Advanced Manufacturing and Prototyping, Integrated to Unlock Potential

AMP IT UP

## 7th Grade Science Curriculum

Griffin-Spalding County School System

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Advanced Manufacturing and Prototyping Integrated to Unlock Potential (AMP-IT-UP)

- **A National Science Foundation Math and Science Partnership to promote workforce development and to identify and cultivate the next generation of creative STEM innovators.**

  - Partnership with the Griffin Spalding County School System
 - Impact: > 11,000 students over 5 years
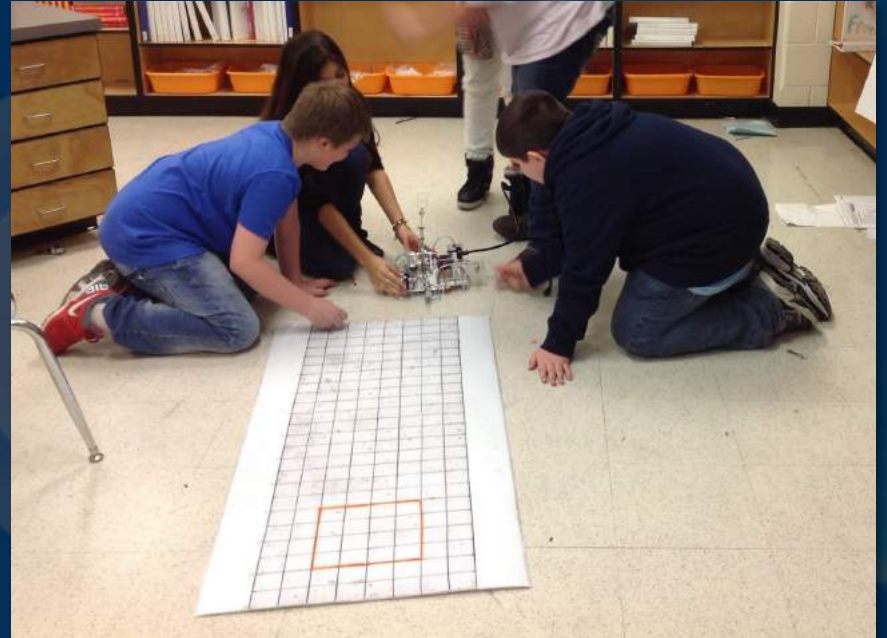
Integrates middle school engineering, science and mathematics to promote STEM learning and entrepreneurship.

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Advanced Manufacturing & Prototyping Integrated to Unlock Potential

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The Program Components

- Middle school STEM Innovation and Design exploratory courses that enable students to explore their creativity using robotics and rapid prototyping
- **Middle school math and science modules that promote inquiry and connect with Georgia Tech High school engineering courses that focus on design-build challenges**
- Extracurricular enrichment for students and teachers
- Research on how AMP-IT-UP affects academic engagement, content understanding, knowledge transfer, and student persistence in STEM

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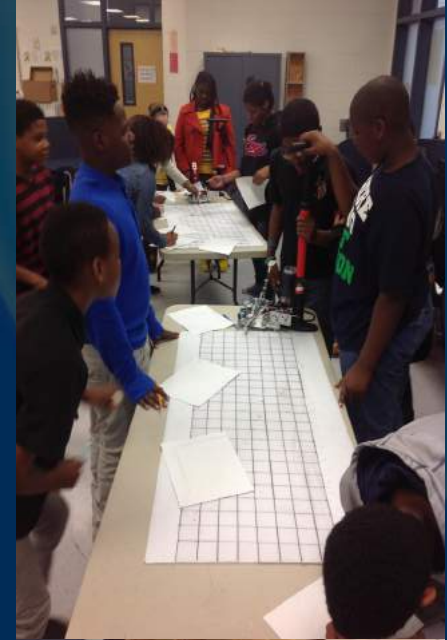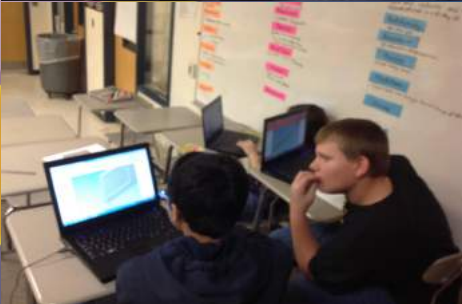
AMP-IT-UP Math/Science Modules

