WPI Teacher Prep. Practicum at Clinton High School

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Abstract

Over the past semester, I completed a student teaching practicum as a technology and engineering teacher candidate at Clinton High School in Clinton, MA. This program serves as both a practicum experience to receive my Initial Teaching License in Tech/Eng from the Commonwealth of Massachusetts as well as my Interactive Qualifying Project requirements for WPI. Over the course of this program I assumed all the responsibilities of a high school STEM teacher for 15 weeks, even as schools closed and shifted to remote-delivery during the COVID-19 crisis. During this time, I was assessed by a supervising practitioner (mentor) and program supervisor (advisor) on my progress in the classroom, more specifically against the six essential elements of the Department of Elementary and Secondary Education's Candidate Assessment of Performance (CAP) cycle. Those elements being: well-structured lesson, adjustment to practice, meeting diverse needs, safe learning environment, high expectations, and reflective practices. My proficiency in these areas, as determined by my mentor and advisor, are supported through evidence such as lesson plans, student work, surveys, and my reflections on the experience. My WPI education prepared me well for my practicum on both a content and pedagogical level through classes in engineering, education, and psychology. Exploration of the accompanying portfolio will provide all the information necessary to understand the project experience and its impact on me as a student and future educator.

Acknowledgements

This IQP and practicum experience would not have been possible without the backing and cooperation of both Worcester Polytechnic Institute and Clinton High School. Without the support of Shari Weaver, Director of the Teacher Prep Program at WPI; Katherine Chen, Director of the STEM Education Center at WPI; and Paul Morrison, Veteran Technology Instructor at CHS this experience would not have become a reality. The aforementioned provided me with not only the opportunity but also the tools and guidance necessary to complete a semester long and immersive STEM education experience as my Junior Interactive Qualify Project. Their contributions were invaluable and greatly appreciated.

Portfolio Contents

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Sample Lesson Plan

The attached sample lesson plan and accompanying materials comes from the Engineering Innovation course's introduction to programming lesson, within the robotics unit. This and other materials can also be found on the accompanying portfolio website.

Topic: Programming **Subject:** Robotics **Grade:** 9 **Teacher:** Amelia Ring

STAGE 1 – DESIRED RESULTS

Unit Title: Beginning to Program

Established Goals: This lesson will introduce the students to programming and to the drag and drop program they will code their robot with. The goal is for students to understand what algorithms and programs are, and how they function to control robots. This marks the transition into the 'computer science' element of robotics. The class will be able to create basic "code" to guide their peers to recreate a grid image in order to recognize the method by which programmers create specific instructions for their robots. By the end of the class, the students will move on to experimenting with their robot and investigating how to code their robot's movement.

Understandings: *Students will understand that…*	**Essential Questions:**
- An algorithm is a step by step set of instructions to perform a task that ends, like a recipe. - Robots follow the programs you write for them, so they must be specific and accurate.	- How do robots know what to do? - What element of robotics does programming fall under? - How do you communicate instructions to another person/machine?
Students will know: - What an algorithm is - How algorithms inform robots' actions - How to write an algorithm	Students will be able to: - Define algorithm - Write an algorithm - Apply knowledge to programming challenges

STAGE 2 – ASSESSMENT EVIDENCE

Performance Tasks:	**Other Evidence:**
Graph paper programming activity VEX Programming Exploration Worksheet	Future work on programming their robot (The "Clinton 500")

Key Criteria:

Engagement and participation in the class activities

STAGE 3 – LEARNING PLAN

Summary of Learning Activities:

Students will arrive to class and get into their "Programming Groups." These instructions plus some questions ("How do robots know what to do?" and "What is an algorithm?") will be written on the board. The class will briefly discuss these questions and the activity sheet (two versions) will be handed out. As a class, review the activity instructions (students will work in groups to write a set of instructions, using symbols, to guide someone to recreate an image on a grid). The groups will complete the sheet, then one group will share their instructions with another group (different activity sheet versions), who will attempt to follow them on the board. The activity will start the class off and get them thinking about what algorithms are and the importance of their specificity.

