

Robotics
2019-2020
By: Brian Jorgensen

Unit: <i>Just what is a robot and what makes it one</i>		Time: <i>August</i>
Standards Taught		
<p>RBT 1.1 Describe the parts necessary to make a robot. RBT 1.2 Examine the relationships among the subsystems. RBT 2.3 Examine current ethical issues.</p> <p>** Note if websites will not lode from the link provided it will be necessary to copy and paste the address of the desired site in the URL line of the search engine that is being used.</p>		
Differentiation/Assessment:	Classroom Management and Environment:	What will the students be doing?
<p><i>Students who needed the extra help received guided notes, extra individual practice, and shortened tests.</i></p>	<p><i>The classroom is set up in a "regular class room" like setting. The desks are in rows with space between students so concentration can be maintained. During robotic labs students are encouraged to rearrange desks so that there is plenty of space to allow robots to preform required maneuvers. Overall the environment is structured and has rules and procedures in place.</i></p>	<ul style="list-style-type: none"> • Create a vocabulary list and define terms. • Read the information presented in the internet articles "What makes it a Robot" and "What Makes up a Robot" (linked below). • Read the information contained in the article "Ethical Considerations and Robotics"

		<ul style="list-style-type: none"> • Compile a summary for the two three articles that were assigned. • Participate in a class discussion with the following agenda: <ul style="list-style-type: none"> - Are there robotic “right and wrongs”? - Where do you draw the line? - What do you for see robots doing in the next 5, 10 and 20 years? - How much inelegance should an AI possess and what safeguards should be in place in case something goes wrong? - What is the number one thing that you would like a robot to do for you? • Create a Robotics Code of Ethics that you are comfortable with. And compare with those of the rest of the class.
Prior Knowledge Needed	Vocabulary	Assessments
<p><i>There is no prior knowledge needed for this class.</i></p>	<ul style="list-style-type: none"> • Servo • ICU • Control unit • Sensor • Input • Output • Actuator • Ethics • Ethical considerations 	<ul style="list-style-type: none"> • Class participation • Written article summary’s • Robotics Code of Ethics

<p><u>Relevance:</u></p> <p>The use of robots in both the manufacturing and service industries has exploded in the last decade. The chances that these students will be using and interacting with robots in their careers are virtually guaranteed. A basic understanding in robotics and how they function will be an advantage to them that others will not have.</p>	<p><u>Examples:</u></p> <ul style="list-style-type: none"> • Grain bin builder • Carpenter • Dry Waller • Painter • Finnish Carpenter • Plumber • Electrician • Contractor 	<p><u>Materials Needed:</u></p> <ul style="list-style-type: none"> • Computer. • Internet • Miscellaneous office supplies • Dictionary
<p><u>Reflection:</u></p> <p>This is a challenging course for me to teach as I am learning along with and from the students as I guide them through this class. I am excited to dig into this area in more detail.</p>	<p><u>Essential Questions:</u></p> <ul style="list-style-type: none"> • What is a robot? • How does it know what to do? • Who makes those decisions? • Is there a right and a wrong way to use robots? • • Can I make a living doing this? • What does job security look like in this career field? 	

“What Makes it a Robot”

<https://www.cnet.com/news/at-ces-2017-you-have-to-ask-what-makes-a-robot-a-robot/>

“What Makes up a Robot”

<https://www.brighthubengineering.com/robotics/26214-robotics-construction-of-a-robot/>

“Ethical Considerations and Robotics”

<https://www.analyticsinsight.net/ethics-in-robotics-will-robots-run-in-line-with-human-values/>

“Introduction to Robotics Lesson Plans (Lego Ev3)”

<https://le-www-live-s.lego.com/sc/media/files/ev3-introduction-to-robotics/introduction-to-robotics-desktop-enus-ac953ea57400c23957e06f93f38bd99b.pdf>

