



# **FINAL REPORT**

**January 1, 2006 – February 28, 2009**

**CURRICULUM IMPROVEMENT  
PARTNERSHIP AWARD II PROGRAM**

**Hartnell College**

Name of Institution

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**Dr. Pimol Moth and Ms. Shannon McCann**

Principal Investigators

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# CIPA II Program

## Final Report

January 1, 2006 – February 28, 2009

**1.0 Name of Institution:** Hartnell College

**2.0 Names of Co-Principal Investigators:** Dr. Pimol Moth and Ms. Shannon McCann

**3.0 Name of CIPA II Project:** Engineering Program Upgrade with Project Management

### 4.0 Project Activities

#### Overview

During the three year lifetime of the Hartnell NASA CIPA II grant, the CIPA II grant team has been able to accomplish all the goals established for the grant and has succeeded in institutionalizing many of the initiatives which comprise the grant. Strategically, this project represents another key piece in the College's effort to upgrade all its science, engineering, and mathematics program in order to increase enrollment, retention, and transfer of underrepresented students in STEM majors. The curriculum upgrades intended for the grant have been accomplished and have all been adopted by the Hartnell curriculum committee. The internship training and speaker series programs have grown and become institutionalized. The project resulted in a closer relationship between Hartnell and the UCSC Baskin School of Engineering thus improving the transfer pathway for Hartnell's students. The feedback that we have received from our students indicates that they are responding remarkably well to project management. Students have gained hands-on project management experience and developed their communication, leadership, and teamwork skills through their participation in several projects such as the Project Management Institute, the Physics Olympics, the Robotics Olympics, and the Regional and International Remotely Operated Vehicle competitions.

The following table lists the main goals taken directly from the NASA CIPA II Project Plan and our achievement of these goals:

<u>Goal</u>	<u>Achievement</u>
Infuse the principles of project management into all current engineering courses	We revised 6 existing engineering and computer science courses and created 1 new special projects course in engineering to include principles of project management. 158 total students received project management training through these courses.
Make the engineering curriculum more current and relevant to developments in modern technology	We purchased 10 laptops for the engineering labs and much needed equipment. We updated Engineering 1 to include a laboratory component and Computer Science 4 to include MATLAB.
Connect our underrepresented students to	Several students participated in research at the

university research early in their development.	Center for Adaptive Optics, the Astronomy and Astrophysics Department, and the Jack Baskin School of Engineering at the University of California, Santa Cruz
Give STEM students critical skills like project management that will give them an advantage when entering the workforce	Created the Project Management Institute (PMI) to train 42 CIPA II STEM interns in project management. 48 students were enrolled in the engineering special projects course to participate in the PMI and planning the Robotics Olympics, and the International Remotely Operated Vehicle competition.
Work with our partners to develop internship support projects as critical platforms to launch our students into universities and the workforce	Created new internships and research experiences at partner institutions. In summers 2006, 2007, and 2008, 42 STEM students participated in internships.

### Engineering Curriculum Upgrade

One of the main goals of the project was to upgrade the engineering curriculum with project management. To complete this goal, the Hartnell CIPA II team revised 6 existing engineering courses and created one new special projects course. The courses that have been revised and passed by the Curriculum Committee are:

- **Engineering 1, *Introduction to Engineering and Related Technologies***: revised in 2006 to include an emphasis on project management training such as student collaborations on team projects and analyzing engineering disasters and assessing risks due to design flaws. This course was revised again in December 2008 to include a laboratory component and improved the articulation of the course with 4 year universities.
- **Computer Science 4, *Introduction to Scientific Programming***: revised in spring 2007 to articulate with a required course at the University of California, Santa Cruz (UCSC) and meets the needs of students by providing them with training in MATLAB. The CIPA II grant has purchased the MATLAB software for the course which was offered for the first time in spring 2008.
- **Engineering 2, *Engineering Graphics/CAD***: revised in fall 2007 to include project management. Specifically, the students will identify potential problems in engineering projects, track projects more effectively, create status reports that show where budgeting, scheduling, and manpower trends are heading, and complete projects within tight project deadlines.
- **Engineering 4, *Materials Science*, Engineering 6, *Introduction to Circuit Analysis*, and Engineering 8, *Engineering Statics***: revised spring 2008 to include components of project management into the course outlines. Some of the project management content added to the revised course outlines include: student participation on team projects and instruction on staffing management, schedule management, quality control and assurance, risk analysis, and cost analysis.

The new course, **Engineering 45, *Special Projects***, was designed by the CIPA II team and was formally completed, reviewed, and accepted by Hartnell College in December, 2006. Through this student-centered course, students are actively engaged in their own learning and are given the tools and training to work independently or as a part of a sustainable team on an engineering project of interest to the students.

During the spring 2007 semester EGN 45, the engineering special projects course, was launched for the first time. Nine students were enrolled in this special projects course, working as a team to write a project plan to design, construct, and test a remotely operated vehicle (ROV). In 2007, the ROV team won 2nd place in the Monterey Bay Regional ROV competition held at the Monterey Peninsula College (MPC). In 2008, they entered the ROV into the International ROV competition held at the University of San Diego, and sponsored by the Marine Advanced Technology Education (MATE) Center. The Hartnell ROV team traveled to San Diego in June 2008 for this competition. During their first time participating in the international competition, Hartnell placed 13th out of 27 community colleges and universities around the world and won the “Biggest Bang for the Buck” award. They scored higher than several top universities such as the Massachusetts Institute of Technology, UC Santa Cruz, and UC Davis.

Additionally, during summer 2008, eighteen students were enrolled in EGN 45 as part of their participation in the 2008 Project Management Institute (PMI). This represents a 64% increase from the 2007 internship cohort. PMI for Hartnell STEM Interns is a training program sponsored by the NASA-CIPA II grant and aimed at infusing project management into early research experiences for science, technology, engineering, and mathematics (STEM) students at Hartnell College. Students who receive internships with the CIPA II partners are enrolled in the institute and are trained in project management before they pursue their internships.