- Nine Math Modules and Nine Science Modules

- Each grade level has three modules in each content area aligned to specific NGSS practices

- Each module presents a challenge that requires math/science content development to develop solutions

- Math modules use science/engineering context and data to teach specific math standards
  - Ocean Zones
  - Solar Energy
  - Manufacturing Challenge

- Science modules use data analysis to reinforce math standards

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NGSS Practices

Each module focuses on one of these themes:

- **Experiment**
  - Planning

- **Data Visua**
  - Analyzing

- **Data-Drive**
  - Construct
  - Engaging in Argument from Evidence (Practice 7)

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as procedures become standardized.

Students analyze data and situations that are intentionally murky, and to make decisions based on data, but where there isn't a simple solution and instead they need to address various trade-offs and then communicate and defend their decisions.

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Science Modules

Experimental Design
- Molten Madness(6)
- Oil Spill Drill (7)
- Ocean Blizzard (8)

Data Visualization
- Shake and Brake (6)
- Under the Sea (7)
- Riding the Concrete Wave- Part 1 (8)

Evidence Based
- Snow Day (6)
- Don't Wreck the Reef (7)
- Riding the Concrete Wave – Part 2 (8)

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Seventh Grade Science Modules

Experimental Design

Data Visualization

Decision Making

Oil Spill Drill

Under the Sea

Don't Wreck the Reef

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Under the Sea

- 7th Grade Data Visualization
- **Challenge:** Students analyze photos of corals to determine the effect of the Deepwater Horizon Oil Spill on Deep Sea Communities
- **Time:** This module takes 4-5 days
- **Georgia Tech Research Connection:** ECOGIG (Ecosystem Impacts of Oil and Gas Inputs to the Gulf) research consortium