Unit: <i>Where are robots used and can I do that?</i>	Time: <i>August</i>	
Standards Taught		
<p>RBT 5.1 Explore career opportunities in the robotics field. RBT 5.2 Investigate commercial applications of robotic systems.</p>		
Differentiation/Assessment:	Classroom Management and Environment:	What will the students be doing?
<p><i>Students who needed the extra help received guided notes, extra individual practice, and shortened tests.</i></p>	<p><i>The classroom is set up in a “regular class room” like setting. The desks are in rows with space between students so concentration can be maintained. During robotic labs students are encouraged to rearrange desks so that there is plenty of space to allow robots to preform required maneuvers. Overall the environment is structured and has rules and procedures in place.</i></p>	<ul style="list-style-type: none"> • Update vocabulary list and define terms. • Examine the use of robots in the manufacturing and service industries and answer the following questions: <ul style="list-style-type: none"> - Where are robots used in industry? - What are the reasons that businesses use robots? - List 10 different functions that robots preform for manufacturing and service industries and find

		<p>illustrations of the robots that perform them?</p> <ul style="list-style-type: none">- When businesses add robots are employees laid off?- What happens to displaced workers?- What careers are disappearing because of robots?- What new careers has the use of robots brought about?- List five businesses with in fifty miles of where you live that use robots. <ul style="list-style-type: none">● Examine how robots are used in people's personal lives.● Identify five different careers associated with the robotic industry (in either the Industrial, service industries or for personal use) and answer the following questions:<ul style="list-style-type: none">- What is the job title and what are their duties in that job?- What education is required to perform this job?- What is the average age of the workers performing this job?- Is there room for advancement?- How often do the workers in this industry have to
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		<p>continue their education?</p> <ul style="list-style-type: none"> - What is the starting and the average salary of people performing this work?
Prior Knowledge Needed	Vocabulary	Assessments
<p><i>There is no prior knowledge needed for this class.</i></p>	<ul style="list-style-type: none"> • Robotic related careers 	<ul style="list-style-type: none"> • Participation in class discussions • Comprehensive written assignments
<p><u>Relevance:</u></p> <p>The use of robots in both the manufacturing and service industries has exploded in the last decade. The chances that these students will be using and interacting with robots in their careers are virtually guaranteed. A basic understanding in robotics and how they function will be an advantage to them that others will not have.</p>	<p><u>Examples:</u></p> <ul style="list-style-type: none"> • Operator • Engineer • Maintenance and repair • Research and development • Coder 	<p><u>Materials Needed:</u></p> <ul style="list-style-type: none"> • Computer. • Internet • Miscellaneous office supplies • Dictionary

Reflection:

This is a challenging course for me to teach as I am learning along with and from the students as I guide them through this class. I am excited to dig into this area in more detail.

Essential Questions:

- Where are robots used in this area, state and region?
- Who do I know that uses a robot?
- Can I make a living in robotics?
- If I decide to pursue a career in robotics will I be required to go on to school after I graduate from high school?
- Just what would this job entail and how much would I make?

Unit: <i>Robotic Safety Concerns</i>	Time: <i>August - September</i>	
Standards Taught		
<p>RBT 2.1 Demonstrate proper safety procedures. RBT 2.2 Determine how to apply OSHA Compliant Lockout – Tag-out procedures.</p>		
Differentiation/Assessment:	Classroom Management and Environment:	What will the students be doing?
<p><i>Students who needed the extra help received guided notes, extra individual practice, and shortened tests.</i></p>	<p><i>The classroom is set up in a “regular class room” like setting. The desks are in rows with space between students so concentration can be maintained. During robotic labs students are encouraged to rearrange desks so that there is plenty of space to allow robots to preform required maneuvers. Overall the environment is structured and has rules and procedures in place.</i></p>	<ul style="list-style-type: none"> • Outline the procedures identified by OSHA for robotic Lockout – Tag-out, and illustrate how this procedure can prevent on the job accidents. • Discuss five industrial accidents that have occurred recently involving robots, and identify the following: <ul style="list-style-type: none"> - What happened? - How did it happen? - What were the injuries and how severe were they? - Did it result in permanent disability of the worker?

