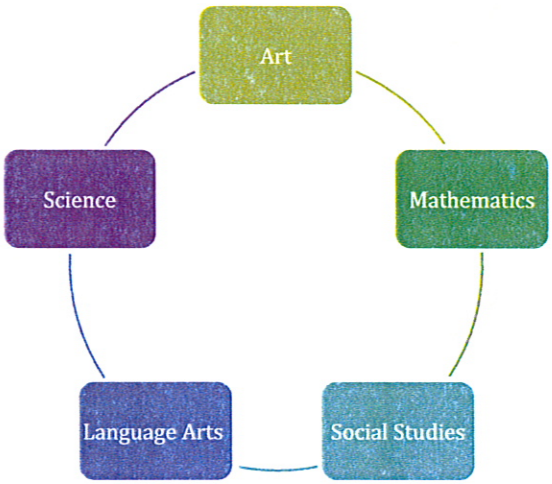
STEM School Chattanooga
9th Grade PBL
Unit Plan Template

Unit 5: Robotics



Learning Target Topics

Art I: Choose and apply images to communicate an idea.

Algebra I: Construct a linear function given a graph, a pair of input and outputs, or a description of a relationship.

Geometry: Define trigonometric ratios and solve problems involving right triangles.

English I: Introduce topics and organize information; Include formatting, graphics, and multimedia for comprehension; Use domain-specific vocabulary; Demonstrate command of Standard English grammar.

Physical World Concepts: Identify, describe, and calculate magnetic and electrical forces, charges, and fields; Use Ohm's Law to design and build series and parallel circuits.

World History: Gather relevant information from multiple sources; Integrating information into text; Avoiding plagiarism.

Grade Level	9th Grade	Unit Length	6 Weeks
Unit Overview	The Unit 5 PBL on Robotics will introduce students to the essential concepts underlying the principles of electrical circuitry and coding with robotics. Along with the study of circuitry, students will apply critical thinking to collaboratively assemble and code a Parallax Boe-Bot Robot. Through the use of various types of sensors and coding, students will successfully maneuver the robot through a maze during the Robotics Competition in March. Students will also create a digital Troubleshooting Guide that includes tips for constructing, wiring, coding, and testing their robot and utilizes at least 2 types of procedural text, as well as a labeled schematic of the robot including a Pop Up History Blurb of a chosen component.		
Unit Essential Issue	**Problem:** Construct and code a Parallax Boe-Bot to successfully navigate an unknown maze.		
Culminating Events	For the Unit 5 PBL, the students will work collaboratively in groups of 2. Student teams will construct and code a Parallax Boe-Bot with the goal of successfully navigating the robot through an unknown maze at the Robotics Competition in March. They will also create a digital Troubleshooting Guide for their robot, outlining suggestions for constructing, wiring, coding, and testing the robot, as well as a labeled schematic including a Pop Up History Blurb on a chosen component. Students will receive 2 grades in Power School for the Unit 5 PBL in each subject area: 1. Performance of the Robot (Same for all subjects). a. Proficient: Prior to the March competition, the robot must be able to create sound and travel in a straight line for 5 feet. b. Advanced: Prior to the March competition, the robot must be able to successfully navigate an unknown maze. 2. Individual Subject Area requirements for the content area assessments. The following items will be assessed by the appropriate content area teacher:		

- Math (Algebra I and Geometry): Learning Targets will be assessed within the code, equations, and graph document submitted to the assignment in Edmodo.
- Physical World Concepts: Learning Targets will be assessed in the Appendix Schematics.
- English I: Effectiveness of the procedural text will be assessed within the Troubleshooting Guide.
- Art: Effectiveness and quality of digital images will be assessed within the Troubleshooting Guide.
- History: Learning Targets will be assessed in the Pop Up History Blurb in the Appendix Schematic.

