GEORGIA | PEACH STATE PATHWAYS

Career, Technical, & Agricultural Education

ENGINEERING & TECHNOLOGY

PATHWAY: Manufacturing

COURSE: Robotics and Automated Systems

UNIT: Introduction to Robotics

INTRODUCTION

Annotation:

In this lesson, students will receive an overview of robotic systems and their impacts on the world today.

Grade(s):

	9th
X	10th
X	11th
X	12th

Time:

5 hours

Author:

Emil L. Decker & Jodie Marshall

Additional Author(s):

Alola Larson, Science Teacher
Monique Vinski, Special Education Teacher

Students with Disabilities:

For students with disabilities, the instructor should refer to the student's IEP to be sure that the accommodations specified are being provided. Instructors should also familiarize themselves with the provisions of Behavior Intervention Plans that may be part of a student's IEP. Frequent consultation with a student's special education instructor will be beneficial in providing appropriate differentiation.

FOCUS STANDARDS

GPS Focus Standards:

ENGR-RAS-1. Students will explain the history of automated systems and the benefits of those systems to manufacturing in a global society.
ENGR-STEM-1. Students will recognize the systems, components, and processes of a technological system.
ENGR-STEM-6. Students will enhance reading by developing vocabulary and comprehension skills associated with text materials, problem descriptions, and laboratory activities associated with engineering and technology education.

GPS Academic Standards:

SCSh7. Students will analyze how scientific knowledge is developed.
SCSh3. Students will identify and investigate problems scientifically.
SCSh6. Students will communicate scientific investigations and information clearly.
MM3P3. Students will communicate mathematically.
MM3P4. Students will make connections among mathematical ideas and to other disciplines.
SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.
SCSh7. Students analyze how scientific knowledge is developed.
MM3P4. Students will make connections among mathematical ideas and to other disciplines.
ELAALRC2. The student participates in discussions related to curricular learning in all subject areas.
ELAALRC3. The student acquires new vocabulary in each content area and uses it correctly.
ELAALRC4. The student establishes a context for information acquired by reading across subject areas.

National / Local Standards / Industry / ISTE:

ITEA -Standard 1. Students will develop an understanding of the characteristics and scope of technology.
ITEA - Standard 2. Students will develop an understanding of the core concepts of technology.
ITEA - Standard 3. Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
ITEA - Standard 4. Students will develop an understanding of the cultural, social, economic, and political effects of technology.
ITEA - Standard 7. Students will develop an understanding of the influence of technology on history.

UNDERSTANDINGS & GOALS

Enduring Understandings:

Students will understand how the safe use of automation in manufacturing systems has developed, with particular emphasis on the role of robotics in the process.

Essential Questions:

- What are some functions of robots within our automated world?
- What jobs might a robot complete more effectively than a human in a manufacturing situation?
- What are the future expectations or possibilities with regard to robotics and automation?

Knowledge from this Unit:

- Students will be able to identify the major contributions of a robot to manufacturing
- Students will be able to describe several negative and positive impacts of robotics

- Students will be able to identify the major components of an industrial robotic arm

Skills from this Unit:

- Students will be able to operate automated equipment utilizing appropriate safety measures.

ASSESSMENT(S)

Assessment Method Type: Select one or more of the following. Please consider the type(s) of differentiated instruction you will be using in the classroom.

X Pre-test
X Objective assessment - multiple-choice, true- false, etc.
_X_ Quizzes/Tests
__ Unit test
____ Group project
____ Individual project
X Self-assessment - May include practice quizzes, games, simulations, checklists, etc.
__ Self-check rubrics
__ Self-check during writing/planning process
__ Journal reflections on concepts, personal experiences and impact on one's life
__ Reflect on evaluations of work from teachers, business partners, and competition judges
_X_ Academic prompts
__ Practice quizzes/tests
X Subjective assessment/Informal observations
__ Essay tests
_X_ Observe students working with partners
__ Observe students role playing
____ Peer-assessment
__ Peer editing & commentary of products/projects/presentations using rubrics
__ Peer editing and/or critiquing
X Dialogue and Discussion
__ Student/teacher conferences
_X_ Partner and small group discussions
_X_ Whole group discussions
__ Interaction with/feedback from community members/speakers and business partners
X Constructed Responses
__ Chart good reading/writing/listening/speaking habits
_X_ Application of skills to real-life situations/scenarios
X Post-test

Assessment(s) Title:

OSHA Safety Exam: http://www.free-training.com/osha/Soshamenu.htm

Assessment(s) Description/Directions:

Students are introduced to automated manufacturing, and the advancements that have lead to the inclusion of robotics in the manufacturing process.

