Verizon Innovative Learning Lab Program Robotics Project User Guide

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Specifications

- Product Name: Verizon Innovative Learning Lab Program Artificial Intelligence & Robotics
- Lesson Facilitator Guide: Robotics Project: Project Overview
- Lesson Duration: 1 class period (approximately 50 minutes)

Product Overview

Welcome to the second round of projects in AIR! In this Unit 3 Project, students will have the opportunity to choose from three different project options in the field of robotics. They will apply design thinking, entrepreneurship, and knowledge from the AI and Robotics course to create a Sphero RVR solution for a real-world problem based on one of the users. Students will be provided with relevant background information on the problem, precedents of existing robotic solutions, conduct interviews for empathy mapping, use a budget worksheet for building, and finally, engage in a programming challenge that can be implemented and tested within the classroom space. In Lesson 1, students will read all three project overviews and then choose the project they want to work on for the remaining lessons.

Project Choices

There are three different Unit 3 projects that students can choose from. Each project has a different problem theme and user, but the process, product, and sustainability themes for each choice are very similar. Here are the three different project choices:

1. Project A: In this project, students will be designing, sketching, and building an RVR with a prototype attachment capable of using color sensors to differentiate between plastic (recyclable A) and paper (recyclable B) and pick them up.
2. Project B: In this project, students will be designing, sketching, and building an RVR with a prototype attachment capable of using color sensors to differentiate between two types of fish – tuna (sustainable) and halibut (limited resource) and catching them.
3. Project C: In this project, students will be designing, sketching, and building an RVR with a prototype attachment capable of using color sensors to differentiate between regenerative shellfish and wild populations then harvesting them.

Lesson Objectives

- Define the “who, what, and how” of for all three Project Choices:
    - A: Coastal Cleanup Bot
    - B: Fishing Bot
    - C: Farming Bot
- Decide if they want to work on Project 3A, Project 3B or Project 3C.

Materials

To complete this Lesson, students will need:

- Laptop/tablet
- Student worksheet

Standards

- Common Core State Standards (CCSS) – ELA Anchors: R.9
- Common Core State Standards (CCSS) – Mathematical Practice: 1
- Next Generation Science Standards (NGSS) – Science and Engineering Practices: 1
- International Society for Technology in Education (ISTE): 6
- National Content Standards for Entrepreneurship Education (NCEE): 1

Key vocabulary

- Empathize: understand a user's wants and needs from their point of view.

Before you begin

- Gather necessary materials (or ensure remote students can access needed materials)
- Review the "Lesson 1: Project Overview" presentations, rubric, and/or lesson modules. Note that there are three different presentations for this lesson, as there are three different project choices.
- Consider if you want to assign students to a specific project, allow students time to read all three projects and make a choice, or work on a single project as a class!
  o Facilitation Suggestion: Encourage students complete Lesson 1 individually and choose which Project they like, then the teacher can place students in groups according to preferred Project (A, B or C). Then, students can work in teams of 2-3 to complete the remaining lessons of the project.
- This project has a RVR building component and a programming challenge component. For the programming challenge, a cleared floor space is needed to test the RVR movement. The 3 different project options will all work with a single map of Samsonville that can be 'built' on your classroom floor with 3 specific 'zones' for each challenge. If you are limited on space, you might choose just one project. The full map has been designed so you can build it with very limited supplies and materials on hand. Additionally, you may involve your students in building the floor map with printed or recycled materials and decorate as much as you like.
- The attachments the students will be making will not be functional or powered by the robot. For example, if a student wants to make the Coastal Clean Up Bot, they could design a rake, a scooper, or a claw type attachment – but it is important they understand this is a 'non-functioning' prototype.

Lesson Procedures

Welcome and Introductions (2 minutes)

Welcome students to class. Use the included presentations, or direct students to the self-guided SCORM module if available on your Learning Management System. Explain to students that they will be exploring three different project options today. By the end of class, students will choose which project (3A, 3B, or 3C) they would like to work on. You may choose to have students review each project overview individually and then decide. Alternatively, you may review each project overview as an entire class and then have students make their choices at the end.

Warm up, Projects A, B, and C (2 minutes each)

Each project overview begins with a simple warmup question. Here are the warmups for each project overview:

1. Project A Warm up: Are you interested in improving the safety and wellbeing of all the Samsonville citizens by

designing a Coastal Clean Up Bot with the Sphero RVR to help clean up the polluted beaches?