After reviewing the worksheet, the class will shift to their drag and drop code exercise. In the same groups, students will work on a VEX Robot Programming worksheet, where they will be presented with very basic instructions and/or questions they will need to think about, code, test, and observe their robot.

This period will serve as the introduction to the students' programming activity "The Gael 500" where they'll program their robot to race around a track, competing against their peers (with the same robots).

Graph Paper activity is based/inspired by Code.org (https://curriculum.code.org/csf-19/coursed/1/)

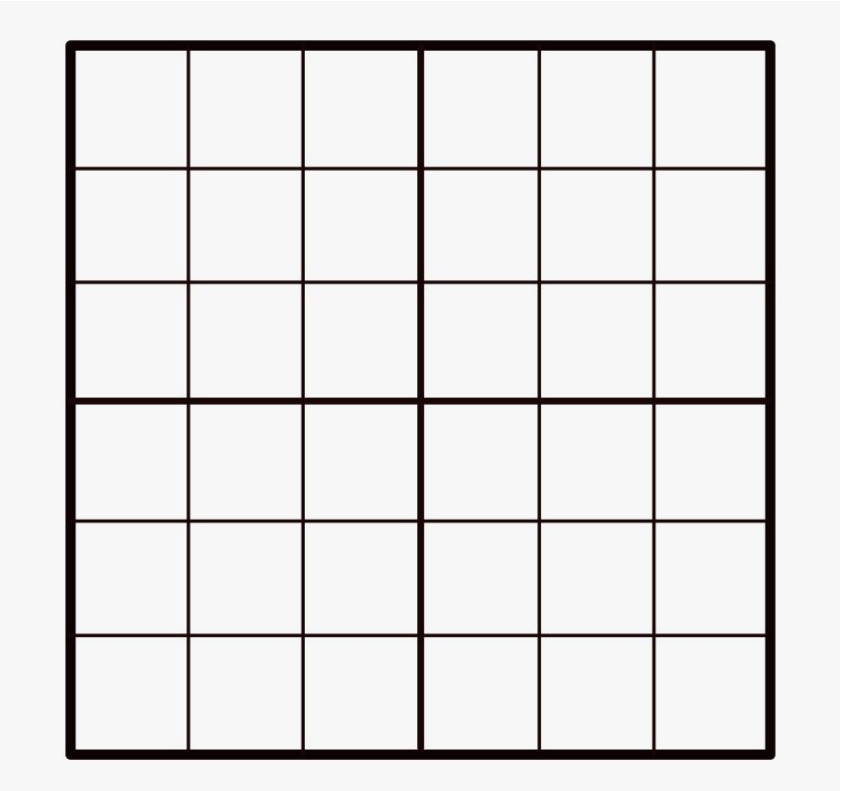
Extension Activities: Bonus draw your own The Clinton 500 Race, moving forward
Materials and Equipment Needed: Whiteboard and markers Graph paper programming activity sheet VEX Robots and Code Program VEX Programming worksheet

