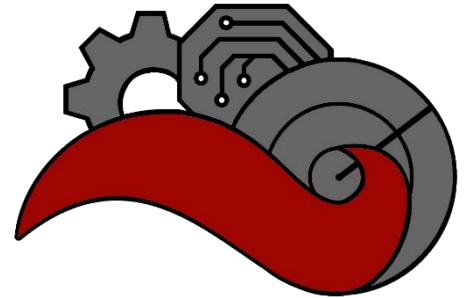THE UNDERWATER ROBOTICS TEAM

STEMBot Outreach Program

September | 2022

Meet the Team 2022-2023

Marta Koziy
Finance
Class of 2025
Business Team

Gabe Willenberg
Mechanical Engineering
Class of 2023
Mechanical Team

Chinyere McLean
Electrical and Computer
Engineering
Class of 2024
Navionics Team

Brach Knutson
Electrical and Computer
Engineering
Class of 2025
Software Team

Dr. Ziaeefard
Team Faculty Advisor
Senior Lecturer, Electrical
and Computer Engineering

Hollie Hinton
Business Advisor
Director, Corporate Relations
University Advancement

Overview of STEMBot Outreach Program

STEMBot Kit

ABSTRACT

- This proposal aims to promote science, technology, engineering, and math (STEM) among underprivileged schools within the greater Columbus area.

WHAT IS THE ROBOT MADE OF?

- Materials include inexpensive, common manufacturing items (e.g. PVC).

OBJECTIVE FOR DESIGN

- To make a plug and play robot so we can focus on the fundamental concepts of engineering (e.g. CAD design, circuits, basic programming)

The in-person curriculum consists of the following…

OVERVIEW

5 Day Program

60 Minutes/Day

WE AIM TO TEACH BASICS!

TOPIC OF THE DAY

01 Introduction to the Program

02 Fundamentals of Mechanics

03 Fundamentals of Electrical

04 Fundamentals of Software

05 Testing the STEMBots in the Obstacle Course

Documentation will be received from Rosemore Middle School students and UWRT members

UWRT MEMBERS

- Read and Acknowledge the Standard Operating Procedure for the STEMBot Outreach Program
- Take and Pass the Universal K-12 Training 60 Days Before Volunteering
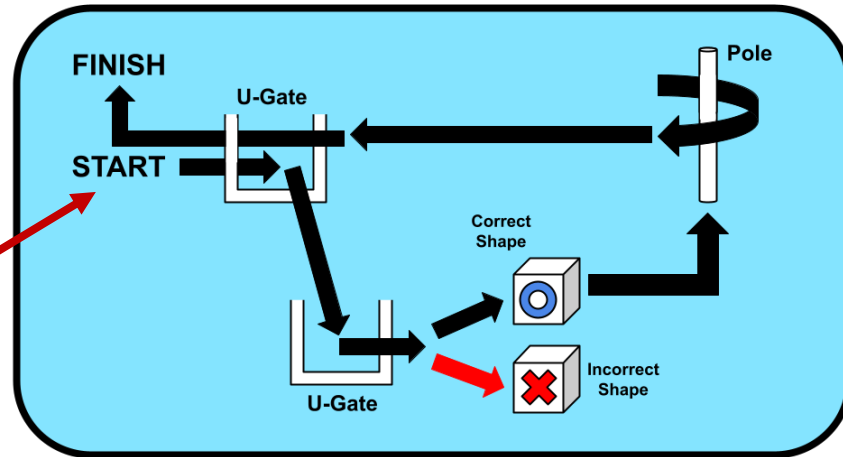
ROSEMORE MIDDLE SCHOOL STUDENTS

- Signage of Liability Waiver by parent/guardian
- Signage of Photo Release Form by parent/guardian

The obstacle course will have tasks like what UWRT sees at competition

STUDENT WILL USE A CONTROLLER TO GUIDE THE ROBOT THROUGH THE COURSE

Each student team will have the ability for at least one person to navigate the robot through the obstacle course!