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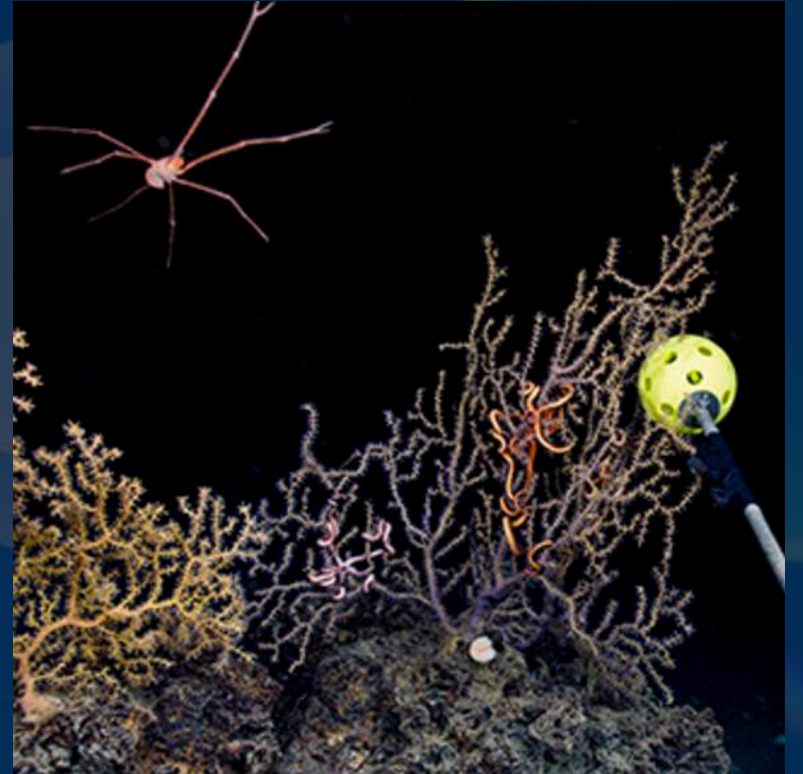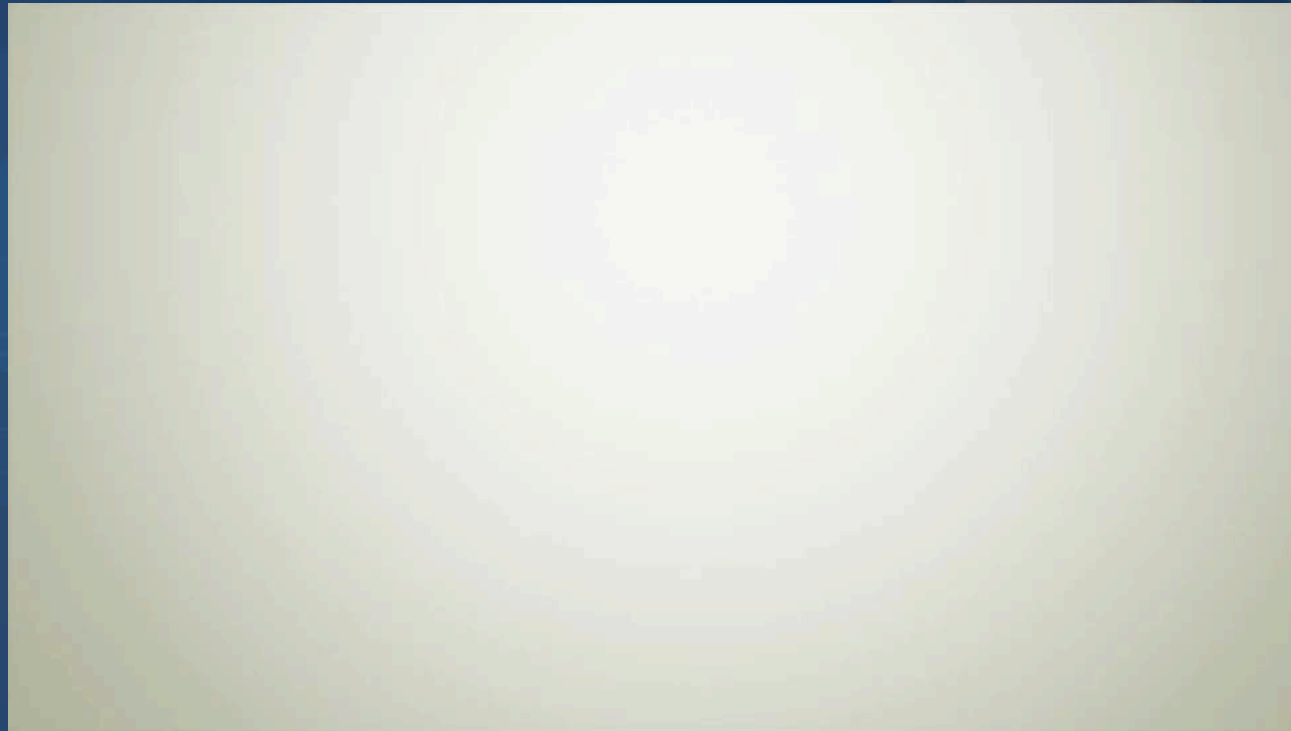
Oil Spill Drill

