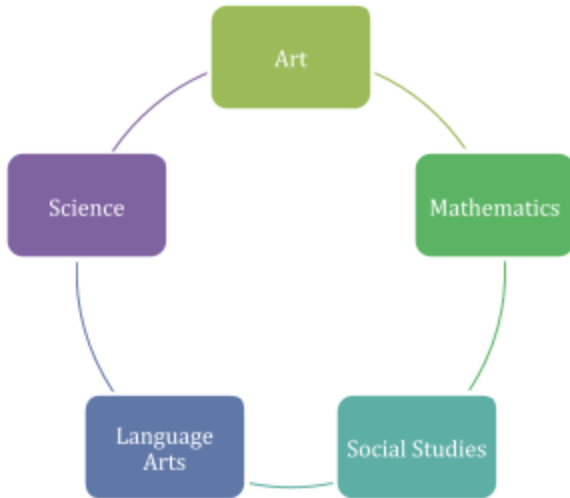# STEM School Chattanooga
9th Grade PBL
Unit Plan Template

Unit 2: Robotics

Learning Target Topics

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

Algebra I: Create an equation and use it to solve problems.

Geometry: Develop definitions of transformations and represent them in the plane.

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	5 Weeks
Unit Overview	The Unit 2 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 late October. 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, including a rationale of the effectiveness of the images used in the guide. Students will also design a labeled schematic of the circuitry, 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 2 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 late October. They will also create a digital Troubleshooting Guide for their robot, outlining helpful suggestions for constructing, wiring, coding, and testing the robot, including a rationale of the effectiveness of the images used. Students will also design a labeled schematic including a Pop Up History Blurb on a chosen component. Students will receive 2 grades in PowerSchool for the Unit 2 PBL in each subject area: 1. Performance of the Robot (Same for all subjects).			

a. **Proficient**: Prior to the October competition, the robot must be able to create sound and travel in a straight line for 5 feet. (Robots must meet PR requirements to participate in the AD competition stations.)
b. **Advanced**: Prior to the October competition, the robot must be able to successfully navigate an unknown maze.
2. Individual Subject Area requirements for the content area assessments (different for each subject).

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 and equations document submitted to the assignment in Google Classroom.
● 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 and Rationale.
● 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**	● Using calculations from the Proficient section, students will calculate the number of pulses they would need to run the robot in order for it to travel 100 cm.	● Students will program their Boe Bot to go to one or more destinations and return to starting point. ● Students will create an equation to calculate the distance the robot travels.	
Math Components: **Geometry**	● Students will generate a program to control a robot to perform the basic maneuvers: forward, backward, rotate left, rotate right and pivoting turns.	● Students will explain how speed and direction are controlled for continuous rotation servos.	
Science Components: **Physical World Concepts**	● Students will design and draw an alternative 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 Guide's instructions effective and easy to follow. ● The different types of multimedia and procedural text aid in the understanding and effectiveness of the Guide's suggestions.	● The suggestions in the 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 Guide are written clearly and are easy to understand, using a problem-solution format.	

		• The guide uses proper parallel structure and comma usage with complex sentences. • 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.	• Examples of domain-specific vocabulary related to robotics and procedural text are used. • The point of view of the manual is consistent and focused on the consumer, not the author.	
	Social Studies Components: **World History**	• 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 written history of the 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 than 1-2 errors in grammar or spelling.	
	Art Components: **Art I**	• The visual images in the Guide improve the effectiveness, clarity, and understanding of the assembly and operation of the Parallax Boe-Bot, which is described in the rationale.	• The visual images (still photos or video) used in the Troubleshooting Guide and discussed in the rationale are appropriate for the task and purpose.	

	Minimum Requirement Components:
	Must be included to be graded
		Algebra 1:
		  • The code and equations must be submitted to the assignment in PBL Google Classroom.
		
		Geometry:
		  • The code must be submitted to the assignment in PBL Google Classroom.
		
		English I:
		  • Troubleshooting Guide must contain at least 2 different types of procedural text - written (text), verbal (audio), or visual (ORIGINAL still photos or video).
		  • Troubleshooting Guide must include at least 2 tips each for the construction, wiring, coding, and testing of the Boe-Bot (8 total).
		
		World History
		  • The Pop-Up History Blurb must be on the schematic and connected to the part being researched.
		  • The 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).
		
		PWC:
		  • The schematics must be included in the Appendix of the Troubleshooting Guide.		

Unit Learning Targets	Algebra 1:
	  • I can create equations and use them to solve problems.
	Geometry:
	  • I can define transformations and represent them in the plane.
	
	English I:
	  • I can introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; and include formatting, graphics, and multimedia when useful to aid 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 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.
Vocabulary	<table><tr><td>Math: Algebra I</td><td>1. Expression 2. Equation 3. Variable 4. Literal Equation</td></tr><tr><td>Math: Geometry</td><td>1. Transformation 2. Translation 3. Rotation 4. Reflection 5. Counter clockwise 6. Composition</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) 5. Complex Sentences</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></table>