning steps in using available hardware and applications (e.g., turn on a computer, launch a program, use a pointing device such as a mouse).
- K-2: 1.2 Explain that icons (e.g., recycle bin/trash, folder) are symbols used to signify a command, file, or application
- K-2: 1.3 Identify, locate, and use letters, numbers, and special keys (e.g., space bar, Shift, Delete) on the keyboard.

Content	Skills
Students will understand that... Using belts of different sizes can change the speed of a machine. Program execute in a sequence.	**Science** Trace the transmission of motion and transfer of energy through the machine. Identify the pulleys and belt drive mechanism, and the effect changing the belt has on the direction and speed of the dancing birds' movement. **Technology** Create a programmable model to demonstrate the knowledge and operation of digital tools and technological systems. **Engineering** Build and test the dancing birds' movement. Modify the dancing behavior by changing the pulleys and belt to affect the speed and direction of motion. **Mathematics** Understand and use numbers to represent the amount of time the motor is turned on in seconds and in tenths of seconds.

Assessments

Observation and Worksheet
Formative: Performance: Authentic Task
Teacher(s) observe children performing their tasks. Check for cooperative learning skills and for performance of the task. During discussion, check for understanding of key concepts. Dancing Birds worksheets should be checked for understanding.

Learning Activities	Resources

Students use the Lego WeDo curriculum to:
 	
1. Do these Getting Started activities as a whole class
    1. Gears (#2)
    2. Gearing Up (#4)
    3. Gearing Down (#5)
    4. Pulleys and Belts (#7)
2. Dancing Birds project in pairs
 	
Teachers can demostrate the programming using a SmartBoard or projector and leave it
	Lego Education WeDo Teacher's Guide
	Lego Education WeDo Robotics Kits
	Laptops with WeDo software installed
	
	Kids Engineer Web Site

up. The Getting Started Activities can be done as a whole class (students can still be in pairs). It can be easier to get the specific parts ahead of time and not provide access to the complete WeDo kit.	

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Unit Map 2011-2012

Hampshire Regional School District

Heffernan, John / Technology 2 / Grade 2 (District Elementary School)

Friday, October 21, 2011, 9:56AM

Unit: Smart Spinner and Drumming Monkey Robots (Week 4, 7 Weeks)

Enduring Understandings	Essential Questions
Gears transfer mechanical energy. Using different sized gears changes the speed of the gears. Cams cause an up and down movement of a beam.	Can you make a Drumming Monkey robot that makes different rhythms using cams? How does using different sized gears change the speed of the gears?

Curriculum Frameworks and Learning Standards

MA: Mathematics (2011), MA: Grade 2 , Measurement & Data
2.MD Work with time and money.

- MA.7.a. Know the relationships of time, including seconds in a minute, minutes in an hour, hours in a day, days in a week, a month, and a year; and weeks in a month and a year.

MA: Science and Technology/Engineering, MA: PreK - 2 , Technology/Engineering
2. Engineering Design

- 2.1 Identify tools and simple machines used for a specific purpose, e.g., ramp, wheel, pulley, lever.
- 2.2 Describe how human beings use parts of the body as tools (e.g., teeth for cutting, hands for grasping and catching), and compare their use with the ways in which animals use those parts of their bodies.

MA: Science and Technology/Engineering, MA: PreK - 2 , Science Inquiry Skills
Skills of Inquiry

- Ask questions about objects, organisms, and events in the environment.
- Tell about why and what would happen if?
- Make predictions based on observed patterns.
- Name and use simple equipment and tools (e.g., rulers, meter sticks, thermometers, hand lenses, and balances) to gather data and extend the senses.
- Record observations and data with pictures, numbers, or written statements.
- Discuss observations with others.