The following table summarizes the program outcomes for the upgrade of the engineering curriculum:

<b>Course</b>	<b>Year course was revised</b>	<b>Year enhanced course was taught</b>	<b>Total # students at first census</b>
Engineering 1	Fall 2006	Fall 2007/Fall 2008	15/24
Computer Science 4	Spring 2007	Spring 2008/ Spring 2009	15/16
Engineering 2	Fall 2007	Spring 2008/Spring 2009	15/13
Engineering 4	Spring 2008	Offered Fall 2009	N/A
Engineering 6	Spring 2008	Spring 2009	12
Engineering 8	Spring 2008	Offered Fall 2009	N/A
Engineering 45 Special Projects	Fall 2006	Spring 2007/Summer 2007/Spring 2008/ Summer 2008	9 ROV/ 11PMI/10 ROV/18PMI
		<b>Total enrollment from Fall 2007-Spring 2009</b>	158

Hartnell is also establishing a new relationship with CSUMB, which has recently launched its Undergraduate Research Opportunities Center (UROC) whose main purpose is to place CSUMB and other regional students into research and experiential internships with CSUMB faculty.

## **Partnerships**

As a CIPA I grantee, Hartnell established partnerships with the Center for Adaptive Optics at UCSC, NASA-Ames, and Konica Minolta. Under CIPA II, Hartnell continued to build new partnerships and network with established ones. These partnerships have provided access to the expertise needed to ensure articulation of the courses, given students experience working with professionals in STEM fields, provided students access to cutting edge research and technology, and laid a firm foundation for internships and special projects collaborations. As a result of the work done by the CIPA II team Hartnell continues to work closely with the UCSC Baskin School of Engineering and its affiliated research center at NASA-Ames, the Center for Adaptive Optics (CfAO) at UCSC, the Naval Postgraduate School (NPS), the Fremont Peak Observatory Association (FPOA), the Monterey Bay Aquarium Research Institute (MBARI), the Monterey Bay Aquarium (MBA) and the Marine Advanced Technology Education (MATE) center at Monterey Peninsula College in developing and implementing this project. As we have begun to transition internship and special projects collaborations away from support by the NASA-CIPA II grant we have established new partnerships with the Pinnacles National Monument and the Monterey Institute of Research in Astronomy (MIRA).

### **CIPA II Grant Funded Internships**

#### **Fremont Peak Observatory Association**

Hartnell has placed teams of students each year at FPOA where the students worked as a team to write and carry out a project management plan to help them prepare for and organize weekly public night observing programs. Student responsibilities included operating the 30-inch telescope and the smaller instruments, interpreting the night sky for visitors, and delivering the pre-observation public lecture. In order to offer a wider variety of astronomy internship experiences, in 2007 the CIPA II team purchased a CCD (Charge-Coupled Device) imaging system that will operate at the Fremont Peak Observatory but will remain the property of Hartnell College. This has enabled both rising freshmen and more advanced students to find challenging opportunities in astronomy. In 2008 two Hartnell students used this equipment to collect and analyze data on Near Earth Asteroids. This successful internship program will be extended through 2010 as Hartnell's NSF Science Talent Expansion Project (STEP) grant takes over supporting this student team.

#### **Naval Postgraduate School**

Hartnell's relationship with NPS has strengthened over the three years of this grant as Hartnell STEM students have proven to be successful and well prepared participants in summer research internships. Leaders at NPS are so convinced of the value of these internship opportunities that they are currently searching for funding to continue supporting Hartnell STEM students in summer and academic year internships.

In 2006 two student interns worked closely with Dr. Craig Martell and his graduate students on projects in Computer Science and Artificial Intelligence. Dr. Martell was so impressed with the students that he arranged for more faculty to serve as research mentors the following year. In summer 2007 four current and former Hartnell students completed projects involving robotics, artificial intelligence and jet fuel propellant burn rates. The faculty who worked with these

students compared the quality of their work and their background preparation favorably with students from Ivy League institutions. For their willingness and ability to offer these valuable early research experiences to Hartnell students NPS was awarded Hartnell's Partnership of Excellence award on April 19th, 2008. That spring Dr. Martell helped link the Hartnell CIPA II team with the Cebrowski Institute at NPS. The Cebrowski Institute for Innovation and Information Superiority sponsors cross-discipline projects leading to innovations that strengthen global security in the information age. Dr. Peter Denning, Director of the Cebrowski Institute, has a strong passion for outreach and agreed to have the individual efforts of the NPS researchers who had been working with Hartnell's interns be brought under the umbrella of the Cebrowski Institute so that researchers from across the NPS campus could be linked with interns from Hartnell and other local educational institutions. This linkage resulted in a vastly increased number of research internships for Hartnell STEM students in 2008. Eleven students worked with eight researchers on such cutting edge research projects as: Probabilistic Search Theory; Autonomous Underwater Vehicles; Humanitarian Assistance/Disaster Relief; Mechanical and Astronautical Engineering; Automatic Understanding of Modern Computer-mediated Communication; Computer Vision and Image Processing; Document and Media; and Rocketry and Propulsion

#### Monterey Bay Aquarium Research Institute

Every summer MBARI selects 10 interns drawn from all over the United States to work on marine science research projects. These highly competitive internships are awarded to educators, graduate students, and undergraduates based upon their academic backgrounds and for their demonstrated interest in learning. In 2007, the CIPA II team developed a partnership arrangement with MBARI, which created a sponsored MBARI internship for a Hartnell STEM student. Oscar Mancillas, who transferred to the University of California at Berkeley to study biochemistry in the fall of 2007, was the first Hartnell student selected to fill this internship position. He worked with Dr. Peter Brewer on background research, at-sea data collection, and laboratory analysis of carbon dioxide sequestration in ocean water samples. Oscar served as third author on a peer-reviewed article on this research published in late 2008.

#### Monterey Bay Aquarium

In the summer of 2008 a Hartnell veterinary science student spent the summer working with MBA researcher Marissa Viens on sea otter blood diseases and growth rates.

### **Externally Funded Internships**

#### NASA-Ames

In 2006 Mr. Clarence Brown, UNCSEFP program officer, helped make arrangements to have a Hartnell STEM student placed in a NASA Science and Technology Institute (NSTI) at NASA-Ames.

#### Center for Adaptive Optics

In 2006 two Hartnell engineering students held seven-week summer internships with the CfAO. The students worked with CfAO research scientists on projects in adaptive optics engineering and analysis of Hubble Space Telescope imaging of dwarf elliptical galaxies. In 2007 one student worked with Dr. Joel Kubby, Associate Professor of Electrical Engineering, on a project investigating and characterizing various micro-electrical-mechanical systems (MEMS) large

stroke actuator designs used for the deformable mirrors in adaptive optics. 2007 was the last year of CfAO internships because the Center had come to the end of its NSF funding and discontinued their internship program.

B.A.STAR, at Chico State University

In 2006 one Hartnell STEM student participated in this computer science/computer engineering internship program at Chico State University installing and configuring computer servers and improving the wireless connection for a local elementary school.

