SHORE REGIONAL HIGH SCHOOL DISTRICT

A Regional Collaborative of the Communities Served by the Monmouth Beach, Oceanport, Shore Regional, and West Long Branch School Districts

Aligned to the New Jersey Student Learning Standards as Applicable

Course Title: Robotics
Content Area: Robotics
Grade Level(s): 7-8
Course Description: Building and Programming Robots
Curriculum Writer(s): James Straley
Date Created: Spring 2015
Date Approved by Board of Education: November 2015/September 2017 (revisions to content standards only to reflect NJSLS)

Unit 1-HISTORY OF ROBOTICS (5 weeks)
Unit Summary: In this unit, students will investigate the history of robotics.
Interdisciplinary Connections/Content Area Integrations Including Technology: They will research and report on robots in the past, their origins and uses, and their impact on society.

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NJSLS Number	NJSLS Content
CCSS.ELA-LITERACY.RI.7.1	*Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.*
CCSS.ELA-LITERACY.RI.7.2	*Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.*
CCSS.ELA-LITERACY.W.8.2	*Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.*
CCSS.ELA-LITERACY.W.8.2.D	*Use precise language and domain-specific vocabulary to inform about or explain the topic.*

Summative Assessment:

- Report and presentation on robot from history

Formative Assessments:

- Electronic journal entries
- Article citations

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Enduring Understandings:

- Students will use digital tools.
- Students will research and properly cite sources.

Essential Questions:

- What is robotics?
- How have robots changed our daily lives?

Instructional Outcomes:

- Understand the history of robotics.

Suggested Learning Activities:

- Explore robotics in history. Use the site below from the University of Ottawa for children to examine and write a reflection on. Each student should choose one robot from the presentation to research further and report on findings on Google Classroom. Students will then respond to each other's presentations: http://www.site.uottawa.ca/~rabielmo/miniCourse06/lecture1.pdf.

Suggested Differentiation:

Differentiation is based on reading level. Articles chosen will be at or above reading level to help students understand and apply concepts.

Curriculum Development Resources:

Ebscohost

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Unit 2-ROBOTS IN INDUSTRY (4-5 weeks)
Unit Summary: In this unit, students will work collaboratively to cover the vast areas of robotics in medicine and industry.
Interdisciplinary Connections/Content Area Integrations Including Technology: They will use current scholarly journals to summarize the use of robots throughout the world today.

NJSLS Number	**NJSLS Content**
8.1	*Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.*
CCSS.ELA-LITERACY.W.8.6	*Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.*

Summative Assessments:

- Google Presentation

Formative Assessments:

- Electronic journal entries
- Collaborative discussion assignments

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Enduring Understandings:

- Students will work collaboratively researching robotics.
- Students will use digital tools.
- Students will learn from practice to work more efficiently highlighting strengths of team members.

Essential Questions:

- What do robots do now?
- What jobs do robots perform to make our lives easier?

Instructional Outcomes:

- Understand use of robots in the modern world.
- Research careers in robotics today.

Suggested Learning Activities:

- Research careers in the field of robotics. Each student will find a particular career and research its requirements and responsibilities and present findings on the Robotics Google Classroom page.
- Research fields of robotics and specific robots and their uses.
- Read and present information about areas of robotics and impact on the world today.

Suggested Differentiation:

Students can work collaboratively or independently to research robots used in the world today. Groups can choose from a number of different areas that interest them.

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Unit 3-SOLAR POWERED ROBOTS (8-9 weeks)
Unit Summary: In this unit, students will work individually and collaboratively to build solar powered robots. They will learn the differences between renewable and nonrenewable resources. Students will investigate alternative energy sources.
Interdisciplinary Connections/Content Area Integrations Including Technology: They will examine natural resources and use solar panels, wind, and water to power their robots.

NJSLS Number	**NJSLS Content**
8.1.8.A.3	*Use and/or develop a simulation that provides an environment to solve a real world problem or theory.*
8.1.P.C.1	*Collaborate with peers by participating in interactive digital games or activities.*
8.1.12.F.1	*Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal, and or social needs.*

Summative Assessments:

- Electronic journals/communication logs
- Reflection summary for each robot

- Performance assessment of robot

Formative Assessments:

- Electronic journal entries
- Observation of progress on robot building/programming
- Self-assessment and peer assessment
- Physical challenges - courses for robots to complete

Enduring Understandings:

- Students will challenge themselves and others to complete difficult tasks.
- Students will work independently and collaboratively in building robots.
- Students will learn from practice to work more efficiently highlighting strengths of team members.
- Students will experience using and being challenged by a real-world robot.

