Grade: 4th
"Ozobot Bit Computer Science Robotics Engineering Program"
Quarter: **3**
Number of hours: 2

Performance Expectation (don't include clarification statements)

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects that can be improved.

Science and Engineering Practices	Disciplinary Core Ideas	Cross Cutting Concepts
Asking Questions and Defining Problems **Planning and Carrying Out Investigations**	**3-5 ETS1 Science & Engineering**	**Cause and Effect**

Maryland College and Career-Ready Standards (MD-CCRS)

Computer Science Practices:
https://k12cs.org/wp-content/uploads/2016/09/K%E2%80%9312-Computer-Science-Framework.pdf

- **Recognizing and Defining Computational Problems**
- **Creating Computational Artifacts**
- **Testing and Refining Computational Artifacts**
- **Communicating About Computing**

ELA/Literacy	**RF4 Read with sufficient accuracy and fluency to support comprehension. RF4.a Read on-level text with purpose and understanding. (SC, 3)** **Demonstrate fluent reading in order to fully comprehend text by responding accurately (e.g., discussion, written response).**
Mathematics	**MP.2 Reason abstractly and quantitatively. (5-ESS2-1)**

Program Title:	**"4th Grade: Ozobot Bit Computer Science Robotics Program"**
Lesson Objective(s)	- Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. - Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects that can be improved.

Engagement (5 min): Activities capture the students' attention, connect their thinking to the situation, and help them access prior and current knowledge. Students may experience a new phenomenon or reflect on an anchor phenomenon.

Students will be requested to read the title of the program, **"Ozobot Bit Computer Science Engineering Robotics Program!"** ppt slide and solicited by the Owens Instructor to share what they know about "computer science" and "robotics".
The HBOSC will show with students a ppt. slide and distinguish the job descriptions of scientists and engineers as well as share how scientists and engineers collaborate to advance science through robotics using NOAA's Argo Float and NASA's Mars ROVERS as examples.
Then the visiting students and teacher will be invited by the HBOSC instructor to share the one task they would want their personal robot to perform from the Pre-Visit "My Robot" activity. After students have shared their responses at their table and in a whole group discussion student volunteer will be selected and invited to use "Ozobot Bit" to perform their stated task to have students formulate explanations as to why the Ozobot Bit" robot is not following the student's instructions
The Owens instructor will then clarify: 1) what computer science programmers do, 2) how instructions to Ozobot Bit must be programmed in a coded language the robot can computer (understand) and 3) share the program objectives listed above with the students regarding how they will learn about computer science and coding in the context of programming Ozobot Bit through a series of creative challenges.

Exploration (20 min): Activities allow students to investig initial ideas and solutions in meaningful contexts.

The HBOSC Science Instructor will guide students through the following hand-on/minds-on activities to program Ozobot Bit smart robot thorough a series of challenging task which include:

- ✓ **Ozobot 4 Color-Line Team Line Activity** – students 1-4 each using a different color marker will draw a single straight line through the diameter of a paper and CSE #1 will turn Ozobot on and place on the student drawn line for students to observe Ozobot Bit's line following ability and dome communication.

Lesson 1 -1 Add a Code Individual/Team Activity - students 1-4 will examine an Ozobot Bit Code Reference sheet located under the white basket with their partner and invited to select a "Speed" or "Directional" category code sequences to color on a team Lesson 1 -1 Track. Students will be instructed to color in color code sequences provided by the HBOSC instructor for the side code placement blocks. ("RED black Red" and "Blue Black Blue". Then CSE # 1 will power on Ozobot Bit and place it on the track for the students to observe Ozobot's response to the student codes.

Explanation (20 min): Students develop an explanation for the concept and practices. Teacher's descriptions and definitions help clarify and modify students' understanding of the lesson.

Visiting students will apply their new coding skills working first independently and then in pairs to Code their team's Ozobot through Challenge tasks. Students will have the opportunity to make personal choices in drawing and choreographing Ozobot to dance.

- ✓ **Help Ozobot Get to School Individual Activity** – students will individually use visual code sequence patterns to program Ozobot Bit to move from home to school. CSE # 1 will power on Ozobot and test run each teammates coding sequence. Student programmers will circle how far Ozobot travelled and if

necessary revise their program. (This task is valuable in getting students to understand that regardless of what they planned or wanted to happen, Ozobot cannot think and can only do what the student program it to do.

- ✓ **OzoDraw** – Working with a partner, visiting students will select a maze challenge level, drag and drop codes to get Ozobot Bit from "start" to "finish".

Elaboration (30 min): Activities provide students with opportunities to expand and apply their understanding of the concepts within new context and situations.

Visiting students will solidify their understanding of Coding by programming Ozobot to implement their own created OzoBlockly Scripts and Ozogroove Dance routines.

- ✓ **OzoGroove** – Working with a partner, visiting students will use a dance editor program Ozobot Bit robot to dance.
- ✓ **OzoBlockly** - Working with a partner, visiting students will use an OzoBlockly Editor to program Ozobot Bit code editor.

The Owens Instructor will summarize what was done in class today and highlight some of the MIT Scratch activities found in the Teacher Post Visit Resource packet for continued study back at school and home. Students will also be invited to the next Howard B. Owens Family Science Night.

Evaluation (5 min): Students analyze their understanding of the concepts, and teachers have the opportunity to assess student learning.

Assessment will be on-going throughout the lesson monitoring student responses to questions and ability to program Ozobot Bit robot through the challenge tasks. Additional assessment and extension activities have been included in the Post Activity packet which includes the Howard B. Owens Selective Response Post Program Assessment.

Modifications and Accommodations: TBD by the Visiting Teacher and HBOSC Instructor

Refer to the PGCPS UDL website to identify specific strategies or technologies to address specific needs of individual students: http://www1.pgcps.org/udl

- Advanced Learners
  - Will be given more difficult Ozobot Programming Challenges..
- English Language Learners
  - Will be shown demonstrations, videos and grouped with fluent English partners.
- Students with Disabilities
  - If necessary, will have their Ozobot calibrated by the HBOSC Instructor, be paired with a supportive partner and assigned appropriate Ozobot programming challenge tasks.