Attachments for Assessment(s):

- http://science.discovery.com/quizzes/robots/robots.html (Good introduction to robots)
- http://www.discoveryeducation.com (formerly United Streaming Subscription service)
- http://en.wikipedia.org/wiki/List_of_basic_robotics_topics

- http://ffh.films.com/id/1682/Robots_Rising.htm Robots Rising is a dated video, but covers much of the materials one wants to cover in an introduction to robotics. Topics such as "top down vs. bottom up" approaches, tele-operated vs. A.I.; cultural concepts of robotics; etc. Highly recommended.

- http://www.thetech.org/exhibits/online/robotics/

- http://robotics.nasa.gov/rcc/general.php?ID=1069 The NASA Robotics Curriculum resource site. Currently being upgraded, so different links may be inactive.

- http://www.estfoundations.com/

- http://www.thefutureschannel.com Excellent short video clips over a wide set of engineering subjects, always emphasizing math, science, and technology.

LEARNING EXPERIENCES

Sequence of Instruction

1. **Identify the Standards. Standards should be posted in the classroom for each lesson.**
2. **Review Essential Questions.**
   - What are some functions of robots within our automated world?
   - What jobs might a robot complete more effectively than a human in a manufacturing situation?
   - What are the future expectations or possibilities with regard to robotics and automation?
3. **Identify and review the unit vocabulary.**
4. **Assessment Activity.**

   Step 1:

   - Discuss General Shop Safety rules using OSHA regulations.
   - (http://www.free-training.com/osha/Soshamenu.htm)
   - Discuss General Tool Safety rules according to the tools available in your lab.

   Step 2:

   Introduction to Robotics

   - What is a robot?
   - How do you control them?
   - Are they a helper or a menace?

   (see Robots_Rising_Answers.doc)

   Step 3:

   Guided Web Searches for general robotic topics (see How_Robot_Works_Sites.doc)

   Step 4:

   Guided Web Search for Engineers, Scientist, and Inventors (see Robotic_Scientist__Search.doc)

   Step 5:

   Guided Web Search for Examples of Industrial Manufacturing use of robots and career opportunities (see Robot_Careers.doc)

   Step 6:

Crossword puzzle of Robotic Information (see Chapt1_Crossword.doc)

Step 7:

Written and Performance Exams. (see Chapter 1 Exam.doc Chapter 1 Performance Exam.doc)

Attachments for Learning Experiences:

Notes & Reflections:

There are few, if any textbooks dedicated to the field of robotics. Much of what I have used in the past comes from online searches and lucky finds on TV. You should allow students to help you find those resources. They will learn in the process.

Recommended practice is to discuss general safety practices as one would with any lab. Each lab is different. Focus your tool safety lecture according to the tools located in your lab.

Discussions of robotics can take place using the Robots Rising paperwork without seeing the film, though I highly recommend this film. If students are able search the Internet, they will find a plethora of robotic sites from across the spectrum. Sites that sell robotic components, toys, research, industry, robotic competitions, and many related fields abound on the net.

One site that can give a jumping off point might be the Honda Asimo site. http://world.honda.com/ASIMO/ Honda documents the history of Asimo, and updates their site on a regular basis. Video clips and photos are available.

For the guided web searches you have different options on how to deliver the lesson: 1) have the student complete all web site discoveries 2) split the class into different groups and have the students present their findings of the site they pick or the one the instructor picks for the group.

Many engineering websites are listed in the resource document (See resources.doc). Some of these sites provide engineering videos, some of which are robotics related.

CULMINATING PERFORMANCE TASK (Optional)

Culminating Unit Performance Task Title:

Intro to Robotics Unit Performance Exam (see Chapter 1 Performance Exam.doc)

Culminating Unit Performance Task Description/Directions/Differentiated Instruction:

Pick a simple task that you have to do regularly and design a robot on paper to do that job. What shape would be best for your robot? If your robot needs to move about, would wheels, tracks or legs work best?
List three advantages of having a robot do the task rather than doing it yourself.

Attachments for Culminating Performance Task:

Grading Criteria (see Chapter 1 Performance Exam Answers.doc)

UNIT RESOURCES

Web Resources:

- http://science.discovery.com/quizzes/robots/robots.html
- http://www.discoveryeducation.com
- http://en.wikipedia.org/wiki/List_of_basic_robotics_topics
- http://ffh.films.com/id/1682/Robots_Rising.htm
- http://www.thetech.org/exhibits/online/robotics/
- http://robotics.nasa.gov/rcc/general.php?ID=1069
- http://www.estfoundations.com/
- http://www.thefutureschannel.com

Attachment(s):

Materials & Equipment:

Robotics materials list to have available for students, DVD/VHS player

What 21st Century Technology was used in this unit:

	Slide Show Software		Graphing Software	X	Audio File(s)
	Interactive Whiteboard		Calculator		Graphic Organizer
	Student Response System		Desktop Publishing	X	Image File(s)
	Web Design Software		Blog	X	Video
	Animation Software	X	Wiki	X	Electronic Game or Puzzle Maker
	Email	X	Website		