Marine Advanced Technology Education Program

In 2007 a Hartnell STEM student was selected to participate in a MATE internship on the Research Vessel Pelican collecting and analyzing undersea geology data offshore in the Gulf of Mexico.

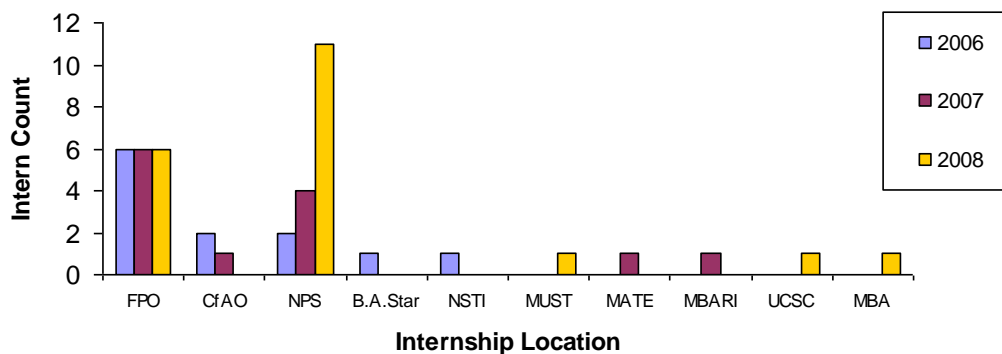
NASA-MUST (Motivating Undergraduates in Science and Technology) Program

In 2007 Hartnell student Ricky Fernandez was awarded a NASA-MUST scholarship and participated in an internship at NASA’s Kennedy Space Flight Center during the summer of 2008. During this internship, Ricky worked with Dr. David Grau to research a new technique for Non Destructive Testing of components of the Delta II rocket. In 2008 Hartnell student Daniel Chairez also won a NASA MUST scholarship and will be participating in an internship in the summer of 2009.

U.C. Santa Cruz, Astronomy & Astrophysics Program

In 2008 a Hartnell student was awarded an internship working with UCSC astrophysicist Dr. Enrico Ramirez-Ruiz on project titled “Feeding Intermediate Mass Black Holes”. Dr. Ramirez-Ruiz reported great success with this intern and is interested in working with more Hartnell students in the future.

**Summary of STEM Student Internships**



**Figure 1.** In 2006 eleven students were placed in 12 internships, in 2007 eleven students were placed in 13 internships and in 2008 nineteen students were placed in 20 internships. In each year there were some interns who were placed both at FPO for weekend astronomy interpretation and at other sites for full time research focused internships.

## Project Management Institute

The Project Management Institute (PMI) for Hartnell STEM Interns is the training program launched in 2007 and aimed at infusing project management into early research experiences for STEM students from Hartnell College. Over the three years of the grant, 42 students received internships from the CIPA II partners and were trained in the PMI as a part of their internship. These cohort of students were required to participate in a day long orientation to project management, to write and carry out a project plan governing their summer research while participating in weekly web-based discussion forums with the cohort and grant personnel and finally, to present their work at a symposium following the completion of their work.

In 2007 we assessed the success of the PMI by asking the students to complete an evaluation after the completion of their work. The student feedback was extremely positive and many commented that they gained a better understanding of Project Management and how to work in teams. In 2008 the PMI followed much the same format as that of the first year, with an added emphasis on communication throughout the summer. Participating in formative evaluation discussions with internship students and their mentors each year allowed the CIPA II grant team to fine tune the training and support offered to the interns and intern mentors in the following year. The PMI and other CIPA II grant related activities were so successful in preparing and supporting students that several of the initiatives launched during the grant have now been institutionalized or blended into campus wide professional development opportunities, as described in the Project Impact section.



**Figure 2.** PMI Orientation Workshop instructors and interns. Back row: Jose Quezada, Ignacio Maravilla, Tim Courrejou, Tiana Dias, Maria Uribe, Timothy Fuller, Miguel Rodriguez, Jim Riley, Lawrence Keener, Rodrigo Sanchez, Leonel Medrano, Shannon McCann, Hector Zhu. Front row: Tito Polo, Daniel Chairez, Ila Caughman-Vasquez, Christina Gonzales, Genaro Sanchez, Fabian Hernandez, Luciano Cerritos, Pimol Moth



**Figure 3.** Students work together as a team to construct the longest spinning top during the orientation workshop.

### **The Science and Math Institute**

In August 2008 the Science and Math Institute officially opened its doors at Hartnell College. Dr. Jesse Cude, Physics Instructor Emeritus and former CIPA II budget manager and curriculum advisor, was hired as the Director of the Science and Math Institute. The Institute seeks to develop and support connections among regional STEM organizations, to create and publicize STEM educational opportunities in and beyond the community, to connect the student population of the region with STEM-related research and career opportunities, to make scientific and technological trends tangible and relevant to our community, to provide an environment to engage the senses and open minds, and to showcase local STEM talent and achievements. In addition, the SMI will help to coordinate CIPA II related activities such as the annual Robotics Olympics in the fall and Physics Olympics in the spring and general STEM functions such as a colloquium series and an annual Family Science and Health Day.



**Figure 4.** Left: The new Science and Mathematics Institute at Hartnell College. Right: Students conducting a study session in the Science and Math Institute

The Science and Math Institute created the STEM internship project in October 2008 to prepare students for success during their summer internships. Shannon McCann met with the group of 24 highly motivated students in fall 2008 one hour every week to research available internship

opportunities and prepare their resumes, letters and other application materials. In spring 2009 these students are continuing to meet weekly with STEM instructors to gain skills in research abstract and poster preparation, PowerPoint, Excel, Matlab, project management, and life science laboratory techniques. As these students win internship placements they will meet with their advisors and write project management plans to govern their summer 2009 internship projects.



**Figure 5.** Students receive instruction on how to make a poster using PowerPoint from Dr. Brooke Haag, Physics Instructor, during the STEM internship training.

The Project Management Institute and STEM internship training served as the inspiration for the now institutionalized intern preparation courses Counseling 123 and Science 124, which will continue to be offered every year. Counseling 123 will be taught by a Hartnell counselor and will be offered for the first time in fall 2009 and Science 124 will be taught by a team of Hartnell science and math faculty and will be offered for the first time in spring 2010. These two courses taken together will serve to extend and institutionalize the internship training and support initiated by the CIPA II Project Management Institute.

