Welcome to the Monterey regional
MATE ROV Stakeholders' Meeting

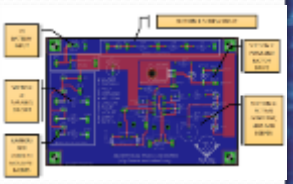
Background on the Marine Advanced Technology Education (MATE) Center

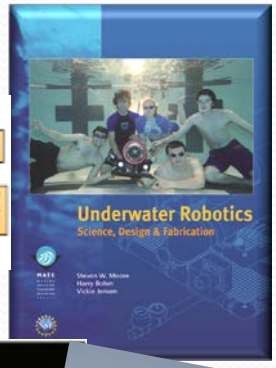
MATE is a national partnership of more than 700 colleges, universities, high school, marine industries, and professional societies.

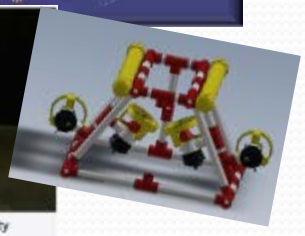
MATE's mission is to use marine technology to create **interest in and improve STEM education** and to provide the marine technical workforce with **well-educated STEM professionals.**

MATE Center Activities

Textbooks & Kits







ROV Building Tutorial 4D – Electrical Safety Demonstrations

Workforce Studies

Underwater Robotics Competitions

Teaching Training

At-Sea Internships

Industry Connections

Career Awareness

2013 MATE International ROV Competition

http://vimeo.com/73115789

MATE SHOW AND TELL

- **MATE ROV kits – “SCOUT,” Angelfish, & Triggerfish**
- **MATE Electro-Trainer**

Are Robots Hurting Job Growth?

http://www.cbsnews.com/video/watch/?id=50154583n

ITEST Scale-Up Grant

Scaling Up Success: Using MATE's ROV Competition to Build a Collaborative Learning Community that Fuels the Ocean STEM Workforce Pipeline

- Funded by the National Science Foundation's Division of Research on Learning in Formal and Informal Settings (DRL).

- Overarching goal: Encourage multi-year student participation in an effort to deepen student interest and learning and reinforce pathways leading to the STEM workforce.




What is new in the Scale-Up Grant?

1. We will focus on multi-year participation; how do we keep students involved year after year?
2. We will focus equally on middle and high school students.
3. We will focus on strategies that will sustain these programs (in classrooms, afterschool clubs, and parents' garages) over time.
4. We will engage parents to a greater degree.
5. **We will develop much improved curricula (tied to workplace competencies and NGSS), videos, and support kits.**
6. We will continue to improve the web site for regional coordination, competition registration and the longitudinal tracking of students.
7. We will measure student LEARNING as well as self-efficacy.

General Engineering/Project Management

A student finishing the (SCOUT) (SCOUT+) (RANGER) level should be able to:

[all levels but responses/activities will be increasingly complex for each progressive level]

1. Describe and implement the engineering design process (spiral).
2. Describe specific strategies to address common design and building challenges (keeping on schedule, on budget, team dynamics, safety, etc.)
3. Define project constraints (time, money, expertise, vehicle depth, etc.)
4. Build a shallow diving ROV using hardware-store technology.

Technology and Society

A student finishing the (SCOUT) (SCOUT+) (RANGER) level should be able to:

1. Describe what a robot is.
2. Describe the common types and uses of modern underwater vehicles.
3. Conduct an underwater mission and relate this mission to what commercial ROVs are doing in science and industry. (see MATE Center competition for examples.)
4. Identify motivating factors and key historic events in the evolution of underwater vehicles.
5. Name and describe the major subsystems of a modern work class ROV.
6. Describe some of the major challenges confronted by developers of early underwater vehicles and describe how they were overcome.

Electrical Knowledge:

A student finishing the (SCOUT) (SCOUT+) (RANGER) level should be able to:

1. Define current, voltage, resistance and explain their relationship to Ohm's Law.
2. Describe what a complete circuit contains.
3. Describe the operation of a switch.
4. List three different types of DC power sources and select an appropriate battery for your vehicle.

Next Generation of Science Standards

Physical Sciences

- PS 1: Matter and its interactions
- PS 2: Motion and stability: Forces and interactions
- PS 3: Energy
- PS 4: Waves and their applications in technologies for information transfer

Life Sciences

- LS 1: From molecules to organisms: Structures and processes
- LS 2: Ecosystems: Interactions, energy, and dynamics
- LS 3: Heredity: Inheritance and variation of traits
- LS 4: Biological Evolution: Unity and diversity

Earth and Space Sciences

- ESS 1: Earth's place in the universe
- ESS 2: Earth's systems
- ESS 3: Earth and human activity

Engineering, Technology, and the Applications of Science

- **ETS 1: Engineering design**
- **ETS 2: Links among engineering, technology, science, and society**

If you understand how to build an ROV, what else can you do?

