GEORGIA | PEACH STATE PATHWAYS

Career, Technical, & Agricultural Education

ENGINEERING & TECHNOLOGY

PATHWAY: Manufacturing

COURSE: Robotics and Automated Systems

UNIT: 2- Automation, Robotics and Society

INTRODUCTION

Annotation:

This lesson will provide students with a clear understanding of the definition and uses of robots in modern society, as well as grasping a clearer picture of the future of robotic systems.

Grade(s):

	9th
X	10th
X	11th
X	12th

Time:

10 Hours

Author:

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Additional Author(s):

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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-RAS-2. Students will identify and explain the major engineering tasks in organizing automated manufacturing.
ENGR-RAS-3. Students will discuss the systems and applications of automation including: AGV, PLC, CNC, CIM, CAD, CAM, and robotics as essential to succeeding globally in a manufacturing market.
ENGR-STEM-1. Students will recognize the systems, components, and processes of a technological system.
ENGR-STEM-2. Students will identify the impact of engineering and technology within global, economic, environmental, and societal contexts.
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:

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.
MM3P1. Students will solve problems (using appropriate technology)
MM3P3. Students will communicate mathematically.
MM3P4. Students will make connections among mathematical ideas and to other disciplines.
MM3P5. Students will represent mathematics in multiple ways.
SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.
SCSh3. Students will identify and investigate problems scientifically.
SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.
SCSh6. Students will communicate scientific investigations and information clearly.
SCSh7. Students will analyze how scientific knowledge is developed.

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 5. Students will develop an understanding of the effects of technology on the environment.
ITEA - Standard 6. Students will develop an understanding of the role of society in the development and use of technology.
ITEA - Standard 7. Students will develop an understanding of the influence of technology on history.
ITEA - Standard 13. Students will develop the abilities to assess the impact of products and systems.

UNDERSTANDINGS & GOALS

Enduring Understandings:

- Students will understand how automation of manufacturing systems has developed, with particular emphasis on the role of robotics in the process.
- Students will be able to formulate a definition of a robot
- Students will be able to describe the historic development of robotics from science fiction to science fact
- Students will be able to evaluate the positive impacts robots have on manufacturing
- Students will be able to discuss the social implications of robots for the future including human job replacement or obsolescence.

Essential Questions:

- How does one convert a human manufacturing process to an automated one?
- What historic inventions and innovations have lead to factory automation?
- What are the future expectations or possibilities with regard to robotics and automation?

Knowledge from this Unit:

Trace the development of manufacturing and outline historical developments in robotics and automation.
List the types of robots and explain their uses.
Predict the future use of robotics and automation.

Skills from this Unit:

Students will have an understanding of the principles of automation and robotics and operating systems used in manufacturing.

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.

____ Pre-test
_X_ Objective assessment - multiple-choice, true- false, etc.
  _X_ Quizzes/Tests
  __ Unit test
_X_ Group project
_X_ Individual project
_X_ Self-assessment - May include practice quizzes, games, simulations, checklists, etc.
  _X_ Self-check rubrics
  __ Self-check during writing/planning process
  _X_ 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:

History of automated manufacturing and robotics

Assessment(s) Description/Directions:

Students are given the challenge of developing a time line focusing on the important inventions, innovations, and advancements that have lead to the inclusion of robotics in the manufacturing process.

Attachments for Assessment(s):

- Bean Can Technology document
- Robotic Websites document
- Time line document
- Asimov document
- "I Robot" documents
- "I Robot" by Isaac Asimov
- "I Robot" unabridged audio recording

LEARNING EXPERIENCES

Sequence of Instruction

1. Identify the Standards. Standards should be posted in the classroom for each lesson.

2. Discuss the manufacturing process from hand crafts, through cottage industries, to the Industrial Revolution. What was the "big deal" with using machines over human power? Discuss exponential growth in technology. Who is most often associated with assembly line production and why? What were the social repercussions of mass production? How have manufacturing processes, materials, and social impacts changed through the years?