### **Key CIPA II Team Meetings and Trips**

The Hartnell CIPA II team participated in a number of meetings and trips to implement the grant objectives. These meetings and trips will be reviewed briefly here.

### **Project Management Training for CIPA II Team Members**

In February 2006 Pimol Moth and Lin Sten participated in the CIPA II Project Management Boot Camp in Lansdowne, Virginia which was designed to educate the grant recipients on the major components of project management. In June of that year they attended the combined CIPA Training Session II and Forum in Lake Geneva, Wisconsin. After Shannon McCann assumed Mr. Sten's duties as co-pi she attended 3 Project Management trainings in 2007. In September she participated in the Project Management Applications Resource System (MARS) Workshop in Starkville, Mississippi. In November she attended an Essentials of Project Management training course in Herndon, Virginia. Finally, in December she took part in a Project Management with Microsoft Project training course offered in Las Vegas, Nevada. Ms. McCann waived her salary for serving as CIPA II co-pi in exchange for the opportunity to take part in these training activities.

### Project Management Training for Hartnell Faculty and Staff

In February 2008 Dr. Moth and Ms. McCann led a workshop on Project Management Fundamentals for Hartnell faculty and staff. This team of personnel was assembled by Dr. Phoebe Helm, Hartnell President, and Dr. Jennifer Fellguth, Hartnell Dean of Distance Learning, Evening & Weekend Programs, in order to examine and revise the process of hiring adjunct faculty at Hartnell College. This team has also all enrolled in an online 6 week Project Management training course and Dr. Moth and Ms. McCann will continue as campus resources for their efforts as they carry out their project.

### Bi-weekly CIPA II Meetings

Throughout the life of this grant the CIPA II team has met on a fairly regular bi-weekly basis to evaluate progress and plan future steps. The minutes of all CIPA II team meetings are available on the Hartnell CIPA II website, maintained by Dr. Moth at [www.hartnell.edu/nasa-cipa](http://www.hartnell.edu/nasa-cipa).

### Advisory Board Meetings

The Hartnell CIPA II team met regularly with a superlative advisory board consisting of educators, administrators, and professionals from academic, research, and partner institutions. The board met approximately every other month throughout 2006 and 2007 to give feedback and advice to the CIPA II team. In 2008 the board met twice to plan for the summer internships and to discuss ways to institutionalize and extend CIPA II activities beyond the end of the grant. The Advisory Board members are:

- Dr. Michael Isaacson, Dean, Jack Baskin School of Engineering at UCSC & Science Director of the University Affiliated Research Center at NASA-Ames
- Ms. Adrienne Harrell, Director of Undergraduate Affairs, Jack Baskin School of Engineering at UCSC
- Ms. Lisa Hunter, Education and Human Resource Director, Center for Adaptive Optics
- Ms. Barbara Love, Articulation Officer, UCSC
- Dr. Charlie McDowell, Professor of Computer Science, Jack Baskin School of Engineering at UCSC & Science
- Dr. Christopher Brophy, Faculty, Naval Postgraduate School
- Dr. Craig Martell, Faculty, Naval Postgraduate School
- Mr. Philip Deutschle, Teacher, Salinas High School
- Dr. Ignacio Pando, STEM Counselor, Hartnell College
- Ms. Beverly Grova, Dean of Institutional Advancement, Hartnell College
- Mr. Andy Newton, Board Chair & CIPA II Partnership Liaison, Hartnell College

### NAFP/JFPF/CIPA Symposiums

In July 2007 Dr. Moth, Ms. McCann and Hartnell students Oscar Mancillas and Angelica Meza participated in the NAFP/JFPF/CIPA Symposium held in Cleveland, Ohio. The Hartnell participants were honored to be presented with the 2007 CIPA Award for Excellence. In July 2008 Dr. Moth, Mr. Newton and Hartnell students Daniel Chairez, and Leonel Medrano attended the NAFP/JFPF/CIPA Symposium held in Baltimore, Maryland. Notably, during this symposium, Hartnell College was invited to speak about the impact of the NASA-CIPA II grant on their institution. Daniel and Leonel gave testament to the impact of the NASA grant in their own lives. The CIPA II team members and Hartnell students all report these events to be very

helpful because of the networking opportunities available for both grant leaders and students.

### CIPA II Site Visits

The Hartnell CIPA II team has enjoyed a number of helpful site visits from Mr. Clarence Brown over the life of the grant:

- In March 2006 Mr. Brown visited Hartnell to meet with the principal members of the CIPA II team and to become acquainted with the engineering and physics laboratories which are used by the courses which have undergone curriculum upgrades as a result of this grant.
- In August 2006 Mr. Brown was able to visit again. He was able to accompany the CIPA II team to three of our partner institutions and met several of the STEM students who participated in internships. In addition, he attended the annual Fremont Peak Observatory Star-B-Que where he met the members of FPOA and the 6 summer interns who participated in the FPOA summer internships.
- In April 2007 Mr. Brown paid another visit to Hartnell College to meet with the CIPA II team. It was an exciting day as his visit coincided with Hartnell's annual Physics Olympics. Mr. Brown was able to meet a number of Hartnell STEM students and watch them in their competitions. The CIPA II team then hosted Mr. Brown for lunch and in-depth discussions of recent grant activities and plans for the summer internship programs and the Project Management Institute.

### **Key CIPA II Student Activities and Trips**

#### Field Trips

The CIPA II team has organized and led a number of one day and multi-day field trips to allow students to interact with engineers and project managers and learn about the real world projects they are involved in:

- In May 2006 Mr. Joe Welch, Hartnell computer science instructor, and Mr. Sten, CIPA II co-pi took 15 STEM students to visit NASA-Ames to give the students the opportunity to interact directly with professional engineers and to give them an initial exposure to project management applications in real-world working environments.
- In March 2007 Dr. Moth and Ms. McCann took a large group of Hartnell STEM students to visit the Naval Postgraduate School to tour robotics labs and to talk with engineering faculty and graduate students. This event was hosted by Dr Craig Martell.
- In April 2007 Ms. McCann and 10 Hartnell STEM students on a 4 day tour of a number of engineering organizations in southern California, including a number of behind the scenes tours with engineers and scientists, all arranged by Mr. Welch. The sites visited included the Air Force Test Pilot School and the Dryden Flight Research Center on the Edwards Air Force Base, AeroVironment, Inc. and the Engineering College at Cal Poly San Luis Obispo.
- Later in April 2007 Ms. McCann took 11 Hartnell STEM students traveled to Lompoc, California to attend the Aeronomy of Ice in the Mesosphere (AIM) Educators' Launch Conference.
- In June 2007 Mr. Newton, Ms. McCann and Dr. Craig Martell took 4 students to UCSC

to give an invited presentation at UCSC's Baskin School of Engineering Senior Design Team Competition.