DOL's Mechatronic Competency Model

http://www.careeronestop.org/competencymodel/pyramid.aspx?ME=Y

COMPETITION STRUCTURE

The competition is divided into 4 classes that vary depending on the vehicle specs & complexity of the mission tasks:

- ***EXPLORER*** *(advanced)** *(vehicle demonstration required)*
- ***RANGER*** *(intermediate)*+* *(participation in regionals required, some exceptions)*
- ***NAVIGATOR*** *(beginner/intermediate) +*
- ***SCOUT*** *(beginner)+*

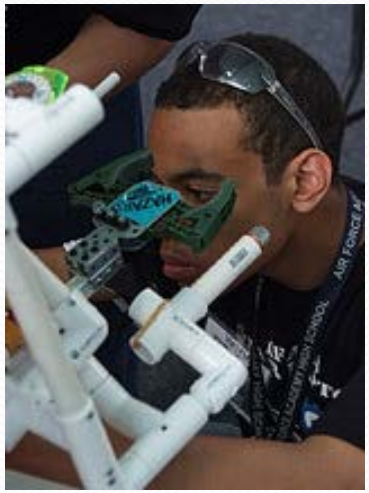
**these classes participate in the international competition*

+these classes participate in the regional contests

COMPETITION STRUCTURE

- ***EXPLORER***
  - 48 volts, 40 amps
  - Camera required
- ***RANGER***
  - 12 volts, 25 amps
  - Camera required
- ***NAVIGATOR***
  - 12 volts, 15 amps
  - Camera required
- ***SCOUT***
  - 12 volts, 15 amps
  - No camera required

- ***OVERALL***
  - “Platform” of your choice
  - Must have a fuse and pass a safety inspection
  - No onboard electrical power
  - Fluid power is permitted – see detailed specs for more information
  - No limit on building materials, but they must not damage the pool



SeaMATE ROV kits* & more

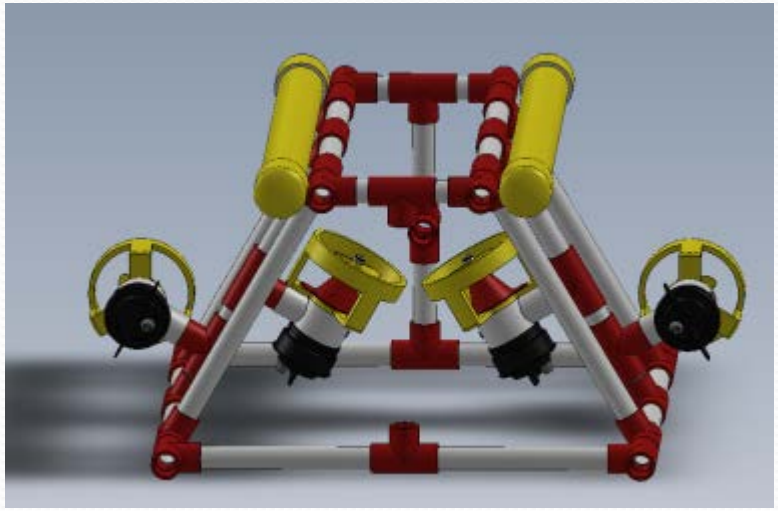
(*with parts and tool lists and detailed building instructions)

