



# TWIN PEAKS MIDDLE SCHOOL

POWAY UNIFIED SCHOOL DISTRICT

## Status Report for the INCOSE STEM Award

### Twin Peaks Middle School SeaPerch ROV kits

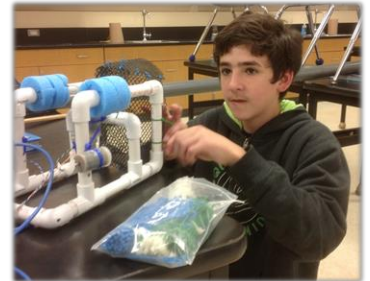
The SeaPerch program is an annual nationwide competition in which student teams build, test, modify and compete by piloting an underwater Remotely Operated Vehicle (ROV) through a series of underwater challenges. The national SeaPerch program is sponsored by the U.S. Navy Office of Naval Research and managed by the Association for Unmanned Vehicle Systems International (AUVSI). San Diego's regional SeaPerch competition will be hosted at Grossmont College on April 16, 2016. The INCOSE STEM award is enabling two teams from Twin Peaks Middle School to prepare and compete in the regional SeaPerch competition. Highlights of our SeaPerch program accomplishments are featured below.

#### *Program Accomplishments*



#### **Procured and assembled SeaPerch ROVs:**

- Two mixed teams of 7<sup>th</sup> and 8<sup>th</sup> graders built and tested SeaPerch ROV kits
- Modifying and optimizing their designs to maximize ROV performance.
- Students learned soldering, assembly, test and documentation practices.



#### **Developed “Engineering Process” lesson plans:**

- Wrote and conducted Engineering Process lessons to address the Next Generation Science Standards.
- SeaPerch students using the Engineering Process to guide their iterative ROV modification and testing.
- New Engineering Process lessons being promulgated throughout the school district.



#### **Pool-test program underway:**

- Students testing and documenting ROV performance as they modify their vehicles and techniques.
- Practicing for April 16 Regional Competition at Grossmont College.





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## Fabricated acrylic parts for Orbs assembly:

- Students learned Autodesk Inventor to lay out parts for laser cutting.
- Field trip to Poway High School engineering lab to help engineering students laser cut parts.
- Tested alternate 3D-printed parts from a UCLA 3D-printing laboratory.



## Assembled/testing Orbs challenge apparatus:

- ROVs actuate levers to release balls underwater
- Students practicing ball-handling techniques



## *Record of Expenses*

Following are the materials being purchased for the Twin Peaks Middle School SeaPerch program. As of March 21, 2016 some of these purchases are still pending. We are currently testing our first SeaPerch Orbs assembly before buying materials to build the second practice unit, we have not yet purchased all the materials for our tri-fold poster presentations, and the SeaPerch registration fees are not collected until the day of the competition.

#	Description	Source	Cost
1	SeaPerch ROV kits (2 ea. at \$169/ea.)	AUVSI Foundation	\$ 338.00
2	SeaPerch tool bag (1 ea.)	AUVSI Foundation	\$ 235.00
3	Materials and supplies for SeaPerch Orbs course (2 sets)	Lowes	\$ 212.10
4	Acrylic stock for laser-cut Orbs parts	Ridout ePlastics	\$ 49.68
5	Materials for SeaPerch obstacle course (2 sets)	Home Depot	\$ 100.00
6	Materials for SeaPerch tri-fold poster presentations	various	\$ 50.00
7	Registration for April 16 competition (2 teams at \$35/ea.)	SDSA	\$ 70.00
	TOTAL		\$ 1,054.78



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## *Student Benefits*

**Direct benefits to SeaPerch students:** SeaPerch is designed to provide students with the opportunity and motivation to learn about robotics, engineering, science and mathematics as they build and compete with their ROVs. Throughout the effort students learn about the engineering process, problem solving, teamwork and technical applications. Another integral part of the SeaPerch competition is a poster presentation to a panel of judges. Each SeaPerch team is producing a poster to document their engineering efforts and each team is required to make an oral presentation accompanying the poster. Students must develop skills to perform, document and communicate the results of their engineering practices.

**Benefits to other students:** In addition to the students directly engaged in our SeaPerch competition, students throughout our school – and beyond – will benefit from our participation in the SeaPerch program, made possible by the INCOSE award. As noted above, our SeaPerch program has been used to develop curriculum for teaching the Engineering Process – which will likely be required by law when the Next Generation Science Standards are widely adopted in the 2016-2017 school year. The lessons we developed, used and refined with our SeaPerch students are being incorporated into district-wide efforts to prepare for the new NGSS standards.

On a more local scale, our 8<sup>th</sup>-grade physical science students will be studying buoyancy and forces in fluids in April and May 2016. We intend to have SeaPerch students share their work with their science classes and use the SeaPerch ROVs to illustrate properties of fluids and buoyancy. These lessons are expected to reach several hundred of our 8<sup>th</sup>-grade students.

**Benefits of collaboration:** Another tremendous benefit from our participation in the SeaPerch program arises from connections we have established between our STEM classroom and people and organizations out beyond the classroom walls. Exposing our students to collaborators from outside our own school is an eye-opening experience for the students, broadening their perspective and giving them the opportunity to picture their future selves engaged in engineering and technical work. The collaborators listed below also serve as exemplary role models – generously lending their time and expertise for the sake of our students' learning. Notable collaborators with our SeaPerch students include the following:

Person / Organization	Collaboration
Mentor Rick Degelsmith – parent of PUSD students	Rick has voluntarily devoted significant time and energy mentoring the students in all aspects of the SeaPerch effort, from solder training to pool practice.
Mentor Tom Ayotte – mechanical engineer with Ocean Aero, Inc.	Tom volunteered to lend our students his expert advice and guidance as an engineer currently working to develop and produce a novel underwater vehicle.
Poway High School Engineering Laboratory	Poway High student Navjot Gill met with our students on a field trip to Poway High and demonstrated their laser-cutting equipment. Teacher Rodger Dohm led a tour of their engineering lab facility.



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Person / Organization	Collaboration
UCLA 3D-Printing Club – Bioengineering Department	UCLA Bioengineering student (and former Twin Peaks student) Brooke Zampell offered the services of the UCLA 3D-printing community to build test parts for the Orb challenge apparatus.
Hunter Pashkow – Teacher/SeaPerch team leader, Warren-Walker Middle School	Hunter has been our “go-to” source for information and advice regarding many aspects of the SeaPerch program. His interest and willingness to help has been exemplary and a great model for our students.
INCOSE – San Diego Chapter	Our SeaPerch students are aware of the financial award from INCOSE that made their SeaPerch learning – <i>and fun!</i> – possible.

Prepared by:

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