- 7th Grade Experimental Design Module
- **The Challenge**
  - Students engage as environmental engineers to assist coastal Georgia communities to develop a procedure to develop the fastest, most efficient way to remove oil after a spill.
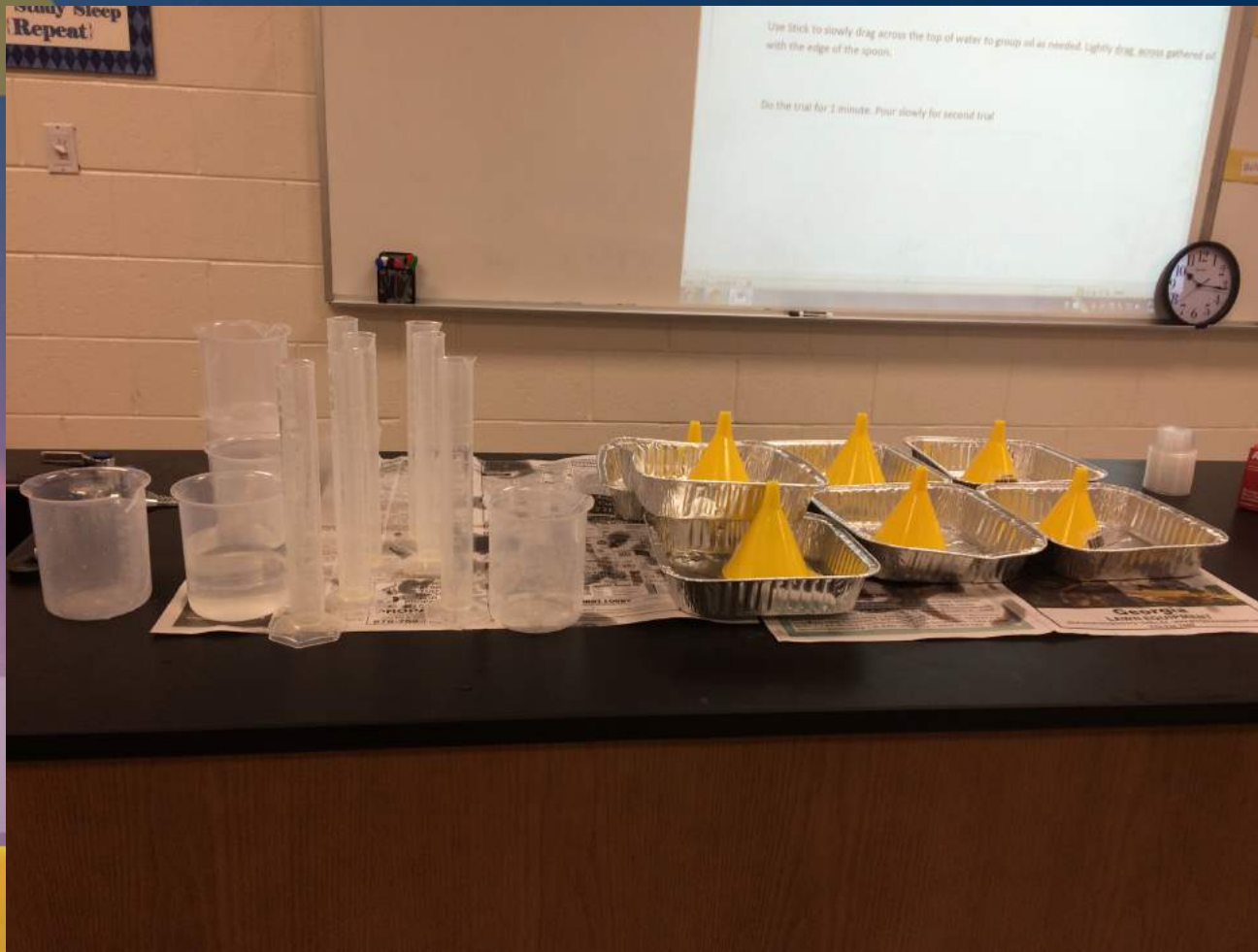
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Oil Spill Drill

Time: This module take 4-5 days.

End Product: Letter to ***Coastal Communities Coalition of Georgia*** explaining the best procedure to clean up oil off the Georgia Coastline

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Oil Spill Set-Up

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Samples of student work (procedures) in the Oil Spill Drill

Oil Spill Challenge 7EDS

NAME

STUDE

DATE: 8/1/16

TEACHER: Mrs. Stowe

High quality student work sample

ion Sheet 1

Record the steps in your procedure to test how to remove 20 ml of oil from a water tray without removing large amounts of water. Your procedure should focus on the removal process, not the set-up.

1. Collect Materials
2. We're gonna measure out 20mL of oil
3. Skim the top with the spoon
4. Put the oil that's on the spoon an pour it into the cup
5. Flip the spoon over and cover the opening of the cup
6. Pour it into the funnel but make sure the spoon is covering the opening so the oil doesn't come out.
7. Pour the water that was in the cylinder back into the tray.
8. Record your results.

DATA

Don't Wreck the Reef
Evidence Based Decision Making

Challenge: Students assist the people of Fiji to understand what factors are degrading their reef. Students investigate a model of the food web at the coral reef to generate and then project species population data . They then take this data to help the people of Fiji decide how many fishing permits need to be allowed to keep the reef safe.