Common Assessment

STEM School Chattanooga

STEM PBL Rubric

PBL Unit 5: Robotics
Student: _____
Date: _____

	Advanced	Proficient	Needs Improvement
Math Components: **Algebra I**	• Given a point relative to the graphed line, students will write a code to have robot run in a line from the original line to the new point. • Students will determine the slope of the new line, create an equation, and graph the line on the Cartesian plane.	• Students can write a code to have robot run 5 feet in a straight line. • Students will demonstrate that the robot can actually move 5 feet in a straight line in three separate trials. The robot can veer off the line no more than I foot left or right. • Students will write an equation and create a graph on a Cartesian plane of the line.	
Math Components: **Geometry**	• Students will evaluate the results of the trials and will justify any changes that need to be made to either the code or the robot.	• Students will write a code to make their robot run in a right triangle formation and will show the robot successfully running the code.	
Science Components: **Physical World Concepts**	• Students will design and draw an additional schematic that utilizes a combination current, minimizes resistance, and uses minimal voltage. • Students will calculate the angular momentum used by the Boe-Bot.	• Students will draw their Boe-Bot circuit to scale as an appendix to the manual. This drawing will include the total voltage, source, all switches, and all resistances. • Appropriate labels of the schematic, including the associated voltage, ampere, or ohm are included in the drawing. • A calculation using Ohm's Law will be shown at the bottom of the schematic. • A discussion of how the differing resistances affect the current in both parallel and series wiring schemes is included in a written piece below the drawing. • A description of how the Boe-Bot takes advantage of angular momentum is included.	
Language Arts Components: **English I**	• The formatting and graphics make the Troubleshooting Guide's instructions effective and easy to follow. • The different types of multimedia and procedural text aid in the understanding and effectiveness of the Troubleshooting Guide's suggestions. • The use of domain-specific vocabulary and proper grammar, spelling, and punctuation create a professional product that could be used by the Parallax Boe-Bot Company.	• The suggestions in the Troubleshooting Guide are presented sequentially and are helpful for troubleshooting the construction, wiring, coding, and testing of the Boe-Bot. • All of the suggestions in the Troubleshooting Guide are written clearly and are easy to understand. • Examples of domain-specific vocabulary related to robotics and procedural text are used. • The parallel structure and point of view of the manual is consistent and focused on the consumer.	
Social Studies Components:	• The written history of the	• The written history of the	

	component gives an insightful look at the invention and also an understanding of its development over the years. • The written Blurb answers who, what, when, where, and why it is important. • Grammar and spelling are free from errors. • The visual images in the Guide improve the effectiveness, clarity, and understanding of the assembly and operation of the Parallax Boe-Bot.	component gives an organized summary of the history and development of the invention. • The written Blurb answers the who, what, where, and when questions of the history. • Proper industry vocabulary and jargon is used correctly. • The History Blurb contains no more than1-2 errors in grammar or spelling. • The visual images (still photos or video) used in the Trouble Shooting Guide are appropriate for the task and purpose.
Minimum Requirement Components: Must be included to be graded	Algebra 1: • The code, equations, and graphs must be submitted to the assignment in Edmodo. Geometry: • The code must be submitted to the assignment in Edmodo. English I: • Troubleshooting Guide must contain at least 2 different types of procedural text - written (text), verbal (audio), or visual (still photos or video). • Troubleshooting Guide must include a list of suggestions for the construction, wiring, coding, and testing of the Boe-Bot. World History • Pop Up History Blurb must be on the schematic and connected to the part being researched. • History Blurb must be no more than one paragraph in length. • The Pop Up History Blurb must include a source citation at the bottom of the blurb. Art: • The trouble-shooting guide must include at least one type of visual media (video or still photos).
Unit Learning Targets	Algebra 1: • I can construct a linear function given a graph, a pair of input and outputs, or a description of a relationship. Geometry: • I can define trigonometric ratios and solve problems involving right triangles. PWC: • The schematics must be included in the Appendix of the Troubleshooting Guide. English I: • I can introduce a topic, organize complex ideas, concepts, and information to make important connections and distinctions, and include formatting (e.g., headings), graphics (e.g., figures, tables) and multimedia when useful to aiding comprehension. • I can use precise language and domain-specific vocabulary to manage the complexity of the topic. • I can demonstrate command of the conventions of Standard English grammar and usage when writing or speaking. Physical World Concepts: • I can use mechanics to measure, calculate, describe and represent the motion and energy of an object. • I can identify, describe and calculate work, force, and power. • I can identify, describe, and calculate magnetic and electric forces, charges and fields. • I can use Ohm's Law to design and build series and parallel circuits. World History • I can gather relevant information from authoritative print and digital sources, using advanced searches effectively. • I can assess the usefulness of each source in answering the research question; integrate information

<table>
<tr><td></td><td>into the text selectively to maintain the flow of ideas.
• I can avoid plagiarism and following a standard format for citation.
• I can draw evidence from informational texts to support analysis, reflection, and research.

Art:
• Choose and apply subject matter and symbols to communicate an idea.</td></tr>
<tr><td>Vocabulary</td><td>
<table>
<tr><td>Math: Algebra I</td><td>1. Slope
2. Y Intercept</td></tr>
<tr><td>Math: Geometry</td><td>1. Ratios
2. Sine
3. Cosine
4. Tangent
5. Adjacent
6. Hypotenuse</td></tr>
<tr><td>Science: Physical World Concepts</td><td>1. Circuit
2. Parallel
3. Series
4. Ohm
5. Ampere
6. Resistance
7. Charge Field
8. Polarity</td></tr>
<tr><td>Language Arts: English I</td><td>1. Procedural Text
2. Chronological/Sequential Order
3. Text Structures
4. Parallel Structure (Parallelism)</td></tr>
<tr><td>Social Studies: World History</td><td>1. Expository Text
2. Chronological/Sequential Order
3. Structure
4. Flow</td></tr>
<tr><td>Art: Art I</td><td>1. Schematic
2. Media</td></tr>
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