- In November 2007 Ms. McCann chaperoned 3 Hartnell science students on a tour of the UC Santa Cruz Jack Baskin School of Engineering.
- In March 2008 Dr. Jeff Hughey, Hartnell biology instructor, and Dr. Moth led 10 Hartnell STEM students on a trip to Southern California to tour several engineering organizations and universities, including Aerospace Corporation, Northrop Grumman Integrated Systems, California Institute of Technology, the Jet Propulsion Laboratory, and California Polytechnic University at Pomona.
- In April 2008 Dr. Moth, Ms. McCann and Mr. Newton took 11 Hartnell STEM students to an NPS Open House intended to introduce these students to faculty interested in mentoring interns during the summer. The open house was organized by Alison Kerr, Programs Manager of the Cebrowski Institute, Kim Wahlin, and Sue Higgins, Deputy Director of the Cebrowski Institute.
- In May 2008 Dr. Moth and Ms. McCann accompanied 10 Hartnell STEM students as they visited the Naval Postgraduate School to tour the Center for Autonomous Undersea Vehicles (AUV). The tour was led by Dr. Anthony Healey, Distinguished Professor and Chair and Director of the Center for AUV Research and Sean Kragelund, an NPS graduate student.

#### Society of Physics Students Science Outreach

During the fall semester 2007, a team of 10 students from the Society of Physics Students used project management concepts to organize and schedule outreach visits to local elementary and high schools. The purpose of these demonstrations was to expose the children to concepts of physics related to their environment and encourage them to pursue math and science in their high school and college years. The Physics Club students worked as a team to organize and carry out a number of other outreach visits throughout 2008.

On April 10, 2008, the Hartnell Physics Department hosted the Physics Olympics, which was organized by the Society of Physics Students Club. The students worked as a team and used project management principles to plan, organize, and execute the Physics Olympics. On this day Physics students from Hartnell College and the local high schools competed in several different competitions that involved an application in Physics. To ensure that they executed the project successfully and on schedule, the students were required to write a project plan that included: Scope Management, Staffing Management, Schedule Management, Communication Management, and Risk Management. In addition, the students were responsible for running and staffing their activity. Dr. Brooke Haag, the new full time Physics Instructor at Hartnell College, has embraced project management and will continue to have students produce a project plan for future Physics Olympics. In addition, she will distribute the Project Management Plan Guidelines produced by the Hartnell CIPA II team to encourage the high school instructors to have their students write project plans in preparation for the Olympics.



**Figure 6.** Left: Students from Gonzales High School make last minute adjustments to their bridge. Right: Tito Polo, Physics lab technician conducts the bridge to see how much weight the bridge can endure without breaking.

### Robotics Olympics

In December 2007 the Hartnell Rockets and Robotics Club hosted a robotics competition which grew out of its involvement with the MATE Monterey Bay Remotely Operated Vehicle competition in spring 2007. Hartnell engineering students worked in teams and programmed Boe-Bot robots to compete in a line recognizing competition and a maze competition. In December 2008 the Hartnell's Robotics Club hosted the 2nd Annual Robotics Olympics. During the event 16 teams representing Hartnell College and 4 high schools (Soledad, King City, Everett Alvarez, and North Salinas) competed in two competitions involving Parallax Boe-Bot robots. Hartnell engineering students worked as a team to write and implement a project management plan to govern the high school robotics team training and mentoring, all in preparation for the competition. This activity generated much positive press for Hartnell College, gave the engineering students in the Robotics club an interesting and hands on application of project management, and increased interest among the underserved population in the STEM fields.



**Figure 7.** High school component of the 2008 Robotics Olympics. Left: Maze competition. Right: Students wiring and programming the robots.

### Monterey Bay Regional Remotely Operated Vehicle (ROV) Competitions

In April 2007 nine students from the Hartnell College Rockets and Robotics Club won Second Place in the Monterey Bay Regional ROV competition. The Hartnell team had to write a project management plan to govern their work, including budget costs to be underwritten by the CIPA II grant. Dr. Moth and Dr. Cude served as team advisors for this event. In June 2008 nine students from the Hartnell College Rockets and Robotics Club competed in the MATE International ROV competition at UC San Diego. As in 2007 the students had had to write and implement a project management plan to guide their efforts in the months leading up to the competition. The students were judged on the quality of their engineering technical report, engineering presentation, poster presentation, and the successful completion of three mission tasks. In their first time at the international competition, the Hartnell College team placed 13th out of the 27 participating community colleges and universities. Notably, they tied for 6th place in the engineering presentation and won the “The Biggest Bang for the Buck” award, which was awarded to the team that spent the least amount of money on a vehicle that performed well.



**Figure 8.** Hartnell’s 2008 Rockets and Robotics ROV team. Standing: Pimol Moth, Luciano Cerritos, Daniel Chairez, Nour Daas, Jose Quezada, Ignacio Maravilla, Leonel Medrano. Sitting: Justin Jordan, Ricardo Cerritos, Genaro Sanchez



**Figure 9.** Left: Ricardo Cerritos driving the ROV with support from teammate Justin Jordan. Right: Hartnell’s ROV team completes one of the mission tasks, freeing a mock ocean bottom seismometer from the “seafloor”.