Content	Skills
Understand how the number of teeth and diameter of the gears affect the speed of the movement.	**SMART SPINNER** **Science**

Understand how the number and position of the cams affects the frequency and timing of the beat pattern (rhythm).	Trace the transmission of motion and transfer of energy through the machine. Identify the gear mechanism and the effect of the gears on the length of time the top can spin. **Technology** Create a programmable model to demonstrate the knowledge and operation of digital tools and technological systems. **Engineering** Build and test the spinner movement. Modify the spinning behavior by changing the gears to affect the speed of the top and the length of time it spins. **Mathematics** Compare the ratio of the smaller and larger gears. **DRUMMING MONKEY** **Science** Trace the transmission of motion and transfer of energy through the machine. Identify the lever mechanism and the effect of the cams on the rhythm or timing of the lever arm movement. **Technology** Create a programmable model to demonstrate the knowledge and operation of digital tools and technological systems. **Engineering** Build and test the drumming monkey movement. Modify the drumming behavior by changing the cams to affect the pattern of tapping and program sound effects to make the patterns more interesting. **Mathematics** Use numbers to represent the type of sounds played and the amount of time the motor turns on.

Assessments

Observation
Formative: Performance: Authentic Task
Teachers observe teams at work looking for understanding and skills. Teachers monitor and check completed Activity Data Tables for understanding. Teachers monitor the final discussions for understanding of the 2 key concepts on cams and gear ratios. [Note: this could be assessed more formally.]

Learning Activities	Resources
Students build the Smart Spinner according to the Lego directions using either the book or the onscreen Activity Guide. Students program the Smart Spinner to spin and the stop when the motion sensor detects that the handle is raised. Students time the spinner for each of the 3 different gear configurations. The class discusses gear rations and why the first configuration resulted in the longest spin times. Students build the Drumming Monkey according to the Lego directions using either the book or the onscreen Activity Guide. Students program the Drumming Monkey to drum for a specified time. Students fill in their Activity Data Table for each of the 4 different cam configurations. Students can add sound to their Drumming Monkey, including record and using their own sounds, if they finish early. The class discusses cam gears and why the different configurations produced different rhythms.	Stopwatches - helpful but not required Wall clock with a second hand Activity Sheets for Drumming Monkeys Activity Sheets for Smart Spinner Yogurt cups or other cups to make a drum for the Drumming Monkey Lego Education WeDo Teacher's Guide Lego Education WeDo Robotics Kits Laptops with WeDo software installed Kids

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Unit Map 2011-2012

Hampshire Regional School District

Heffernan, John / Technology 2 / Grade 2 (District Elementary School)

Friday, October 21, 2011, 9:57AM

Unit: Amusement Park Open Ended Engineering Challenge (Week 12, 6 Weeks)

Enduring Understandings	Essential Questions
Rides (and other transportation machines) must be safe and fun. Engineering design is an iterative process.	Can you design and build a great amusement park ride using your Lego WeDo robot kit? What is it like to be an engineer who designs and builds fun products for people to use?

Curriculum Frameworks and Learning Standards

MA: Science and Technology/Engineering, MA: PreK - 2 , Physical Sci (Chemistry & Physics)
Position and Motion of Objects

- 3. Describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.
- 4. Demonstrate that the way to change the motion of an object is to apply a force (give it a push or a pull). The greater the force, the greater the change in the motion of the object.
- 5. Recognize that under some conditions, objects can be balanced.

MA: Science and Technology/Engineering, MA: PreK - 2 , Technology/Engineering
1. Materials and Tools

- 1.1 Identify and describe characteristics of natural materials (e.g., wood, cotton, fur, wool) and human-made materials (e.g., plastic, Styrofoam).
- 1.2 Identify and explain some possible uses for natural materials (e.g., wood, cotton, fur, wool) and human-made materials (e.g., plastic, Styrofoam).

2. Engineering Design

- 2.1 Identify tools and simple machines used for a specific purpose, e.g., ramp, wheel, pulley, lever.