Time: This module take 4-5 days

Don't Wreck the Reef 3D Learning

## Core Concepts, Practices, and Core Content

- Predator/Prey relationships

- Food Web/Food Chain

- Interdependence of organisms, Ecosystems

- Obtaining, evaluating, and communicating information

- Constructing Explanations

- Causality (Cause and Effect)

- Systems (Stability and change)

- Developing and using models

- Analyzing and interpreting data

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Introducing
Don't Wreck the Reef
Georgia Tech Research Connection

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Providing Context and Content to the Challenge

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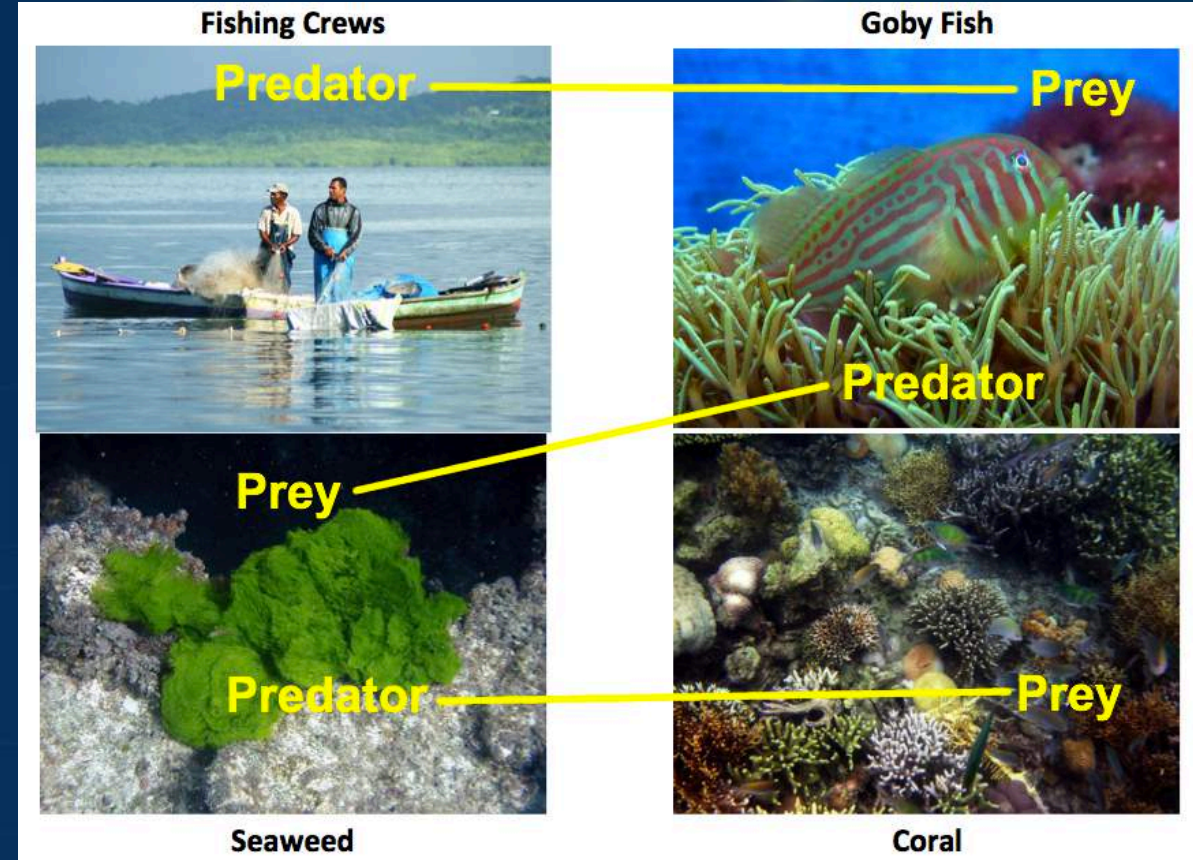
Modeling the Food Web

- **Year 1 Simulation:** Use the instructions on P. 11-12 and use the Reef Sorting Sheet to model the changes in population of Goby, Seaweed, and Coral

> - 1 Orange Counter = 1 Fishing Crew
> 1 Purple Counter = 100 Goby fish
> 1 Pink Counter =10 feet of healthy Coral
> 1 Green Counter = 1 clump of Seaweed

- **Years 2-5 Simulation:** Use the instructions on P.13 to simulate the population changes through year 5. Remember to allow for reproduction and add (2) Goby, five (5) Seaweed, and one (1) Coral between each year.