### Speaker Series

The CIPA II grant team has been instrumental in organizing and presenting a number of influential STEM speakers over the last few years at Hartnell. An important institutionalized outcome of this effort has been the adoption of this responsibility by Hartnell's newly launched Science and Mathematics Institute. The speakers organized by the grant team include:

- February 3<sup>rd</sup>, 2006: Dr. Michael Isaacson, Dean of the Jack Baskin School of Engineering at UCSC, spoke on research activities at the Baskin School.
- August 26<sup>th</sup>, 2006: Dr. Joe Hennawi, UC Berkeley Hubble Space Telescope Fellowship recipient, spoke about his academic career which began at Hartnell College and led him to his work on dark matter and cosmology.
- September 29<sup>th</sup>, 2006: Dr. James Newman, NASA visiting professor at the Naval Postgraduate School and veteran astronaut, visited Hartnell to give a public talk titled "Reflections on Spaceflight."
- November 3<sup>rd</sup>, 2006: Professor Joel Kubby and Bautista Fernandez, UCSC Jack Baskin School of Engineering, spoke about research and engineering opportunities at the Baskin School and the design of micro-electro mechanical systems (MEMS).
- November 17<sup>th</sup>, 2006: Young Kim, Outreach Coordinator from the UCSC, Jack Baskin School of Engineering, visited Hartnell and met with STEM students and members of the Physics club to answer questions and give advice about the transfer process and programs offered at the Baskin School.
- March 9<sup>th</sup>, 2007: Dr. Craig Martell, Co-Director of the Autonomous Coordination Laboratory at NPS, visited Hartnell to give an overview of the internship opportunities available at NPS.
- April 27<sup>th</sup>, 2007: Dr. Jim Bellingham, Chief Technologist at MBARI, delivered an address on his research on the development and use of Autonomous Underwater Vehicles (AUVs).
- May 4<sup>th</sup>, 2007: Dr. David Le Mignant, W. M. Keck Observatory and Center for Adaptive Optics at UCSC, spoke about how adaptive optics and laser guide star technologies are used by astronomers to overcome the problem of the atmospheric turbulence and can provide images with 4 times more detail than the Hubble Space Telescope.
- November 16<sup>th</sup>, 2007: Dr. Hongde Hu, Chairman of the Department of Mathematics and Statistics at the California State University, Monterey Bay, traveled to Hartnell with four other CSUMB math faculty to present information about CSUMB's math and science programs and scholarship opportunities.
- November 30<sup>th</sup>, 2007: Dr. Puragra Guhathakurta, Professor of Astronomy at UC Santa Cruz, visited Hartnell College and gave a talk to the Introductory Astronomy class and the Society of Physics students on using Adaptive Optics to detect black holes.
- December, 2007: Young Kim, Outreach Coordinator from the UCSC, Jack Baskin School of Engineering, visited Hartnell and met with STEM students and members of the Physics club to answer questions and give advice about the transfer process and programs offered at the Baskin School.
- March 28<sup>th</sup>, 2008: Dr. Tom Wilkinson, UCLA Medical School in the Molecular & Medical Pharmacology Department, gave an invited lecture at Hartnell on HIV, viral proteins using NMR spectroscopy and surface plasmon resonance techniques.
- December, 2008, Young Kim, Outreach Coordinator from the UCSC, Jack Baskin School

of Engineering and Miles Hansen, a Hartnell alumni and participant of the Project Management Institute majoring in engineering, visited Hartnell and met with STEM students and members of the Physics club to answer questions and give advice about the transfer process and programs offered at the Baskin School.

In September 2008 the Science and Mathematics Institute launched its STEM Colloquium series and has presented 2 or 3 speakers every month from a variety of STEM disciplines. More information about this and other SMI events can be found at [www.hartnell.edu/smi](http://www.hartnell.edu/smi).

## **CIPA II Documents and Reports**

### **Required CIPA II Reports**

The CIPA II team has completed the following required documents and reports, all delivered on or before the stated deadline:

- CIPA II Project Briefing
- CIPA II Executive Summary
- CIPA II Project Management Plan
- 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> 2006 UNCFSP Quarterly Reports
- 2006 UNCFSP Annual Report
- 2007 UNCFSP Self Evaluation Report
- February 2007 UNCFSP Change of Scope Report
- 2007 NASA Reverse Site Visit Progress Report
- 2007 UNCFSP Semi Annual Report
- 2007 NASA Minority University Research and Education Program POSTrack Performance Outcome and Student Performance Report
- 2007 UNCFSP Annual Report
- 2008 UNCFSP Self Evaluation Report
- April 2008 NASA Basic Data Report
- 2008 NASA Minority University Research and Education Program POSTrack Performance Outcome and Student Performance Report
- 2008 NASA Reverse Site Visit Progress Report
- 2008 UNCFSP Semi Annual Report
- 2009 UNCFSP Annual Report

### **Hartnell CIPA II Website**

Dr. Moth regularly updates the website for the grant in order to ensure that all documents and information are easily accessible by the CIPA II team, their partner representatives, advisory board, and UNCFSP. The address is <http://www.hartnell.edu/nasa-cipa>. The website describes the goals of CIPA II and provides links to the various Hartnell CIPA II documents.

## 5.0 Project Impact

The NASA CIPA II program has made a tremendous impact on the College and has strengthened our engineering curricula by giving underrepresented students practical project management experience. Through their participation in the revised engineering courses, internships, and special projects, students have received more experience with organizing projects, working together effectively and efficiently as a team, expressing themselves more clearly in writing and oral communication, creating a schedule and meeting deadlines, assessing risks and developing response strategies, and meeting a budget. Looking back over the three year lifetime of the grant Hartnell engineering students have grown noticeably more pro-active and have approached the members of the CIPA II grant team to indicate their interest in participating in activities because they had heard such positive feedback from their peers during the previous years. Students enjoy the team interaction that comes with project based learning and quickly realize that the organizational skill sets learned are a life-long treasure. These skills are important to their future success when they transfer to four year institutions and eventually to the workforce.

Because of the skills and confidence they gained through participation in the grant activities, several STEM students have been highly successful in obtaining large scholarships to further their education and more underrepresented students are now considering pursuing graduate school in STEM fields. For example, in 2007, a Hartnell STEM student who participated in several CIPA related activities, Ricky Fernandez, was awarded a NASA MUST (Motivating Students in Science and Technology) scholarship to pursue his studies in Physics at the University of California in Santa Cruz. Ricky spent the summer at the Kennedy Space Center in a NASA MUST sponsored internship. Ricky also won the prestigious \$20,000 UCSC Karl Pister Scholarship in spring 2008 to further support his undergraduate studies. Two other outstanding Hartnell Engineering students who have taken part in CIPA II sponsored activities, Daniel Chairez and Leonel Medrano, were both awarded \$20,000 scholarships from the Matsui Foundation to continue their engineering studies at Cal Poly, San Luis Obispo in fall 2008. Daniel and Leonel were both enrolled in the summer Project Management Institute and were both summer interns at the Naval Postgraduate School. In addition, Daniel Chairez is one of the 2008 recipients of the NASA MUST Scholarship. All these students expressed interest to the CIPA II team in continuing with their education and pursuing graduate degrees.