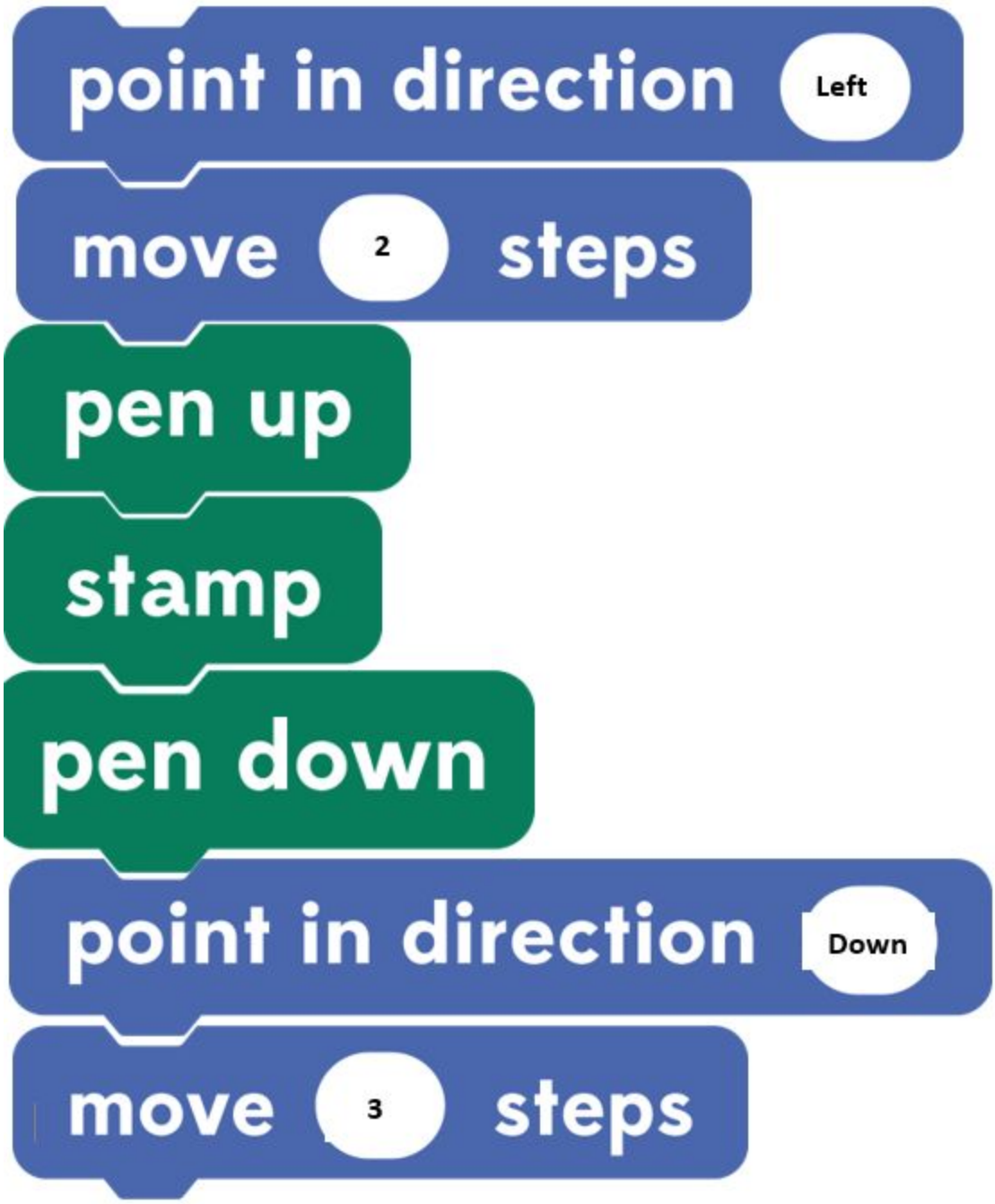
Get into your Programming Groups!

NO Chromebooks...yet

How do robots know what to do?

What is an algorithm?