		<ul style="list-style-type: none"> - How long did it take for the employee to resume their job? - How could this accident have been prevented? <ul style="list-style-type: none"> • List what constitutes Personal Protective Equipment in the robotics industry and how much does it cost to outfit yourself with it? • Listen to a guest speaker for the topic of why do we use an industrial robot and be prepared to ask them at least one question.
Prior Knowledge Needed	Vocabulary	Assessments
<p><i>There is no prior knowledge needed for this class.</i></p>	<ul style="list-style-type: none"> • PPE • Industrial accidents 	<ul style="list-style-type: none"> • Participation in class discussions • Five accident reports • Equipment list • Prepared question
<p><u>Relevance:</u></p> <p>Safety should always be of primary concern in the manufacturing and building trades industries.</p>	<p><u>Examples:</u></p> <p>The internet or interviews can be a very good tool for finding examples to complete this assignment.</p>	<p><u>Materials Needed:</u></p> <ul style="list-style-type: none"> • Computer. • Internet • Miscellaneous office supplies • Dictionary • Local resource people

Reflection:

I don't think it is possible to overemphasize safety. If we can get students to think first then act they will continue the habit in the workplace and reduce workplace accidents.

Essential Questions:

- What are the chances of getting hurt?
- What should I be watching out for?
- What has already happened?

Unit: <i>Electronics</i>	Time: <i>September - October</i>	
Standards Taught		
<p>RBT 3.1 Build circuit according to schematic diagram. RBT 3.2 Calculate circuit parameters. RBT 3.3 Measure circuits parameters. RBT 3.4 Compare Calculated and measures solutions to analyze circuit operation.</p>		
Differentiation/Assessment:	Classroom Management and Environment:	What will the students be doing?
<p><i>Students who needed the extra help received guided notes, extra individual practice, and shortened tests.</i></p>	<p><i>The classroom is set up in a "regular class room" like setting. The desks are in rows with space between students so concentration can be maintained. During robotic labs students are encouraged to rearrange desks so that there is plenty of space to allow robots to preform required maneuvers. Overall the environment is structured and has rules and procedures in place.</i></p>	<ul style="list-style-type: none"> • Update vocabulary list and define terms. • The breadboard labs will be used by the students to demonstrate the purpose and the functions of various electronic components included in the vocabulary • Demonstrate how these components interact with one another and what each item is designed to do. • Trouble shoot individual labs to determine faults and problems. These may either occur during

		<p>construction or they may be created to test the students' skills.</p> <ul style="list-style-type: none"> • There will be a minimum of 12 labs preformed using the bread boards so that students will achieve a certain level of proficiency. Each lab will be completed by the student so that it works then the teacher will create a problem with the circuit that the student will then identify and solve. • Students will create a circuit that will solve a special problem given to them by the teacher.
Prior Knowledge Needed	Vocabulary	Assessments
<p><i>There is no prior knowledge needed for this class.</i></p>	<ul style="list-style-type: none"> • Diode • Conductor • Voltage • Amperage • Resister • Transistor • Capacitor • Load • Switch • Integrated circuit • Sequence • Relay • Resistance • Rectifier • Fuse • Transformer • Relay switch • Inductor • Light emitting diode • Battery 	<ul style="list-style-type: none"> • Participation in class discussions • Completed lab projects • Vocabulary definitions • Function identifications • Demonstration of problem-solving skills

	<ul style="list-style-type: none"> • Motor • Servo 	
<p><u>Relevance:</u></p> <p>In order to understand how a robot works a student must first understand what it is made of and what the individual parts do.</p>	<p><u>Examples:</u></p> <ul style="list-style-type: none"> • Radio • Electronic sound • Switches • Amplification 	<p><u>Materials Needed:</u></p> <ul style="list-style-type: none"> • Computer. • Internet • Miscellaneous office supplies • Bread board electronic kits. • Voltage tester • Hand tools
<p><u>Reflection:</u></p> <p>Students have a lot of fun with this unit. Care will have to be taken when they are working on the labs so that it does not become a race to the finish.</p>	<p><u>Essential Questions:</u></p> <ul style="list-style-type: none"> • What does this stuff do? • How do these components interact with each other? • Is there a systematic approach to take when troubleshooting an electronic problem? • Where would I find this stuff in a robot? 	