3. Identify and review the unit vocabulary.

4. Use a variety of canned goods to simulate artifacts from an archaeological exploration on a distant planet. Divide the class into teams. Have the teams inspect the cans to find clues that will give information about the people from this planet. Teams should record assumptions about the people based on the information they gather from the cans. Observations may be correct or wrong. Based on information gathered from the cans, teachers can lead students into a discussion of manufacturing processes involved in canning food. (see Bean-Can Technology document)

5. From where does the word "Robot" come? When was robotics introduced as a manufacturing process? Did Science Fiction beget science fact, or the other way around? Have students do online research for the history of robotics. (see Robotic Websites document)

6. Create a mini-poster 8.5" x 11" of Karel Capek and his R.U.R. play as the accepted origin of the word Robot. Show your poster to the students, and have them create similar posters to construct a "Time line of Robotics" around the room. Entries can be from Science Fiction, Fact, Inventors, Inventions, Innovations, or any aspect related to robotics. If desired, individual student time lines of instructor determined length may be produced instead. Timelines can be created in Word documents; Presentation formats; or other media deemed acceptable by the teacher. (see Timeline documents)

7. Discuss Isaac Asimov, the Father of the Robotic Laws. What are the laws? How did he come by them? Must the Laws be enforced? Have students create and design on paper a robot that will serve some function. Have them list three advantages of having the robot do the job instead of having a human do it. (See Asimov documents)

8. Begin reading "I Robot" by Isaac Asimov. This collection of short stories is nothing like the movie. Discuss the historic time frame for the stories (1950's). Use the worksheets attached for each short story. (See "I Robot" documents)

Attachments for Learning Experiences:

Notes & Reflections:

This unit can be run concurrently with other units. The time line or reading the book, "I Robot", can be completed a little at a time or in one large block of time.

The time line can be an individual, group, or class project. If the time line is an individual project, the checklist for the number of items is more important and an extended amount of time should be given to research and gather entries. This can be a sponge activity at the beginning or end of the period depending on the activity of the day. If the time line is a group project, students will find items faster and less time will be needed for the complete project. This usually becomes the day's activity instead of the sponge activity. As a class each student adds their contribution to the time line and it is posted or displayed around the room. Instead of a power point or word document, since duplication is out, this causes the students to collaborate with each other to complete the assignment. CAUTION: If the assignment stalls or grows stale, set it aside and come back to the assignment later. Students may enter class with new information to add at random times throughout the year.

Suggestion: read one short story a week – pick one day for students to read. This becomes the activity for that day's period. For struggling-readers or those students who may not use their time wisely in class, play the audio unabridged book while they follow along.

Read approximately ½ of the story in class. The remainder of the story and the accompanying worksheet are assigned as homework to complete before the next reading session. Discuss the previous week's short story before starting the next story.

CAVEAT: Make sure to get approval through the proper committee, authority, or whoever is responsible for making reading material decisions for your system.

A study guide is provided for most chapters. The purpose is to help ensure students read the book, provide discussion points, and assists the students in researching true science versus science fiction. The last few chapters currently have no accompanying worksheets.

Send a letter home to the parents informing them that the students will be participating in a cross curricular activity. Include a time line of the reading and worksheet expectations. The book is nothing like the movie so students will have to read the book in order to fill out the worksheets. Explain that there is nothing objectionable in the book. Students will be required to buy the book. Recommend used book sales, Online book sales, or anywhere they can get a discount. The school and public library may also be good locations to pick up a copy of the book. At the end of the reading, request any student that doesn't want to keep the book please donate their book so that there will be spare copies for those who will not buy a book, forget their book, or cannot afford a book.

CULMINATING PERFORMANCE TASK (Optional)

Culminating Unit Performance Task Title:

History of Robotics Time Line

Culminating Unit Performance Task Description/Directions/Differentiated Instruction:

See attached time line documents.

Attachments for Culminating Performance Task:

UNIT RESOURCES

Web Resources:

Attachment(s):

Materials & Equipment:

CD/DVD player, "I, Robot" book by Issac Asimov

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	X	Desktop Publishing	X	Image File(s)
	Web Design Software		Blog	X	Video
	Animation Software	X	Wiki		Electronic Game or Puzzle Maker
	Email	X	Website		