In addition, many of our students have participated in cutting edge research activities at the Naval Postgraduate School in rocketry and robotics, two NASA related fields. Several students who participated in these internships have expressed strong interests in working for NASA. Because of the project management training in the STEM courses they received and experience in the internships, this future generation of NASA employees will be better prepared to participate in NASA missions and related projects than their predecessors. Through this project, we have increased the pool of highly trained minority workers for future employment at NASA. In these ways, the project has successfully reached the specific objectives of the CIPA II program to increase the quantity and quality of NASA related STEM curricula and to increase the number of minority students on the precollegiate and collegiate levels that study STEM subjects and that choose a career in NASA-related fields.

Several unexpected and positive outcomes have occurred as a result of the positive relationships established through grant initiatives. The success of the CIPA II project has inspired our president, Dr. Phoebe Helm, to transform Hartnell College into a Science and Mathematics magnet school. One of the first functions that she attended when she arrived on campus in 2007 was the NASA CIPA II Student Research Symposium. She was so impressed with the quality of work completed by the students and by the impact of the activities of the CIPA II grant team and other STEM grants on campus that she called for the creation of a Science and Mathematics Institute (SMI) as a means to institutionalize project management and to serve as a regional focal point and funding source to improve and enrich the educational efforts of the Hartnell College math and science programs. In addition, research institutions are now inviting us to partner with them on future grants and establishing new internships. The mentors from our partner institutions have been very impressed with the interns from Hartnell and would like to see more interns at their institutions. We have had enthusiastic support from the Cebrowski Institute for the internship program at the Naval Postgraduate School, and because of this, we were able to have a record number of interns working on cutting-edge research projects in 2008.

This project is also of benefit to society because it enhances Hartnell's ability to offer a rich education in science, technology, engineering, and mathematics (STEM) courses and to provide compelling undergraduate research experiences which have been shown to result in significant improvements in student retention and promotion in the STEM disciplines, and ultimately, increased representation for this population in STEM careers. Local Salinas Valley high school students also benefit directly through the programs established through the grant such as the Physics Olympics, Robotics Olympics, and the Fremont Peak Observatory Internships, because they offer the students the opportunity to participate directly in STEM activities at Hartnell College that are both engaging and have high academic merit. The exposure of these activities to the STEM high school students in turn benefits Hartnell by creating a pipeline from the high schools to the College. The impact of this and other science grants to the College and Salinas Valley has inspired Salinas mayor, Dennis Donohue, to make the bold statement, "Salinas is growing more than lettuce, it is now growing scientists."

## **6.0 Dissemination**

Hartnell is partnering with California State University, Monterey Bay (CSUMB) on a Department of Education College Cost Reduction and Access Act (CCRAA) grant which is intended to increase the number of minority students who complete college degrees in the STEM disciplines. CSUMB has recently launched its new Undergraduate Research Opportunities Center (UROC) to train and place college undergraduate and graduate students in research internships. Members of the CIPA II grant team and other Hartnell faculty have worked with UROC faculty and staff to align the content covered in Hartnell's new intern preparation courses, Counseling 123 and Science 124 with the training provided to CSUMB students. This collaboration has given the CIPA II team the opportunity to disseminate lessons learned about intern preparation and support with CSUMB. In addition, the tremendous success of Hartnell interns at the NPS has fostered a strong interest among NPS faculty and administrators in expanding the CIPA II intern training model to other interns at NPS and to other institutions beyond NPS as well.

The members of the CIPA II team also help execute Hartnell's NSF Science Talent Expansion Project (STEP) grant, which is focused on increasing the enrollment and success of women and Latinos in the STEM disciplines. The internship training and support model developed during CIPA II is being used to support NSF STEP funded student internships and is documented in reports delivered to NSF and at presentations made at NSF functions such as the NSF STEP grantees meeting held in March of every year in Arlington, Virginia. These meetings attract a nationwide audience of faculty and administrators from NSF STEP grant institutions.

The CIPA II team has also sought to promote project management by actively disseminating important project management documents to other institutions. The Project Management Plan Guidelines used to train students in the Engineering 45 Special Projects course has been distributed to other CIPA II grantees. The Program Coordinator of the International MATE ROV competition was also interested in seeing how we train students in project management and requested a copy of the Project Management Plan Guidelines. The coordinator intends to distribute the document to other MATE ROV participants and to all sections of the nationwide Marine Technology Society (MTS) as a model for project management training. Dr. Brooke Haag, our newly hired Physics Instructor, aims to disseminate the Project Management Plan Guidelines to the local high schools to assist the students in learning project management while they prepare for the 2009 Physics Olympics at Hartnell College. The Project Management Institute Summer Symposium Internship Abstract booklets have been distributed to our partner institutions and to prominent NASA officials. In addition, partner institutions were made aware of and have access to important documents and curriculum improvements generated by the NASA grant on the Hartnell College NASA-CIPA II grant website.

## **7.0 Project Future**

Hartnell remains fully committed to increasing the number of minority students entering STEM disciplines in general and engineering related STEM disciplines in particular. The CIPA II grant has enabled us to enrich the education of these students by providing them with engineering special projects and coursework infused with project management training which helps the students develop and value the skills and efficiencies afforded by using these techniques to accomplish tasks. The long term institutionalization of this grant project will be evident in the following ways:

### Engineering Curriculum

We have institutionalized project management into the engineering course curricula with the six revised engineering courses and new special projects courses. These project management infused courses are currently being offered at the College, and through them, students will use project management to learn to work and communicate effectively as a team on short and long term projects. The Engineering 45 Special Projects course is now fully established on campus and will continue to give Hartnell engineering students a structured way to plan and carry out activities such as the MATE ROV competitions and Hartnell's annual Robotics Olympics and Physics Olympics. Hartnell's Physics Olympics has been an annual event for over 20 years and given the level of excitement generated among Hartnell students and among local high school physics and science students, it is strongly anticipated that the Robotics Olympics will continue as annual events and can be sustained in the future without any extra funding given that the

robots purchased through the grant are reusable and can be rewired. The upgraded engineering lab equipment and astronomical imaging software purchased through the grant will benefit students in the engineering, physics, and astronomy labs for many years to come.

### Partnerships

Our partners at nearby universities and research institutions are committed to continue providing summer internships for our students. Relationships between Hartnell and our CIPA II partner institutions, NPS, the UCSC Baskin School of Engineering, and Fremont Peak Observatory have been greatly strengthened by the establishment and success of the Project Management Institute for training and supporting Hartnell students in research internships. The fact that Hartnell has developed this intern training structure has deeply strengthened its relationships with institutions that can offer placements in research internships. These strong partnerships will help Hartnell to continue to develop and provide these opportunities for students.