point in direction
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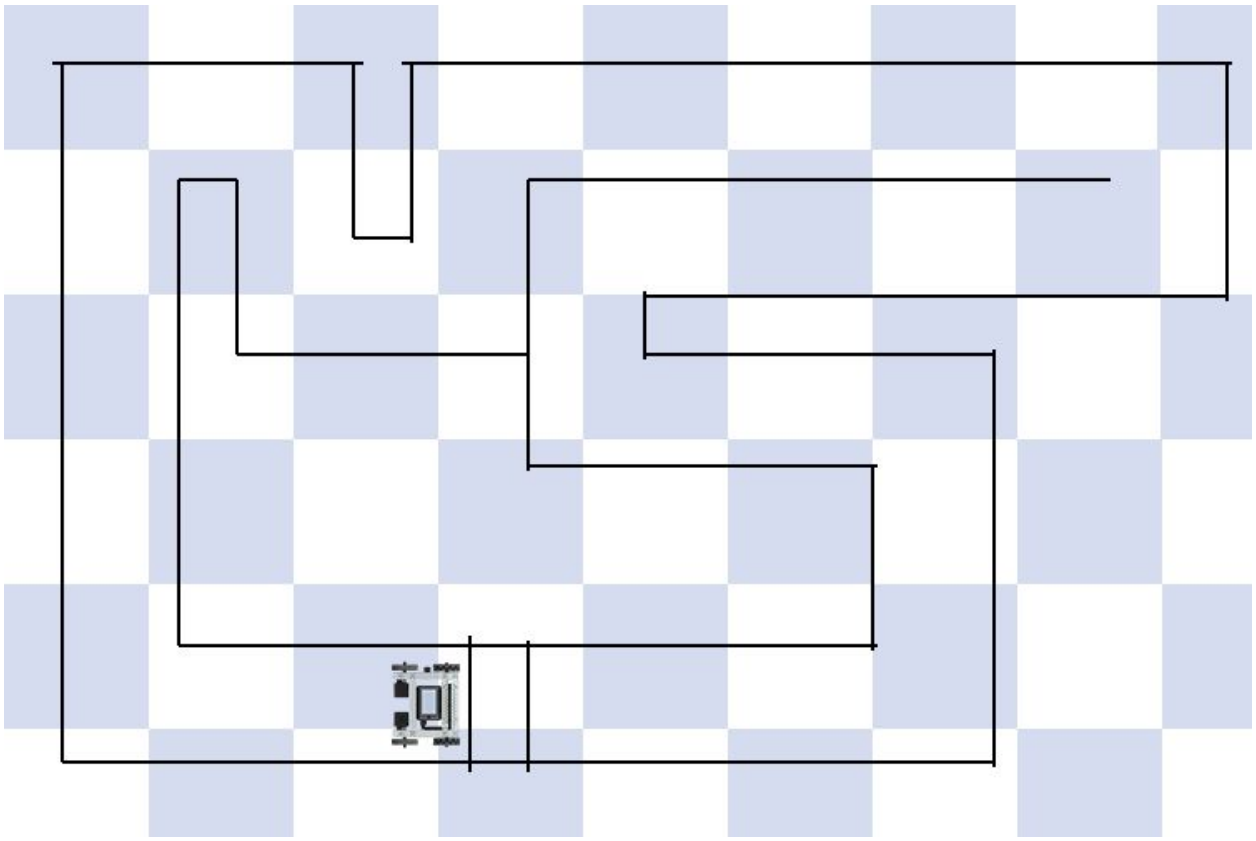


Graph Paper Programming - V1

Date:_____

Team Number:_____

Names:_____

Algorithm: A set of rules to be followed, especially by a computer, to compete a goal.

Instructions:

Below you will find multiple 6x6 grids with various full and half shaded squares. Your team objective is to write step-by-step instructions (using the symbols indicated below) for how to recreate the drawing. Be sure to indicate which corner you start in and be specific and exact with your instructions. Remember, there are multiple ways to get to the end goal, listen and collaborate with your team members.