MA: Science and Technology/Engineering, MA: PreK - 2 , Science Inquiry Skills
Skills of Inquiry

- Ask questions about objects, organisms, and events in the environment.
- Tell about why and what would happen if?
- Make predictions based on observed patterns.
- Name and use simple equipment and tools (e.g., rulers, meter sticks, thermometers, hand lenses, and balances) to gather data and extend the senses.
- Record observations and data with pictures, numbers, or written statements.
- Discuss observations with others.

Content	Skills
Electrical energy is transformed to mechanical energy by a motors. There are different ways to transfer energy in a mechanical system from a motor to mechanical parts via gears, pulleys, belts, and cams. People design ads to attract other people to a product or service. Engineers need to consider the safety of products.	Design a prototype. Test a prototype and make adjustments as needed. Build and program an amusement park ride of their own creation using Lego kits. Create a poster to advertise their creation.

Assessments

Observation and Final Poster
Formative: Performance: Authentic Task
Teacher observes students working in their group. Are they working through problems? Are they using simple machines in their design? Is the ride safe? Is the ride interesting? Does their ad poster do a good job showing off the best features of their design?

Learning Activities	Resources
Design and exciting, interesting, and safe amusement park ride using your WeDo Robot kit and your computer. With your partner, talk about a design and draw a picture and/or use words to describe your idea. Make sure you can actually build your idea using your WeDo kit. People should be able to get on and off safely. The ride should be fun and interesting. You can use the computer to change speeds, make sounds, change directions. If you have time, add a sensor to start your ride automatically. After you finish make an poster for your ride using words and pictures.	Lego Education WeDo Robotics Kits Laptops with WeDo software Paper and markers for designs Reflection Worksheet

Last Updated: Friday, October 21, 2011, 9:57AM

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Unit Map 2011-2012

Hampshire Regional School District

Heffernan, John / Technology 3 / Grade 3 (District Elementary School)

Friday, October 21, 2011, 9:57AM

Unit: Adventure Stories - ELA and Robots (Week 11, 7 Weeks)

Enduring Understandings	Essential Questions
Students understand that... • There are different types of writing including: scripts, interviews, and logs. • Sensors allow a robot to interact intelligently with its environment.	Can you create an adventure story and adventure robot and capture the story in different ways?

Curriculum Frameworks and Learning Standards

MA: ELA & Literacy in History/Social Studies, Science, & Technical Subjects K-5(2011), MA: Grade 3 , Writing

3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

- 3. Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.
- 3a. Establish a situation and introduce a narrator and/or characters; organize an event sequence that unfolds naturally.
- 3b. Use dialogue and descriptions of actions, thoughts, and feelings to develop experiences and events or show the response of characters to situations.
- 3c. Use temporal words and phrases to signal event order.
- 3d. Provide a sense of closure.

Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

- 4. With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

- 5. With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.

MA: ELA & Literacy in History/Social Studies, Science, & Technical Subjects K-5(2011), MA: Grade 3 , Speaking and Listening

Comprehension and Collaboration

1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

- 1b. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
- 1c. Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.

Presentation of Knowledge and Ideas
4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

- 4. Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

MA: ELA & Literacy in History/Social Studies, Science, & Technical Subjects K-5(2011), MA: Grade 3 , Language
Conventions of Standard English
1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

- 1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- 1i. Produce simple, compound, and complex sentences.

2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

- 2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
- 2a. Capitalize appropriate words in titles.
- 2c. Use commas and quotation marks in dialogue.
- 2d. Form and use possessives.
- 2e. Use conventional spelling for high-frequency and other studied words and for adding suffixes to base words (e.g., sitting, smiled, cries, happiness).
- 2f. Use spelling patterns and generalizations (e.g., word families, position-based spellings, syllable patterns, ending rules, meaningful word parts) in writing words.
- 2g. Consult reference materials, including beginning dictionaries, as needed to check and correct spellings.

Knowledge of Language
3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

- 3. Use knowledge of language and its conventions when writing, speaking, reading, or listening.
- 3a. Choose words and phrases for effect.
- 3b. Recognize and observe differences between the conventions of spoken and written standard English.

6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when

encountering an unknown term important to comprehension or expression.