2. Project B Warm up: Are you interested in helping Dock to Dish, the Samsonville seafood restaurant, improve its business operations and build a sustainable fishing bot?

3. Project C Warm up: Are you interested in learning about how robotics and artificial intelligence can help the environment through gardening and farming?

Who, What, and How for Projects A, B, and C (5 minutes each)

After students complete the warmup, they will learn about the who, what, and how for each project. Here is a quick summary of each project:

1. **Project A: Coastal Clean-Up Bot**
    - Who: Tamara Touriste, a robotics researcher and frequent tourist to Samsonville
    - What: A coastal cleanup robot that will distinguish between plastic and cardboard
    - How:
        - Create an empathy map and problem statement.
        - Learn about coastal pollution and the importance of keeping the coasts clean.
        - Brainstorm and sketch ideas for the RVR and a prototyped attachment that can identify plastic vs cardboard recyclables using the Requirements and Budget Worksheet.
        - Create pseudocode and/or a diagram/picture of the program you want your RVR to follow.
        - Create a prototype using the RVR kit and other prototyping materials.
        - Use Sphero Edu to program and test your Coastal Clean Up Bot on the provided map. Record your robot running its path. If it does not successfully complete the program debug and revise the

program before testing the Bot again.
    - Turn in your empathy map, sketches, Budget Worksheet, and video/pictures of your Bot running its course with completed reflection questions.
2. **Project B: Sustainable Fishing Bot**
    - Who: Dock to Dish, the Samsonville seafood restaurant
    - What: A sustainable fishing bot to improve business operations
    - How:
        - Create an empathy map and problem statement.
        - Learn about sustainable fishing and its importance.
        - Brainstorm and sketch ideas for the RVR and a prototyped attachment that can identify plastic vs cardboard recyclables using the Requirements and Budget Worksheet.
        - Create pseudocode and/or a diagram/picture of the program you want your RVR to follow.
        - Create a prototype using the RVR kit and other prototyping materials.
        - Use Sphero Edu to program and test your Coastal Clean Up Bot on the provided map. Record your robot running its path. If it does not successfully complete the program debug and revise the program before testing the Bot again.
3. **Project C: Robotics in Gardening and Farming**
    - Who: Francis Farmer, a regenerative ocean farmer and owner of Kelp Kultivators in Samsonville.
    - What: A farming bot
    - How:
        - Create an empathy map and problem statement.
        - Learn about coastal pollution and the importance of keeping the coasts clean.
        - Brainstorm and sketch ideas for the RVR and a prototyped attachment that can identify plastic vs cardboard recyclables using the Requirements and Budget Worksheet.
        - Create pseudocode and/or a diagram/picture of the program you want your RVR to follow.
        - Create a prototype using the RVR kit and other prototyping materials.
        - Use Sphero Edu to program and test your Coastal Clean Up Bot on the provided map. Record your robot running its path. If it does not successfully complete the program debug and revise the program before testing the Bot again.
        - Turn in your empathy map, sketches, Budget Worksheet, and video/pictures of your Bot running its course with completed reflection questions.

Project Examples (3 minutes each)

Students will review examples of the type of project they choose. For 3A, the Coastal Clean Up Bot, three real world images are presented with hyperlinks. Each of the robots is designed to clean up trash and has an attachment. For 3B, the Fishing Bot, there are also real-world examples of aquatic robots that monitor and help with sustainable fishing. This will give them a tangible idea of the types of deliverables they will be creating. Make sure students are sure what project and user they are focusing on.

Wrap up, deliverable, and assessment (5 mins)

- Wrap up: If time permits, discuss the three project choices. Have students raise their hand or move to certain corners of the room based on project preference.
- Deliverable: There is no deliverable for this lesson. The goal is for students to choose one of the project

options.
- Assessment: There is no assessment for this lesson. The goal is for students to choose one of the project options.

Differentiation

- Additional Support #1: For ease of facilitation, you may choose to have all students work on the same project choice. For instance, perhaps each student will work with a partner on project 3A.
- Additional Support #2: You may choose to present and describe each project choice to the entire class, rather them have them independently read the overviews. Alternatively, you could “jig saw” the project overviews and have a group of students summarize a specific project choice to the entire class.
- Extension: Make this a cross curricular project with the students’ other teachers! The following projects pair well with these subjects:
    - Project 3A (Coastal Clean Up Bot): science, environment, economics, ELA
    - Project 3B (Fishing Bot): economics, engineering, science, history, math
    - Project 3C (Farming Bot): history, engineering, science, math.