Essential Questions:

- How do I build a robot?
- How do I make a robot do what I want it to?
- How do I make a mental model and predict how it plays out?
- How do I break a big problem down into a number of smaller ones?
- How do I work as part of a team on building a robot?

Instructional Outcomes:

- Understand the use of natural resources.

- Understand the importance of investigating and using alternative energy sources.
- Build robots using detailed instructions.
- Learn the importance of effective communication with members of a group.

Suggested Learning Activities:

- PowerPoint presentations and group reading on nonrenewable and renewable energy.
- Robotikits and K'nex robot kits - Students will choose and build multiple models individually and collaboratively.

Suggested Differentiation:

Differentiation is based on the group size. Students can work collaboratively or individually to build more than 15 different solar, wind, and hydroelectric powered robots.

Unit 4 - PROGRAMMING AND BUILDING THE EV3 (17-18 weeks)

Unit Summary: In this unit, students will work individually and collaboratively to build and program robots. They will learn the basics of programming. They will challenge other groups to design programs to operate different robots more efficiently.

Interdisciplinary Connections/Content Area Integrations Including Technology: They will use digital tools and devices to enhance technological skills.

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NJSLS Number	NJSLS Content
8.1	*Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.*
8.1.5.A.1	*Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.*
8.1.8.A.3	*Use and/or develop a simulation that provides an environment to solve a real world problem or theory.*
8.1.P.C.1	*Collaborate with peers by participating in interactive digital games or activities.*
8.1.2.C.1	*Engage in a variety of developmentally appropriate learning activities with students in other classes, schools, or countries using various media formats such as online collaborative tools, and social media.*
8.1.5.C.1	*Engage in online discussions with learners of other cultures to investigate a worldwide issue from multiple perspectives and sources, evaluate findings, and present possible solutions, using digital tools and online resources for all steps.*

Summative Assessments:

- Electronic journals/communication logs
- Reflection essay for each robot
- Performance assessment of robot
- Unit challenges (Lego EV3)

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Formative Assessments:

- Electronic journal entries
- Observation of progress on robot building/programming
- Self-assessment and peer assessment
- Physical challenges - courses for robots to complete

Essential Questions:

- What is programming?
- How do I build and program a robot?
- How do I make a robot do what I want it to?
- How do I make a mental model and predict how it plays out?
- How do I break a big problem down into a number of smaller ones?
- How do I work as part of a team on building and programming a robot?
- How do I write my own program?

Instructional Outcomes:

- Program the Lego EV3.
- Build robots using detailed instructions.
- Learn the importance of effective communication with members of a group.

Suggested Learning Activities:

- Introduce Lego EV3 robot. Locate the batteries, firmware, and ports, and operate menus.
- Download firmware to EV3 and computer.

- Basics of Programming: Learn basic directions for robot; moving straight, turning, move until touch, move until near, turn for angle, move until color, loops, switches, and switch-loops. Follow step by step guided videos on Lego website that illustrate key concepts in programming the EV3.
- Complete mini-challenges on Lego website for EV3.
- Complete virtual robotic challenges on robotvirtualworlds.com. (Example: Expedition Atlantis: Choose among three underwater robots, and program them to go certain distances or angles.)
- Complete challenges on Carnegie Mellon Robotics website: Movement, Touch Sensor, Ultrasonic Sensor, Gyro Sensor.
- Students keep detailed journal entries on progress and problems in building and programming the EV3.
- Find and use iPad apps or Chrome Store apps to program virtual robots.
- Use flip camera to record robots performing tasks and edit video footage. Add sounds and text. Publish videos online.

Suggested Differentiation:

Differentiation is based on the group size and grade level. Students can work collaboratively or independently to solve challenges. Groups can choose from a number of different robot designs from EV3 site and other third party sites.

Curriculum Development Resources:

Lego EV3 website
Carnegie Mellon Robotics Academy
RobotVirtualWorlds.com