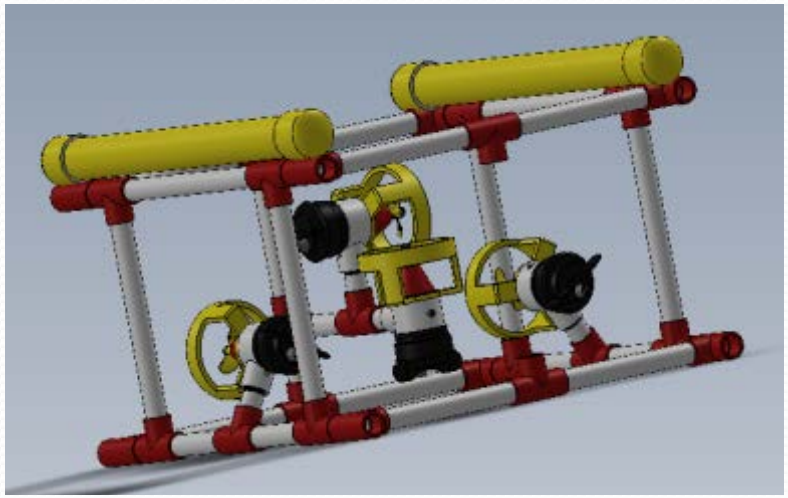
With more kits to come…

- **PufferFish**
- **Coral CatFish**
- **SunFish**

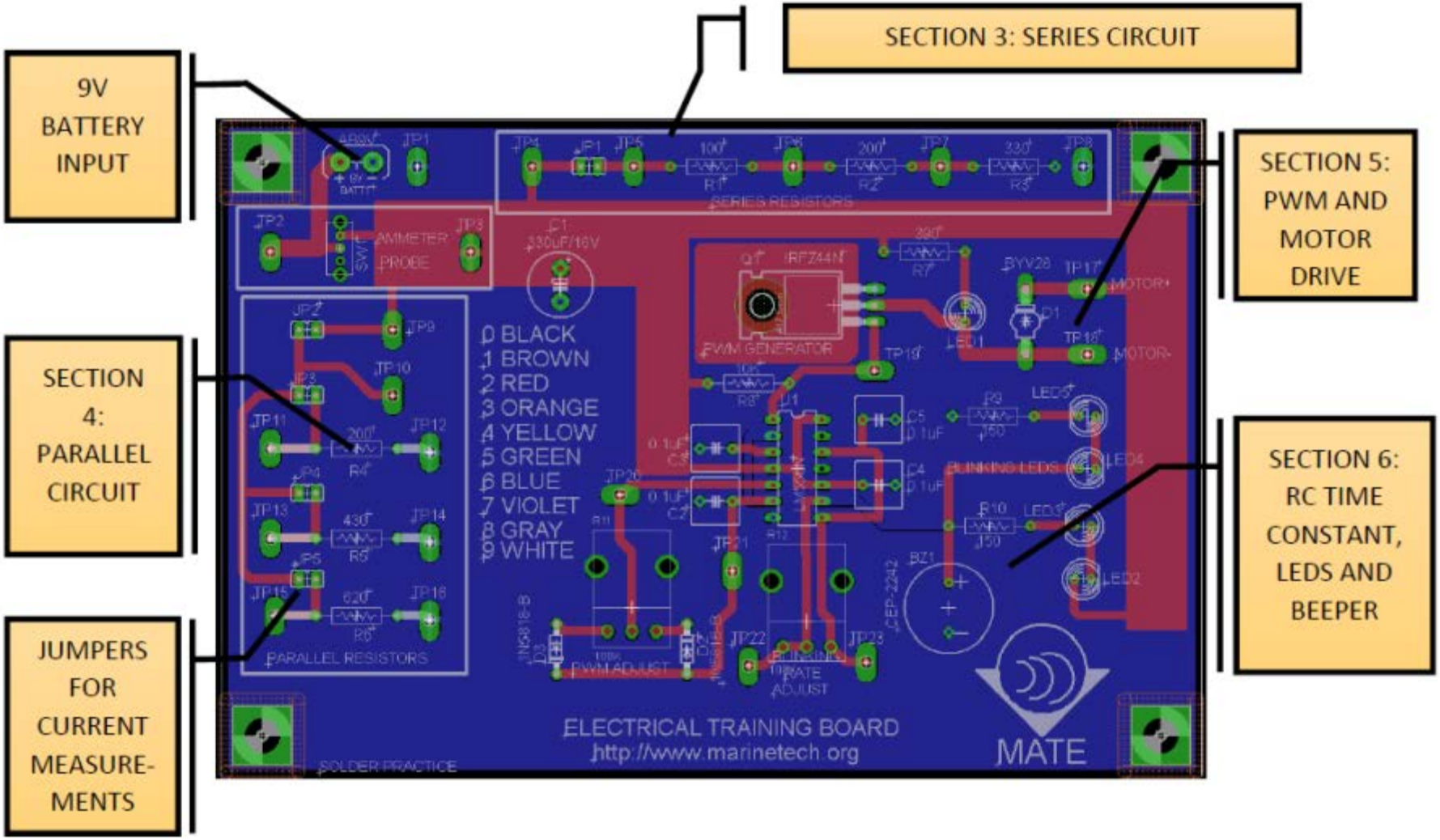
SeaMATE TriggerFish ROV Kit

The SeaMATE TriggerFish uses the K-166 Bidirectional DC Motor Speed Controller to introduce speed control, offering more complexity (as well as better control) than the simple switch box ROV. The TriggerFish has two motor configurations – orthogonal and vectored.