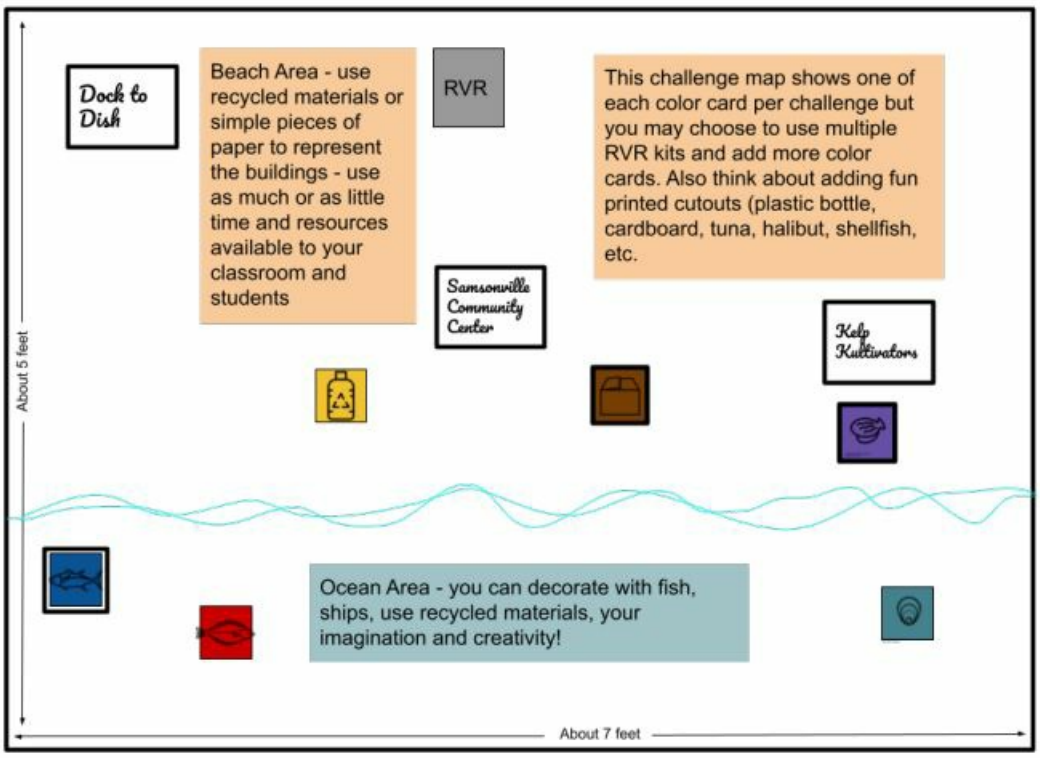
Supplement

This supplement is designed to help you setup the Challenge Map in your classroom for the AIR Unit 3 Project. Look through the map, the photo, and the instructions. Use the setup that works best for your classroom space and your students’ needs. The Challenge Map is designed to be implemented with limited resources that you may have on hand or can be extended by involving your students to help build and design the map with upcycled materials, magazine clippings, materials students bring in, etc. The full map will take up approximately 5’ x 7’ of classroom space and is divided into three specific zones for the three different challenges. For the minimum challenge, the RVR should be able to:

- navigate from Dock to Dish to a ‘water area’ to ‘catch’ fish designated by two different color cards then return to Dock to Dish
- navigate from Samsonville Community Center to ‘beach area’ to ‘pick up’ a plastic bottle and a cardboard box designated by two different color cards then return to the Center
- navigate from Kelp Kultivators to beach and water area to pick up farm shellfish and to designate non-farm shellfish then return to Kelp Kultivators

Students will build a prototype attachment that could be capable of picking up, catching, or harvesting. They will simulate the prototype operation by using LED lights on the RVR that light up to indicate the action of picking up, catching, or harvesting. You may modify this activity in a variety of ways:

- Add additional color cards or requirements for different sensors to add extra challenge.
- Have students challenge each other with races or have them simulate picking up and dropping off at all 3 locations.



Documents / Resources

Verizon Innovative Learning Lab Program Artificial Intelligence & Robotics Lesson Facilitator Guide: Robotics Project: Project Overview	Verizon Innovative Learning Lab Program Robotics Project [pdf] User Guide Innovative Learning Lab Program Robotics Project, Learning Lab Program Robotics Project, La b Program Robotics Project, Program Robotics Project, Robotics Project, Project

References

- ISTE | 1. Students
- User Manual