Cost of Program

TOTAL PROGRAM COST: $1,000.00

MATERIALS

$500.00

PARTS

$150.00

CIRCUIT BOARDS/BATTERIES

$200.00

ADDITIONAL COSTS

$150.00

THE UNDERWATER ROBOTICS TEAM

Detailed Curriculum for each Section of STEMBot

Learning Initiatives

MECHANICAL	ELECTRICAL	SOFTWARE
• I can use TinkerCAD. • I can build a remote operated underwater vehicle (ROUV). • I understand center of mass and center of buoyancy and its applications.	• I understand the differences between series and parallel circuits. • I can build simple circuits on a breadboard. • I know concepts related to motor speed control. • I can use software to control motors and LEDs. • I can build a remote operated underwater vehicle (ROV).	• I can understand and explain what software is. • I can understand what ROS is and how it applies to the STEMBot. • I can understand and explain the different applications software has. • I can build and run a simple program using Scratch.

Curriculum: 60 minutes

| Section	Lesson Plans	Description	Resources
1	Introduction to mechanical team, TinkerCAD account set-up	• ~30 minutes to set up TinkerCAD	• Intro mechanical presentation • CAD modeling presentation • instruction packet
2	Introduction to making parts	• Starting a project • Learn to sketch • Learn to extrude and cut	• CAD modeling presentation • instruction packet
3	Introduction to assembly and constraints, introduction to COM and COB	• Learning assembly feature in TinkerCAD (focusing on mating) • Center of Mass and Buoyancy experiment and teaching	• StemBot CAD modeling presentation • STEMBot COM&COB presentation • Instruction packet
4	Assembly of STEMBot and being modifications of STEMBot	• Assembling physical STEMBot mechanical kit	• Instruction packet

Curriculum: 60 minutes

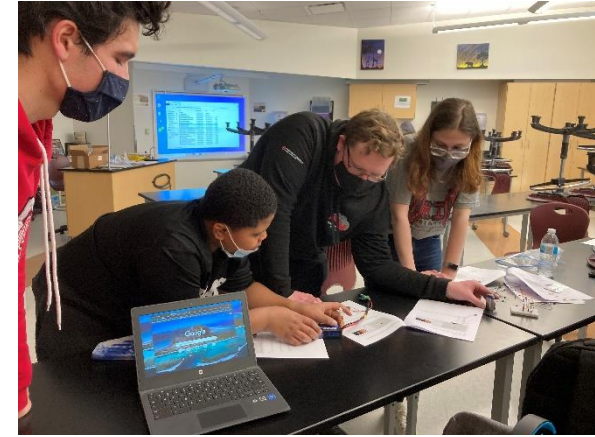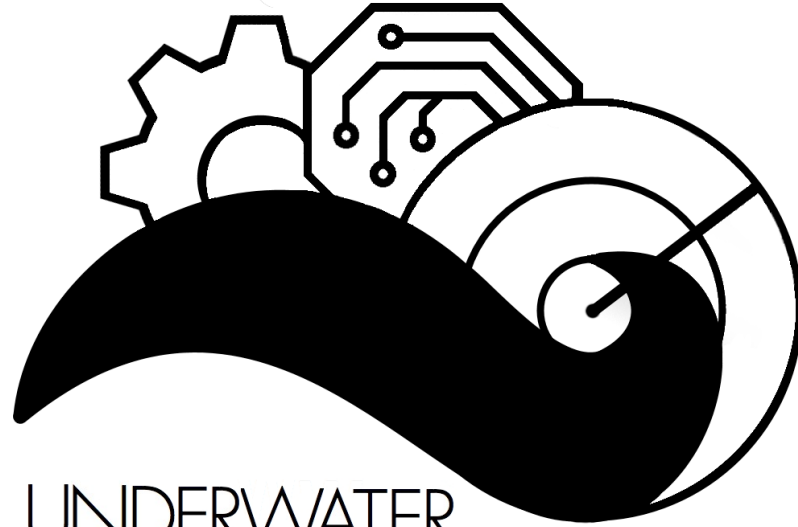| Section	Lesson Plans	Description	Resources
1	Introduction to electrical team and battery safety	• Simple intro to the team • What EE is all about • General battery safety presentation	• Team intro presentation • Battery safety presentation
2	Introduction to simple circuits and breadboard demos	• Simple intro to the team • Circuits with resistors • Circuits with LEDs • Circuits with switches	• Simple circuits presentation • Simple circuits instructional packet
3	Motor circuits and motor speed control	• Motor types and uses • Demo motor circuits • Explanation of motor speed control • Motor speed control demo	• Motor controller presentation • Motor controller instructional packet
4	Microcontrollers; connecting software with electronics	• What is a microcontroller • Controlling LEDs with a MCU • Controlling Motors with MCU	• Microcontroller presentation • Microcontroller instructional packet
5	ROUV electrical construction	• Putting together the ROUV from kit and instructions	• ROUV construction instructional packet