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Data Analysis

GOOD		POOR
15 or Greater	**GOBY**	Fewer than 15
30 or Greater	**CORAL**	Fewer than 30
Fewer than 10	**SEAWEED**	10 or Greater

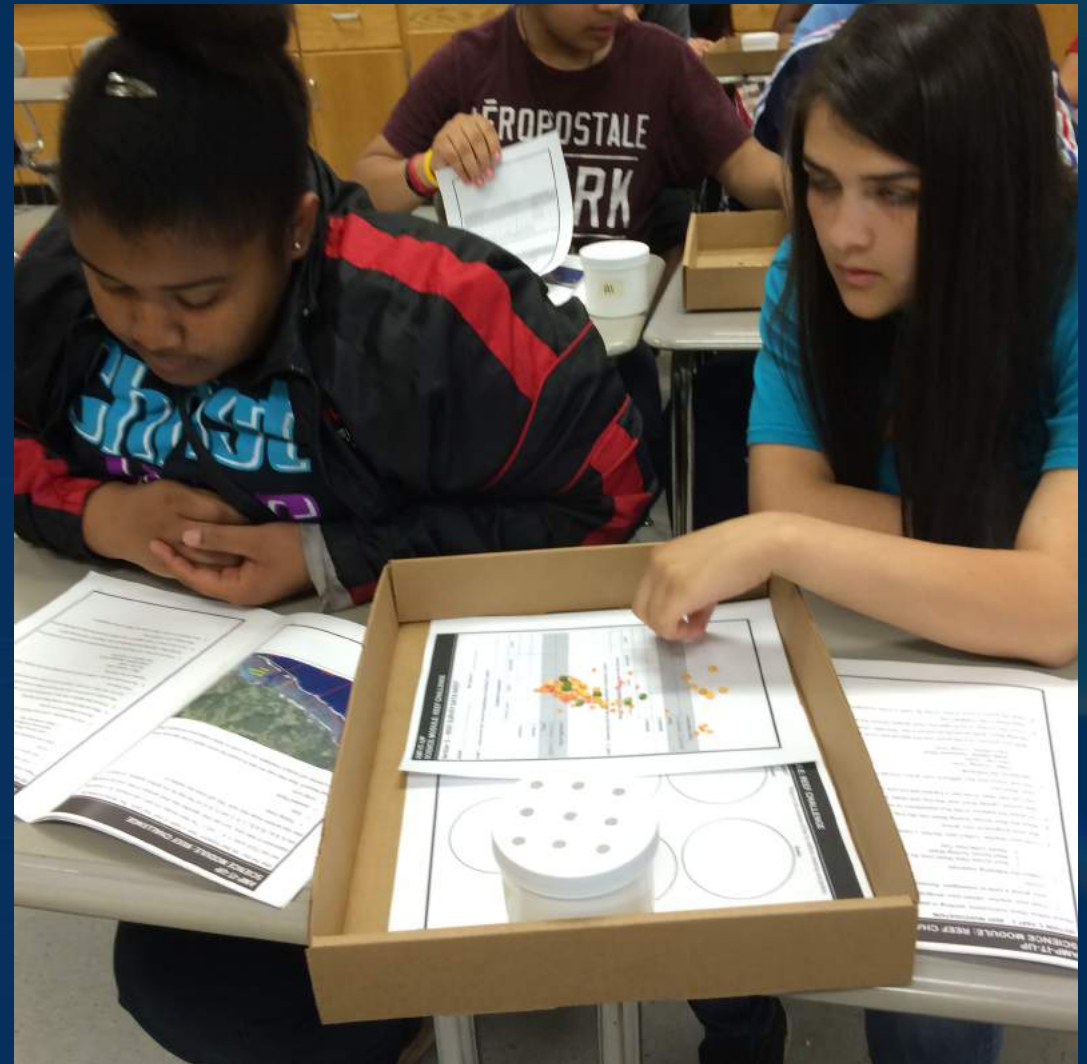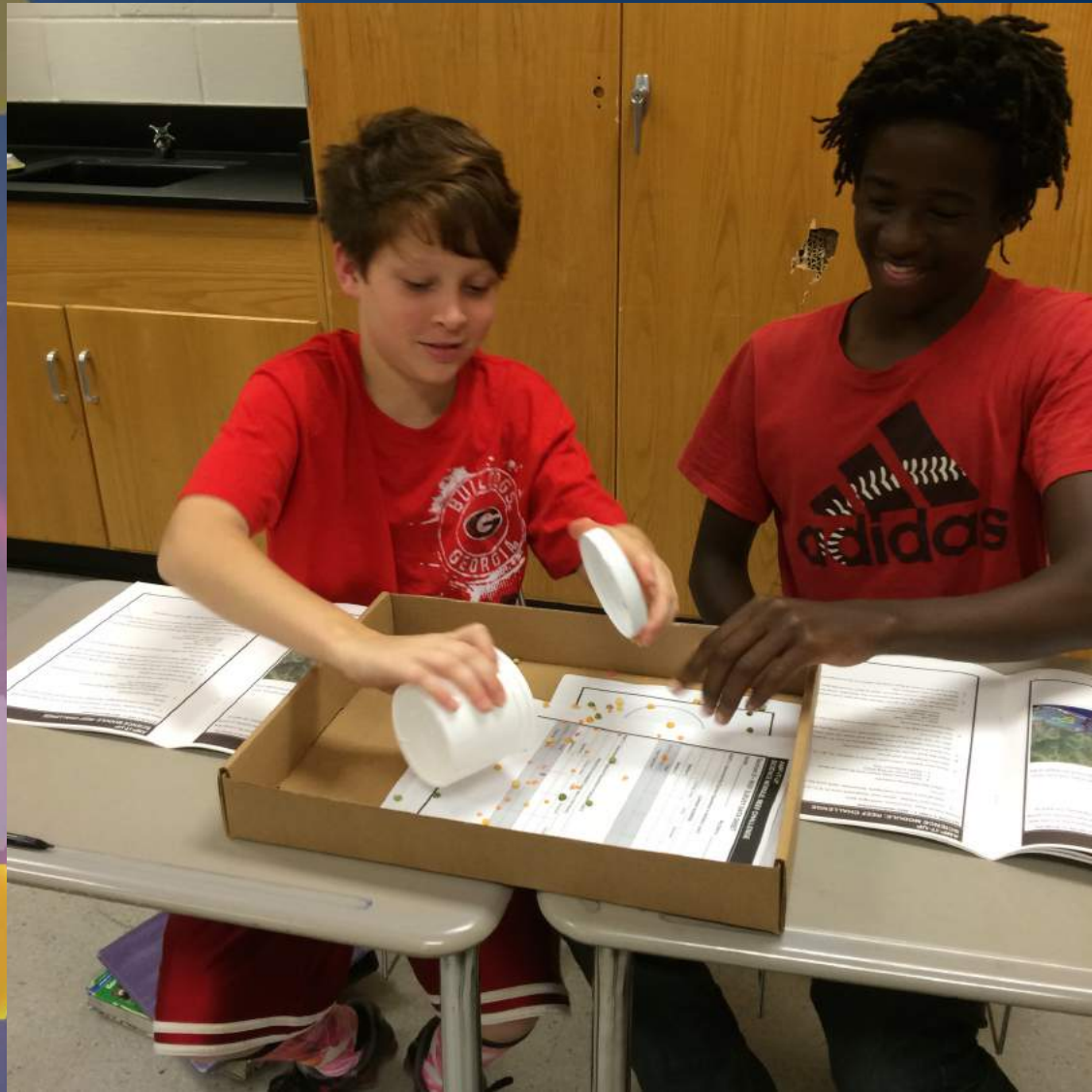| **VERY HEALTHY**	All 3 organisms are **GOOD**
HEALTHY	2 of 3 organisms are **GOOD**
UNHEALTHY	2 of 3 organisms are **POOR**
VERY UNHEALTHY	All 3 organisms are **POOR**