- 6. Acquire and use accurately grade-appropriate conversational, general academic, and domain-specific words and phrases, including those that signal spatial and temporal relationships (e.g., After dinner that night we went looking for them).

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

- 1.2 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.
- 2.4 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.
- Conduct multiple trials to test a prediction. Compare the result of an investigation or experiment with the prediction.

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).
- G3-5: 1.3 Use various operating system features (e.g., open more than one application/program, work with menus, use the taskbar/dock).
- G3-5: 1.4 Demonstrate intermediate keyboarding skills and proper keyboarding techniques.

Content	Skills
Students will... • Understand and use tilt sensor values to control the timing of the motor and the type of sounds played. • Understand that numbers control the timing of the motor and the type of sounds played. • Understand how the speed of the motor and the timing of the sounds relate to the rocking pattern of sailboat. • Understand and use tilt sensor values to control the timing of the motor and the type of sounds played. • Understand that a repeat loop can repeat or conditionally repeat parts of a computer program. • Understand that multiple programs can run simultaneously.	**AIRPLANE RESCUE** **Science** Trace the transmission of motion and transfer of energy through the machine. **Technology** Create a programmable model to demonstrate the knowledge and operation of digital tools and technological systems. **Engineering** Build and test the airplane's power level and movement. Improve the airplane by programming sounds to coordinate with the feedback from the tilt sensor. **Mathematics** Understand and use tilt sensor values to control the timing of the motor and the type of sounds played. **Language** Use interview questions to find out information. Organize that information to write a story, maintaining a focus on the events. Use technology to create and communicate ideas. Communicate in spoken and written forms using the appropriate vocabulary. **GIANT ESCAPE** **Science** Trace the transmission of motion and transfer of energy through the machine. Identify the range of motion as well as the pulley and gears at work in the model. **Technology** Create a programmable model to demonstrate the knowledge and operation of digital tools and technological systems. **Engineering** Build and test the giant's movement. Improve the giant by adding the motion sensor and programming the giant to respond when someone comes near. **Language** Write a script with a dialogue among the three characters: Mia, Max, and the giant. Use technology to create and communicate

	ideas. Communicate in spoken and written forms using the appropriate vocabulary. **SAILBOAT STORM** **Science** Trace the transmission of motion and transfer of energy through the machine. Identify the range of motion as well as the gears and the gearing down at work in the model. **Technology** Create a programmable model to demonstrate the knowledge and operation of digital tools and technological systems. **Engineering** Build and test the sailboat's power level and movement. Improve the sailboat by adding the tilt sensor and programming sounds to coordinate with the movement. **Language** Write a logical sequence of events. Organize those events to create a story, maintaining a focus on the characters and objects. Use technology to create and communicate ideas. Communicate in spoken and written forms using the appropriate vocabulary.

Assessments

Adventure Story
Formative: Performance: Dramatization
Teacher(s) will evaluate the adventure story the students act out.

Adventure Story Written Assignment
Formative: Written: Narrative
Teacher(s) will evaluate the script, log, or interview according to the Common Core Standards using a checklist.

Robot Build and Program
Formative: Performance: Authentic Task
Teacher(s) will evaluate, by observation of the development and final performance, of the student robots and programming.

Learning Activities	Resources
Students will do one or more of the 3 Adventure Story robots: Giant Escape, Sailboat Storm, and/or Airplane Rescue and	Lego Education WeDo Robotics Kits Lego Education WeDo Teacher's Guide Laptops with Lego Education WeDo software

the corresponding writing activity: log, script, or interviews as well as act it out in front of the class.	installed Paper and pencil Kids Engineer Web Site

Last Updated: Friday, October 21, 2011, 9:57AM

 Atlas Version 7.2.5

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
The students will understand that... You can predict how machines will operate and then test your predictions. The students will understand that sensors enable robot to interact with the world in intelligent ways when so programmed. Robots can be created and programmed to do human like activities. Simple machines are used to make work easier. Energy can be transformed and transmitted in different ways using motors and mechanical devices. Mathematics is used in engineering.	How can math be used to help in building things? How can machines transfer and move energy to accomplish a task? Can you build a robot to do a human activity like playing soccer?