Curriculum: 60 minutes

Section	Lesson Plans	Resources
1	Intro to Software	• Introduction to software presentation • Code.org activities
2	Software: Introduction to Simple Code and ROS	• Internet access for Code.org and ROS Slides
3	Introduction to Scratch	• Introduction to scratch presentation & internet access
4	Scratch Activities	• Instructions to create an online scratch game (easy) • Instructions to create an online scratch game (medium) • If time permits, students can create their own online games and use UWRT members as a resource
5	Introduction to STEMBot Software	• UWRT codebase & simulator • Software team walkthrough

Photos from STEMBot Workshop
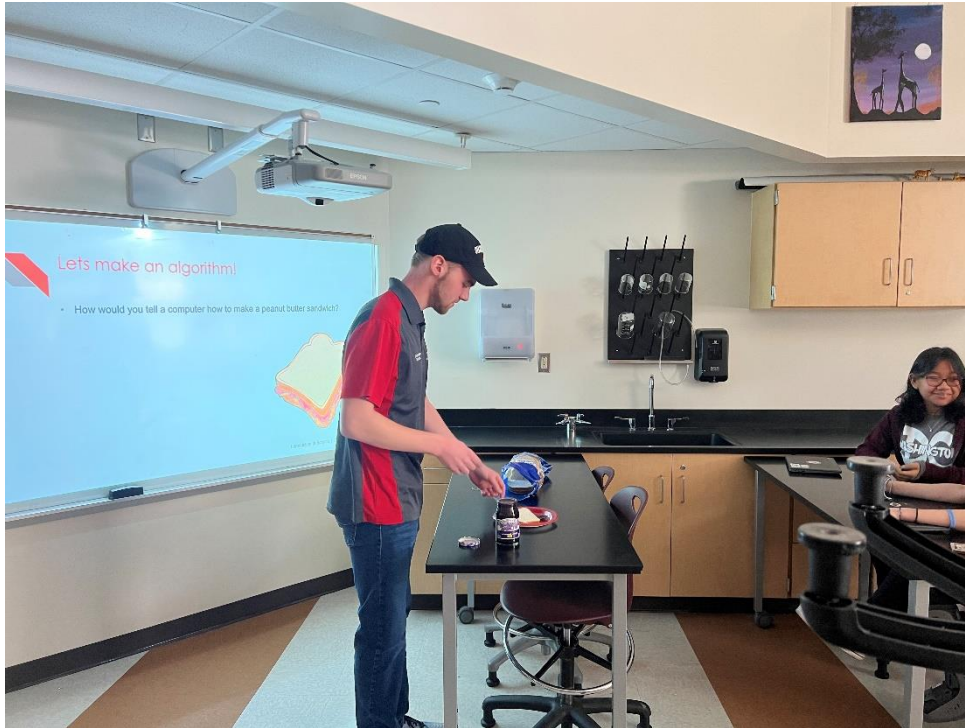
Photos from STEMBot Workshop

UNDERWATER
ROBOTICS