Making Decisions Based on Data
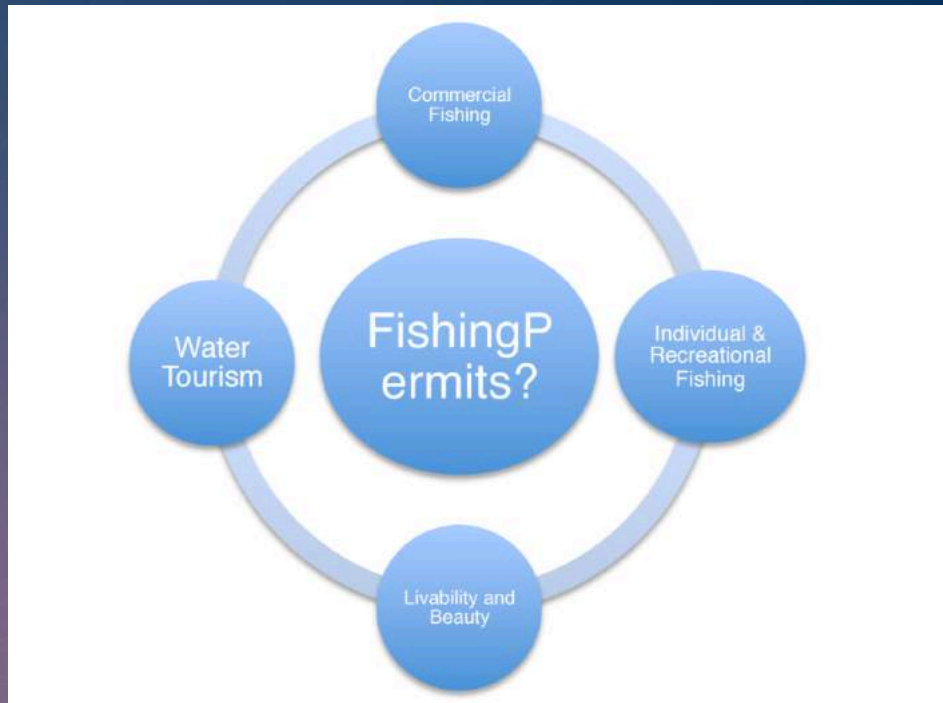
Reef Location	Commercial Permits	Individual Permits	Number of Goby	Number of Seaweed	Number of Coral
Initial	1	1	20	100	100
End of year 1			19	88	18
End of year 2			18	77	1
End of year 3			17	67	1
End of year 4			16	58	1
End of year 5			15	50	1
End of year 6			8	43	1