Curriculum Frameworks and Learning Standards

MA: Mathematics (2011), MA: Grade 3 , Measurement & Data
3.MD Represent and interpret data.

- 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.

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.

- 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.

MA: Mathematics (2011), MA: Grade 4 , Number & Operations in Base Ten

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

	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	Resources
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.	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

Last Updated: Friday, October 21, 2011, 9:58AM

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Unit Map 2011-2012

Hampshire Regional School District

Heffernan, John / Technology 4 / Grade 4 (District Elementary School)

Friday, October 21, 2011, 9:59AM

Unit: Open Ended Engineering Challenge - Burglar Alarm (Week 34, 7 Weeks)

Enduring Understandings	Essential Questions
The students will understand that sensors allow robots to interact with the world. The students will understand that engineering design is a iterative process with a defined cycle of steps. The students will understand that failure is an important and valuable part of the engineering process. The students will understand that engineers work cooperatively in teams to accomplish a task.	How does adding a sensor change what your robot can and cannot do? How can using the engineering design process help you build a better burglar alarm. How do failures help you create a better robot? What techniques can you use to work cooperatively to accomplish an engineering task?

Curriculum Frameworks and Learning Standards

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.

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.

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

Skills of Inquiry

- Ask questions and make predictions that can be tested.
- 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).
- G3-5: 1.3 Use various operating system features (e.g., open more than one application/program, work with menus, use the taskbar/dock).
- G3-5: 1.4 Demonstrate intermediate keyboarding skills and proper keyboarding techniques.

Content	Skills
Students will know that sensors can be used to detect changes in the environment. Robots can use data from sensors to respond to changes in the environment. There are different kinds of sensors: motion sensors and tilt sensors. Understand what engineers do in their jobs.	• Program a robot car to alter its behavior when it senses motion or tilt • Test and refine an engineering design • Make an ad for a product they design

Assessments

Observational Checklist
Formative: Performance: Authentic Task
Did the burglar alarm meet the requirements and work? Did the team work together well? Did the students come up with multiple, possible designs? Did the poster show understanding of their design and the design features? Did the alarm use multiple sensors? Did the students represents their possible solutions in multiple ways? The above can be written and a checklist for the project. Did both students program and use the computer?

Define robot, define engineering, indicate interest in technology and engineering
Define robot, define engineering, indicate interest in technology and engineering

Learning Activities	Resources
The teacher introduces and motivates the students to use their WeDo kits to design and build a burglar alarm. They will also build a small house (can be just some walls) to contain the alarm. In teams of 2, students will: _____ Research the parts available _____ Write down 3 ideas for the alarm.	LEGO Education WeDo Robotics Construction Set LEGO Education WeDo Robotics Software v.1.2 and Activity Pack LEGO Education WeDo Resource Sets

_____ Build the alarm _____ Program the alarm _____ Test the alarm _____ Redesign alarm as needed _____ Make poster draft _____ Make final poster _____ Reflect on their design individually See attached links for a student checklist and reflection worksheet. Checklist Reflection Worksheet	Kids Engineer Web Site

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Unit Map 2011-2012

Hampshire Regional School District

Heffernan, John / Technology 5 / Grade 5 (District Elementary School)

Friday, October 21, 2011, 10:00AM

Unit: Robotics Grade 5 (Week 20, 6 Weeks)

Enduring Understandings	Essential Questions
Robots can move in different ways under the control of a program the students create. Mathematics can be used to help make a engineering task much easier.	How can you build and program a robot to move in different ways? How can you use mathematics to make programming a robot easier?

Curriculum Frameworks and Learning Standards

MA: Mathematics (2011), MA: Pre-K, Mathematical Practice
The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- 1. Make sense of problems and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- 4. Model with mathematics.
- 6. Attend to precision.
- 7. Look for and make use of structure.
- 8. Look for and express regularity in repeated reasoning.