Unit: <i>Designing Building and Coding Robots</i>	Time: <i>October - December</i>	
Standards Taught		
<p>RBT 4.1 Build and program a robot to perform a specified task. RBT 4.2 Test the robot for any flaws in hardware or bugs in software components. RBT 4.3 Write technical report evaluating the system performance.</p> <p>Important components not included in content standards. RBT ???.? Identify limitations inherent with working with robots. RBT ???.? Code robots to preform specific and complex tasks.</p>		
Differentiation/Assessment:	Classroom Management and Environment:	What will the students be doing?
<p><i>Students who needed the extra help received guided notes, extra individual practice, and shortened tests.</i></p>	<p><i>The classroom is set up in a “regular class room” like setting. The desks are in rows with space between students so concentration can be maintained. During robotic labs students are encouraged to rearrange desks so that there is plenty of space to allow robots to preform required maneuvers. Overall the environment is structured and has rules and procedures in place.</i></p>	<ul style="list-style-type: none"> • Update vocabulary list and define terms. • Students will participate in the Robotics Club, acting as tutors for underclassmen members. • Students will build two introductory robots using You Tube Lego tutorials. • Keep a journal to record what has been tried and to brain-storm ideas so

		<p>that there is a record of each student's progress and their thought processes.</p> <ul style="list-style-type: none">• Demonstrate competence using remote controls, and smart phones to operate robots.• Build a robot and code it to perform the following functions:<ol style="list-style-type: none">1. Move forward 5 feet turn right advance 5 feet turn right advance 5 feet turn right advance 5 feet turn right. The robot should be at its original location.2. Using a combination of robotic and cellphone technology create a robot that can be out of your direct sight that is capable of navigating around obstacles to a specific location.3. Create a robot that will pick up an object move it to a predetermined location deposit it and return for another item to be delivered.4. Create a working wind turbine.5. Create two robots using gears one to increase power and torque and one to increase speed produced by a motor.6. Code a robot to follow a line on the floor.
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Prior Knowledge Needed	Vocabulary	Assessments
<p><i>There is no prior knowledge needed for this class.</i></p>	<p>Students will be encouraged to use proper vocabulary in both class participation and when writing in their journals.</p>	<ul style="list-style-type: none"> • Weekly journal review. • Class and group participation • Check list of tasks completed by robots • Utility and practicality of robotic creations • Comprehensive written assignments

<p><u>Relevance:</u></p> <p>Creating task specific robots is and should be the desired outcome of a class in robotics. This is the nature of the industry and it allows the students to use the Scientific Process in real world situations.</p>	<p><u>Examples:</u></p> <p>You Tube has a wealth of examples for creating Lego Robots to perform specific tasks. Students will be encouraged to search this and other resource sites to obtain ideas that will help them solve the challenges presented in this class.</p>	<p><u>Materials Needed:</u></p> <ul style="list-style-type: none"> • Computer. • Internet • Access to You Tube • Lego Mindstorms EV3 advanced block coding software • Robot maze • Miscellaneous office supplies • Lego EV3 Mind storm robotic kits • Lego EV3 Mind storm expansion kit • Lego education and tutorial software • You Tube
<p><u>Reflection:</u></p> <p>I have never had more fun teaching a course of study as I have had teaching this one. The students adopt an attitude of “That wasn’t so hard now what else do you got”. It was a situation of the students demanding to dig deeper into the subject matter because they were eager to learn. The only caution I have is it is necessary to remind them to keep the solution as simple as possible so they don’t make it more complicated than it has to be.</p>	<p><u>Essential Questions:</u></p> <ul style="list-style-type: none"> • How would I do that and how can I make a robot do it instead? • Is there a simpler way to do this? • Do I understand what an if then statement is and can I create code to answer them? • Am I willing to ask for help if I need it? • Am I up for the challenge? 	