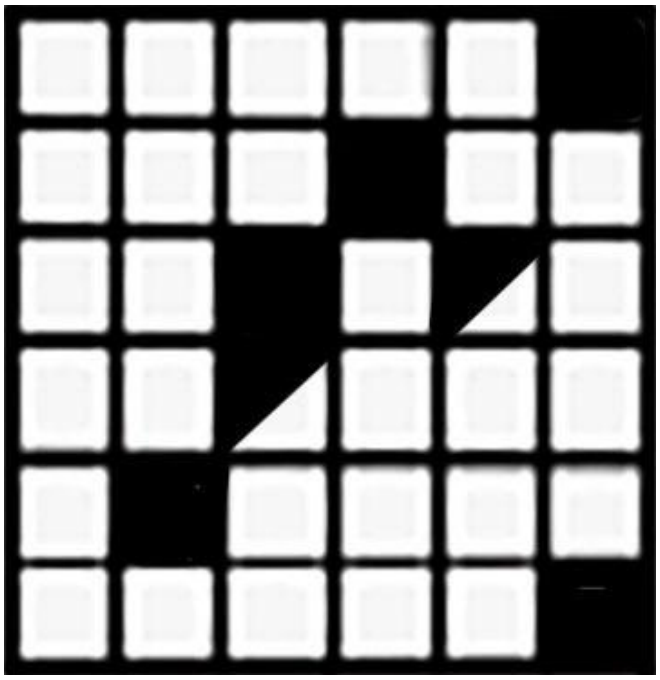
Symbols

Arrow for direction to move one space in

Scribbled in **square** to color a full square

Scribbled in **triangle** to color half square

Change orientation of shape to indicate specifics



Recreation Algorithm:

Start at:_____ corner

Instructions:

Graph Paper Programming - V1

Date:_____

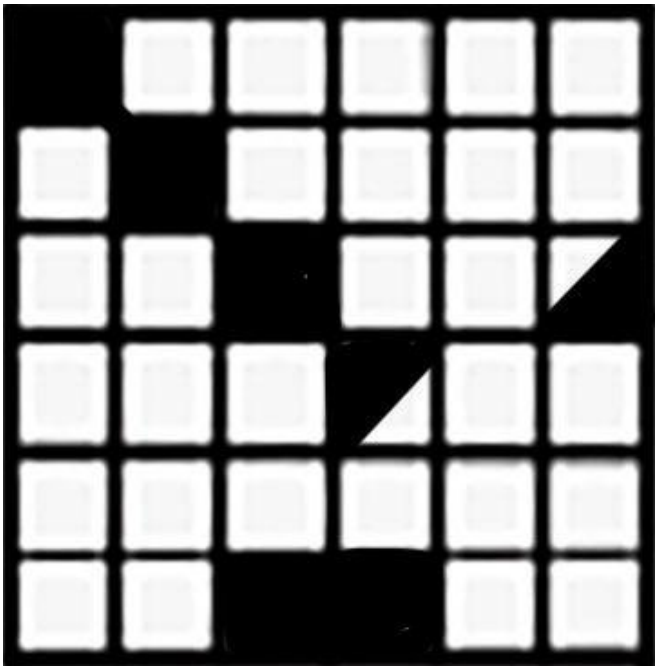
Team Number:_____

Names:_____

Recreation Algorithm:

Start at:_____ corner

Instructions:



Recreation Algorithm:

Start at:_____ corner

Instructions:

VEX Programming Exploration Worksheet

Date:_____

Team Number:_____

Names:_____

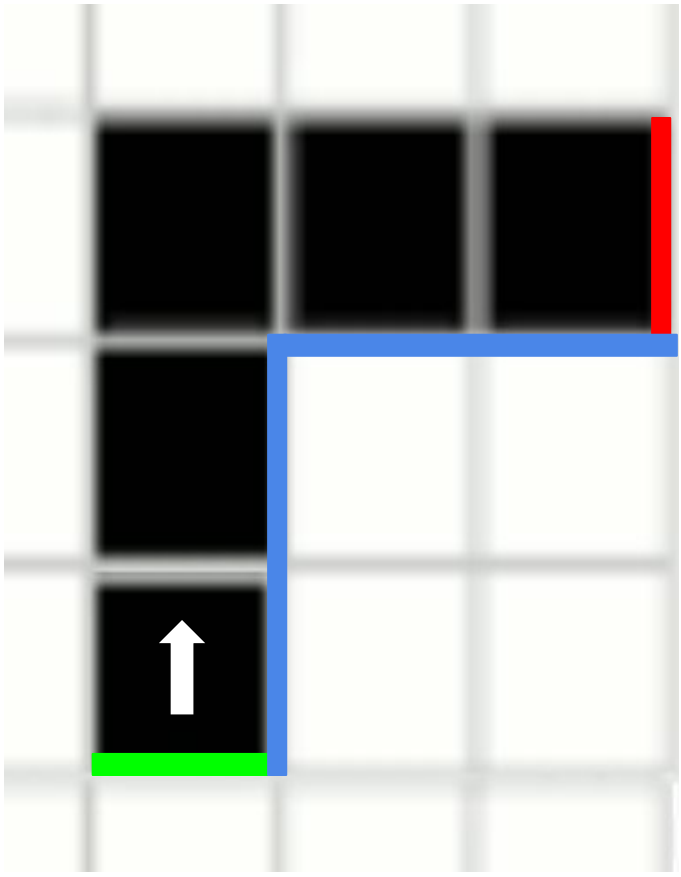
Now it's time to try coding your robot using the V5 Block Code