MA: Mathematics (2011), MA: Grade 5 , Operations & Algebraic Thinking
5.OA Write and interpret numerical expressions.

- 2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

MA: Science and Technology/Engineering, MA: Grades 3 - 5 , Physical Sci (Chemistry & Physics)
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.
- 7. Identify and classify objects and materials that conduct electricity and objects and materials that are insulators of electricity.

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.
- 2.3 Identify relevant design features (e.g., size, shape, weight) for building a prototype of a solution to a given problem.

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 , Research, Prob Solv & Comm
Standard 3. Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.

Research (Gathering and Using Information)

- G3-5: 3.4 Use content-specific technology tools (e.g., environmental probes, sensors, measuring devices, simulations) to gather and analyze data.

Problem Solving

- G3-5: 3.6 With teacher direction, use appropriate technology tools (e.g., graphic organizer) to define problems and propose hypotheses.

Content	**Skills**
Robots can be programmed to move in their environment in different ways. Trial and error can be used to figure out how to turn a robot 90 degrees. Math ratios can be used to make a task easier. Example, if I know the robot takes .5 seconds to go 12 inches, I can multiply to figure out how long it takes to go 120 inches. Visual instructions can be used to build Lego	Build a robot car according to the visual Lego instructions. Program a robot to: • Travel a fixed distance • Make a square • Follow a taped path

based robots.

It pays to be careful when building Lego robots since later steps depend on precision and correctness in earlier steps.

In engineering, mistakes, diagnosing mistakes, and fixing mistakes are a part of the engineering process.

Programming blocks can added sequentially to produce complex behaviors.

Assessments

Observation
Formative: Project: Technology
Observe that students complete the required task. Look for examples that they have used math to make the programming task easier.

Quiz
Formative: Other: Quiz
If a robot car travels one tile in .5 seconds, how long will it take to travel 7 tiles? Show your work and your answer below.

Learning Activities	Resources
Build a robot car according to the visual Lego instructions. Program a robot to: • Travel a fixed distance • Make a square • Follow a taped path Students will complete a checklist as they go along. (See attached) G5LegoL2.pdf	Lego Education Mindstorms NXT Base Set Laptops with MINDSTORMS NXT installed Kids Engineer Web Site

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Unit Map 2011-2012

Hampshire Regional School District

Collaboration / Technology 6* (D) / Grade 6 (District Elementary School)

Thursday, April 19, 2012, 2:40PM

Unit: Robotics - Grade 6 (Week 34, 7 Weeks)

Enduring Understandings	Essential Questions
The students will understand that sensors allow robots to interact with the world. The students will understand that engineering design is a iterative process with a defined cycle of steps. The students will understand that failure is an important and valuable part of the engineering process. The students will understand that engineers work cooperatively in teams to accomplish a task.	How does adding a sensor change what your robot can and cannot do? How do you measure the speed of a moving object? How can using the engineering design process help you build a faster robot? How do failures help you create a better robot? What techniques can you use to work cooperatively to accomplish an engineering task?

Curriculum Frameworks and Learning Standards

MA: Mathematics (2011), MA: Grade 6 , Mathematical Practice
The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- 1. Make sense of problems and persevere in solving them.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.

MA: Mathematics (2011), MA: Grade 6 , Ratios & Proportional Relationships
6.RP Understand ratio concepts and use ratio reasoning to solve problems.

- 1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 2. Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship.
- 3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
- 3b. Solve unit rate problems including those involving unit pricing and constant speed.

MA: Mathematics (2011), MA: Grade 6 , Expressions & Equations
6.EE Apply and extend previous understandings of arithmetic to algebraic expressions.

- 2. Write, read, and evaluate expressions in which letters stand for numbers.
- 2a. Write expressions that record operations with numbers and with letters standing for numbers.

MA: Science and Technology/Engineering, MA: Grades 6 - 8 , Physical Sci (Chemistry & Physics)
Motion of Objects

- 11. Explain and give examples of how the motion of an object can be described by its position, direction of motion, and speed.