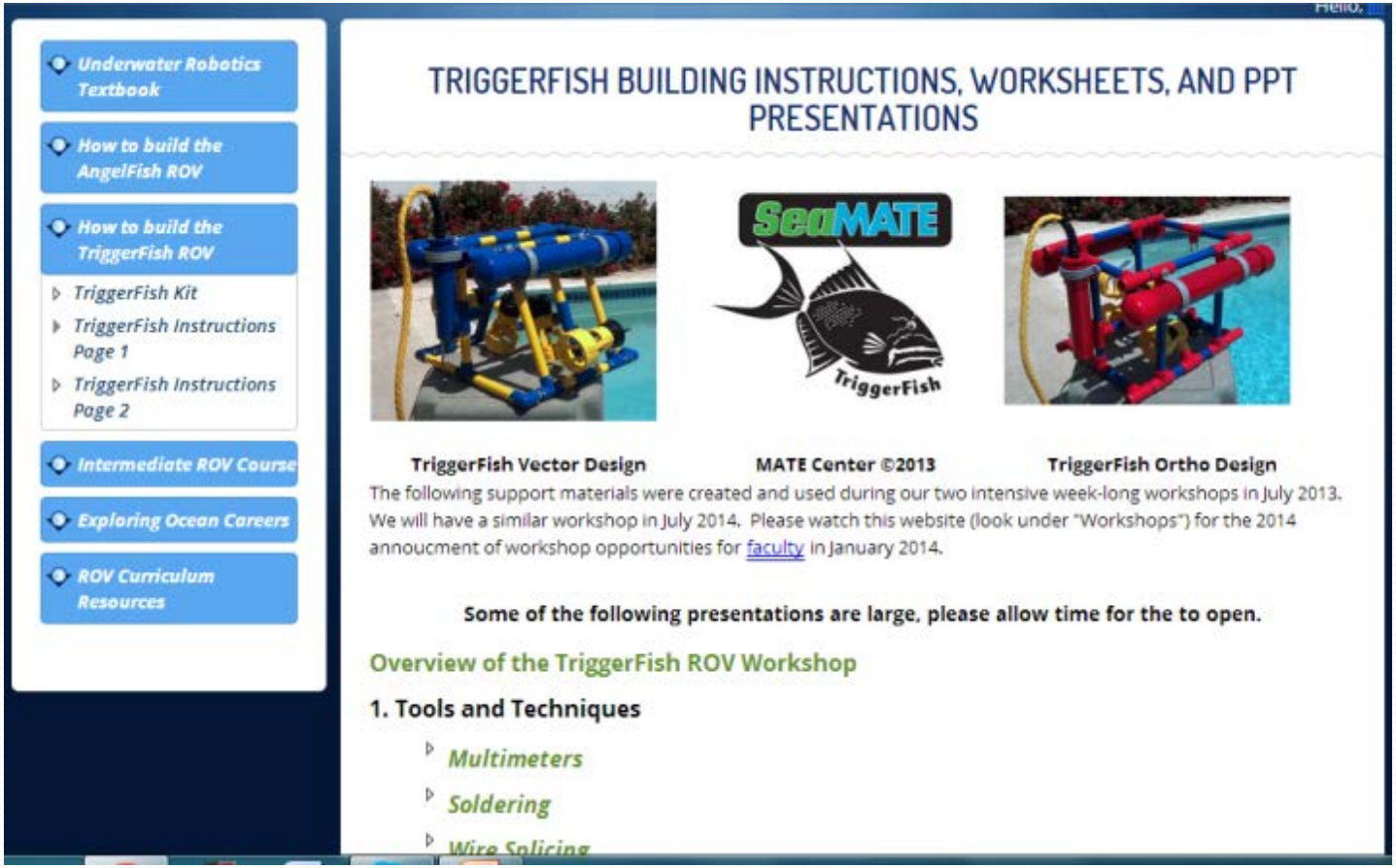


MATE Electrical Trainer Board: soldering & multimeter practice



Curriculum and instructional resources

- **Tied to workplace competencies (the hallmark of MATE) and the Next Generation of Science Standards**
- **Online assessments (we hope that you will contribute your best practices)**
- **This is a start – more in the works!**



Over 30 introductory videos starring MATE's Matt Gardner

www.marinetech.org/tutorial-7f-left-handed-and-right-handed-propellers-/

A new competition class, curriculum tied to standards, how-to videos, kits, and more to support the progression of learning (and multi-year participation)

- Given the geographic reach of our program, these resources will be online, with regional workshops and teacher leaders to provide professional development and support at the local level.
- Over time we hope to build capacity (teachers and students) and a wealth of resources online so that the program can be sustained in schools even when the NSF funding goes away.

MONTEREY REGIONAL SUPPORT

- **Teachers and students participate in the ROV program:**
  - Afterschool
  - In the classroom

- **Current offerings**
  - 2-hour “ROV-in-a-bag” activity for teachers and students
  - 2-hour switch box control wiring workshops
  - Camera waterproofing workshop
  - Pool practice days

- **Future offerings (including this school year)?!**
  - Electro-trainer trainings
  - TriggerFish control box workshops
  - Design review sessions coupled with pool practice days