### Internships

Over the last year we have also been discussing sustainability of the CIPA II grant activities through the leveraging of other grants at the College such as the NSF STEP grant, Hartnell's Mathematics, Engineering, and Science Achievement (MESA) program, and through institutional support from partner organizations. We have already identified several potential future funding sources such as the funding of the Fremont Peak Observatory internships by Hartnell's NSF Science Talent Expansion Project (STEP) grant and the potential of future funding of the NPS internships through the Cebrowski Institute at NPS. These internships will be administered by the new Science and Math Institute at Hartnell College.

### The Science and Math Institute

Hartnell's new Science and Mathematics Institute has been developed as an administrative umbrella for the special projects activities and internships now that the CIPA II grant has ended and the CIPA II grant team has returned to their normal duties and responsibilities. The Project Management Institute developed by the CIPA II team has been institutionalized by the Science and Math Institute through the creation of the two semester sequence of courses, Counseling 123 and Science 124, which focuses on preparing students for STEM careers and for research focused internships in STEM disciplines. Hartnell's commitment to carrying on these CIPA II projects, as evidenced by the creation of the Institute, means that Hartnell is well poised to conduct these activities far into the future.

## **8.0 Personnel Changes**

Dr. Pimol Moth, co-principal investigator, and Mr. Andrew Newton, partnership liaison, have functioned in the same capacity on the Hartnell CIPA II team for the life of the grant. Mr. Mohammad Hussain, Hartnell math instructor was co-principal investigator at the inception of the grant but Mr. Lin Sten, Hartnell physics instructor, took over that position for the first year of the grant. When he resigned his teaching position at Hartnell in December 2006 he was replaced by Ms. Shannon McCann, MESA director, who continued in the role of co-principal investigator for the remainder of the grant. Mr. Jim Riley, Hartnell Math Lab Coordinator, served as project management advisor to the grant team from January 2006 through the end of the grant.

At the end of June 2006, Dr. Charlene Frontiera, who was the responsible administrator with CIPA II, left Hartnell College to assume a new job elsewhere. She was replaced by the new dean of Math, Science, and Health Professions, Dr. Kathleen Schrader. Dr. Schrader left the college in March 2008 and Dr. Kathleen Rose, Associate Vice President of Academic Affairs, assumed the role of responsible administrator for the grant.

Dr. Jesse Cude served as the budget manager and curriculum advisor for the grant through June 2007, despite the fact that he retired from teaching in fall 2006. After his departure Shannon McCann assumed the duties of budget manager.


Mr. Tito Polo, Hartnell physics and engineering lab assistant, was hired to serve as support personnel for the summer 2008 internship program and for the Robotics Olympics in fall 2008.

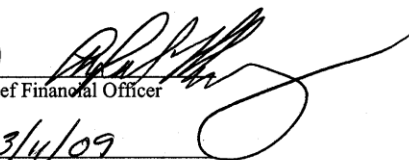
## 9.0 Expenditures

**CIPA II PROGRAM  
FINAL Fiscal Report  
For January 1, 2006 – February 28, 2009**

INSTITUTION	<u>Hartnell College</u>		
TOTAL GRANT AWARD	\$400,000		
	Budget	Expenses	Remainder
1. Direct Labor (Salaries, Wages, & Fringe Benefits)	\$252,840	\$161,279	\$91,561
2. Other Direct Costs			
a. Faculty release time, Summer study	Inc. Above		
b. Staff Support	Inc. Above		
c. Student Assistants	Inc. Above		
d. Facility Improvement	In-kind		
e. Equipment	\$38,500	\$57,817	(\$19,317)
f. Supplies	\$40,470	\$32,408	\$8,062
g. Copying, faxing	In-kind		
h. Office Space	In-kind		
i. Travel	\$19,826	\$13,773	\$6,053
j. Other	\$12,000	\$98,359	(\$86,359)
3. Indirect Costs and Other Applicable Costs	\$36,364	\$36,364	\$0
4. Subtotal	\$400,000	\$400,000	\$0
5. Cost Sharing (if applicable)	\$0	\$0	\$0
6. Total Expenditures	\$400,000	\$400,000	\$0

Approved:

  
CIPA II Principal Investigator

  
Chief Financial Officer

Date

3-10-09

Date

3/4/09

## Budget Narrative by Line Item

### Direct labor

Mr. Andy Newton, Partnership Liaison	\$50,833
Dr. Pimol Moth, Co-Principal Investigator	\$45,448
Mr. Lin Sten, Co-Principal Investigator (yr 1)	\$11,052
Dr. Jesse Cude, Budget Manager & Curriculum Advisor	\$7,885
Mr. Tito Polo, Robotics Olympics & Intern Coordinator	\$4,882
Mrs. Shannon McCann, Co-Principal Investigator (yrs 2 & 3)	\$4,341
Robotics Olympics Student Leadership Team	\$3,327
Mr. Jim Riley, Project Management Advisor	\$2,500
Ms. Monica Grova, Intern Research Symposium Coordinator	\$450
Miscellaneous Benefits	\$30,561
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	\$161,279

### Equipment

Laboratory equipment for physics and astronomy labs	\$43,209
CCD imaging equipment for astronomy internship research projects	\$8,454
Equipment for engineering student work spaces	\$4,408
Equipment for MATE Student ROV & Robotics Olympics competitions	\$1,746
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	\$57,817

### Supplies

Supplies for MATE Student ROV and Robotics Olympics competitions	\$13,249
Supplies for Project Management Institute	\$6,441
Books, DVDs & other supplies for engineering & astronomy courses	\$6,299
Miscellaneous supplies for grant projects & engineering courses	\$5,808
Supplies for summer bridge astronomy program	\$611
	<hr/>
	\$32,408

### Travel

NASA NAFP/JPPF/CIPA Symposium & other grant travel	\$13,773
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### Other Direct Costs

Project Management training (Pimol Moth & Lin Sten, 2006)	\$6,707
2006 student internship stipends	\$13,742
Project Management training (Shannon McCann, 2007)	\$5,024
2007 student internship stipends	\$35,923
2008 student internship stipends	\$30,017
Project Management training (Hartnell faculty & staff, 2009)	\$1,946
Dr. Jesse Cude, STEM Internship Project Advisor/Consultant	\$5,000
	<hr/>
	\$98,359

### Indirect Costs

Allocated at 10% of project costs	\$36,364
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<b>Total Final Expenditures</b>	<hr/> <b>\$400,000</b>
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