MA: Science and Technology/Engineering, MA: Grades 6 - 8 , Technology/Engineering
2. Engineering Design

- 2.1 Identify and explain the steps of the engineering design process, i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign.
- 2.2 Demonstrate methods of representing solutions to a design problem, e.g., sketches, orthographic

- 2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype.

4. Manufacturing Technologies

- 4.2 Explain and give examples of the impacts of interchangeable parts, components of mass-produced products, and the use of automation, e.g., robotics.

6. Transportation Technologies

- 6.1 Identify and compare examples of transportation systems and devices that operate on each of the following: land, air, water, and space.
- 6.3 Identify and describe three subsystems of a transportation vehicle or device, i.e., structural, propulsion, guidance, suspension, control, and support.
- 6.4 Identify and explain lift, drag, friction, thrust, and gravity in a vehicle or device, e.g., cars, boats, airplanes, rockets.

MA: Science and Technology/Engineering, MA: Grades 6 - 8 , Science Inquiry Skills
Skills of Inquiry

- Formulate a testable hypothesis.
- Design and conduct an experiment specifying variables to be changed, controlled, and measured.
- Select appropriate tools and technology (e.g., calculators, computers, thermometers, meter sticks, balances, graduated cylinders, and microscopes), and make quantitative observations.
- Present and explain data and findings using multiple representations, including tables, graphs, mathematical and physical models, and demonstrations.
- Draw conclusions based on data or evidence presented in tables or graphs, and make inferences based on patterns or trends in the data.
- Communicate procedures and results using appropriate science and technology terminology.
- Offer explanations of procedures, and critique and revise them.

Content	Skills
• Gearing down increases the speed of a vehicle • Distance = rate times time • Using multiple trials, increases accuracy in an experiment • Sensors allow robots to interact with their environment • Touch or distance sensors allow a robot to sense obstacles • A robot is a machine that interacts intelligent with its environment in an autonomous fashion • Understand what engineers do in their jobs	• Measure the velocity of a robot car • Build a basic robot car according to pictorial directions • Add a sensor to a basic robot car • Program a robot car to move • Program a robot car to alter its motion when it senses an obstacle • Using gears, increase the speed of the basic car using the engineering design process • Test and refine an engineering design • Discover techniques and parts to add gears to an existing robot car design • Write a definition of robot • Write a definition of engineer

Assessments

Presurvey
Summative: Written: Informative
Define robot and engineer. Students express using a Likert scale, their interest in being and engineer and in using technology.

Postsurvey
Summative: Written: Informative

Formative: Performance: Authentic Task

Students take at least 3 measurements and calculate the speed of their robot car. Student teams turn in the results. Teacher captures the results and displays them on the whiteboard. Discuss accuracy and reasons for differences in results.

Speedy Robot Demonstration

Formative: Performance: Authentic Task

Students demonstrate their faster car, measure, and report on the velocity. Teacher displays results and class discusses differences and how the different designs produced the different results. Students explain their basi design to the rest of the class.

Define robot, define engineering, indicate interest in technology and engineering

Define robot, define engineering, indicate interest in technology and engineering

Learning Activities	Resources
• Students build their basic car. This was done in fifth grade. • Students measure the velocity of their car by taking at least 3 measurements of time over a given distance. • Student research, design, build, test, and refine a car that can go faster than the standard car they built. Students research how gears can be used to change speeds. Steering is optional (dragsters). • Optionally, students add a sensor to their car that alters its motion when it senses an object. • As an extension, students can make a program and car that can find its way out of a room.	LEGO Mindstorms NXT Education Base Set LEGO Mindstorms NTX Software LEGO Mindstorms Resource Kit (contains extra parts, wheels, and gears) Kids Engineer Web Site Velocity Checklist (PDF) Grade 6 Challenge Checklist

Last Updated: Thursday, April 19, 2012, 2:40

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