- **https://drive.google.com/open?id=1b7tCIKe0Iz-NBrUbzfkfInUjKH60HzA4V0WyJGOZx3g**

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Students in Action

Georgia Tech Research Connections

Georgia Tech Biology Professor, Dr. Mark Hay

Reef Research Team

DOUG   DANIELLE   PAIGE   JULIA   ROBERTA

ECOGIG
Gulf Ecosystem Research

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Want to learn more? Visit ampitup.gatech.edu

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AMP-IT-UP Module Request Form

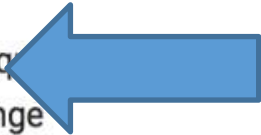Start ————————————————— Module Selection ————————————————— Complete

Selected Modules *
(check all that apply)

☐ .6th-12th Grade - Engineering/Technology - Electronic Engineering Design Process Log

☐ 6th Grade - Engineering/Technology - Carnival Tycoon Challenge

☑ 6th Grade - Math - Data Visualization: "Data Saves the Whales!" - Whale Challenge

☐ 6th Grade - Math - Experimental Design: "Some Assembly Required" - Packaging Challenge

☐ 6th Grade - Science - Data Visualization: "Molten Madness" - Lava Challenge

☐ 6th Grade - Science - Experimental Design: "Shake and Break" - Earthquake Challenge

☑ 7th Grade - Engineering/Technology - Flight of Fancy Challenge

☐ 7th Grade - Math - Data Visualization: "Crab Friend or Foe?" - Crab Ac

☐ 7th Grade - Math - Experimental Design: - Board Game Piece Challenge

☐ 7th Grade - Science - Data Visualization: "Don't Wreck the Reef" - Coral Reef Challenge

☑ 7th Grade - Science - Experimental Design: "Oil Spill Drill" - Oil Spill Challenge

☐ 8th Grade - Engineering/Technology - Robot Rescue Challenge

☐ 8th Grade - Math - Data Visualization: "Extract the Hot Shots!" - Hot Shot Challenge

☐ 8th Grade - Science - Data Visualization: "Riding the Concrete Wave" - Helmet Challenge

☐ 8th Grade - Science - Experimental Design: Cookie Challenge

☐ 9th Grade - Engineering - Foundations of Engineering and Technology

[Go back to Module Request Form]   [Submit Module Request]

Fill out the information on Module Request Form and then select the module(s) that you would like copies and click submit. You will then receive an email with the links for downloads of the modules requested.

Contact Information

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