Instructions:

In your Programming Group, open the program and make sure the robot brain is connected.

Explore the program, connect your motors, and test it.

When everything is connected and ready, begin to solve the challenge(s) below. *If you finish it all, Create your own design and code for it!*



"The Right Turn"

Using what you know about your robot (think circumference and speed) and the program, write instructions for your robot to travel the length of the right turn track (two spaces up, two spaces to the right).

Work in teams with one robot but write your own code. You will need to submit this online!

1. Explain how you achieved the challenge. What was your code like? How many times did you edit it? Etc.?

VEX Programming Exploration Worksheet

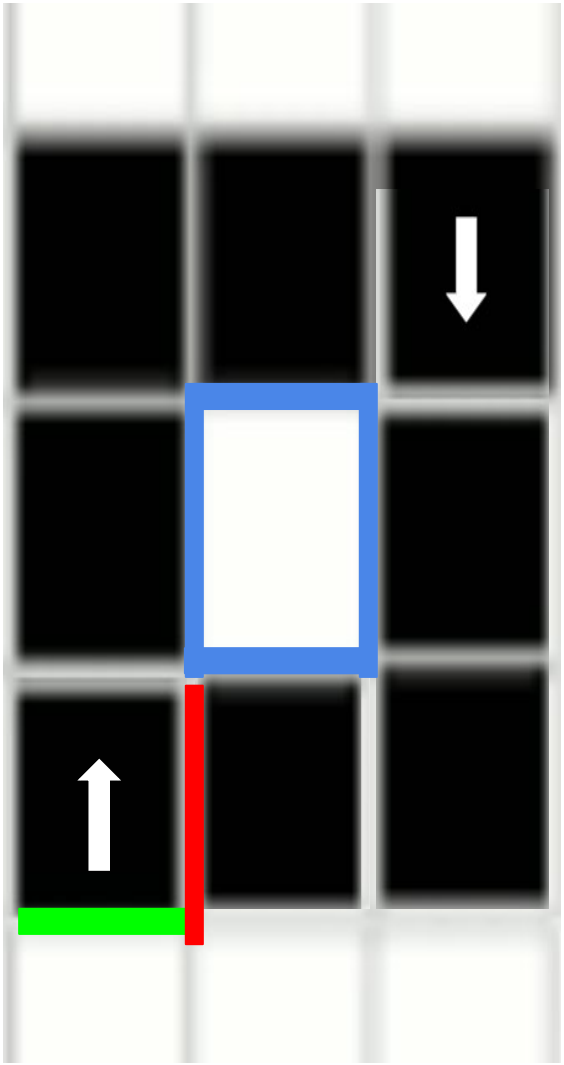
Date:_____

Team Number:_____

Names:_____

2. How close to the finish line did your robot get (without crossing it?)

3. How many trials did you perform? Were your results repeatable?



When you successfully achieved "The Right Turn"...

"The Mini-Loop"

Add to your successful code, and make the robot go all the way around a loop to come back to the start!