The National Space Grant Office requires two annual reports, the Annual Performance Data Report (APD – this document) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.

Florida Space Grant Consortium
Lead Institution: University of Central Florida
Director: Jaydeep Mukherjee
Telephone Number: 407-823-6177
Consortium URL: www.floridaspacegrant.org
Grant Number: NNX10AM01H

PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Florida Space Grant Consortium is a Designated Consortium funded at a level of $575,000 for fiscal year 2014.

PROGRAM GOALS

FELLOWSHIPS & SCHOLARSHIPS

1. Enable students to pursue careers in the space program – whether through graduate, undergraduate, or Community College technical training.

   SMART Objective – On an annual basis, at least 20 undergraduate and/or technical training awards and 3 graduate fellowships will be competitively awarded to students who wish to pursue space/aerospace/aeronautics training. At least six of these awards will be offered to minority candidates and at least 8 to female students. At least 70% of awardees will continue to the next step in their chosen STEM disciplines (academia/NASA/industry).

This goal positively impacts NASA Objectives: 5.1 and 6.1

2. Facilitate Space-Related Research Symposia for students, NASA engineers and FSGC awardees

SMART Objective – By March 2014, facilitate at least two Space-Related Research Symposia within the State of Florida that specifically target graduate student participation involving at least 12 students and 10 mentors.

This goal positively impacts NASA Objectives: 5.1 and 6.1

RESEARCH INFRASTRUCTURE

1. Support NASA related interdisciplinary research projects emphasizing work-force development with undergraduate and graduate students.

   SMART Objective – On an annual basis, at least 12 research projects will be competitively awarded. At least three of these research project awards will be awarded to a minority serving institution and/or include minority participation. At least 12 undergraduate or graduate students will be supported by the projects, including at least 5 women and 4 under-represented minorities

This goal positively impacts NASA Objectives: 5.1, and 6.1

2. Foster collaboration among NASA engineers, Florida university faculty and industry partners.

   SMART Objective – By March 2014, facilitate at least two Space-Related Research Symposia within the State of Florida that specifically target NASA engineers, Florida university faculty and industry partners.

This goal positively impacts NASA Objectives: 5.1. and 6.1.

HIGHER EDUCATION

1. Provide undergraduate students with opportunities for interdisciplinary hands-on experiences in team-based student launch activities and student pay-load development programs to better understand STEM concepts as they relate to space exploration.

   SMART Objective – On an annual basis, involve at least 100 students, representing a minimum of five Florida-based higher education institutions, including at least one minority serving institution, in collaborative space-based interactive learning experiences.

This goal positively impacts NASA Objectives: 5.1, 6.1, and 6.2.

PRE-COLLEGE EDUCATION

Contribute space-related resources and training to help increase the number of K-12 teachers who:

1. Use space-related curricula resources to motivate more students to pursue advanced math and science courses.

   SMART Objective – On an annual basis, conduct and/or facilitate space-related pre-service and in-service teacher training opportunities focused on

space-related math and/or science curricula. A minimum of 50 Florida teachers per year will attend this training.

This goal positively impacts NASA Objectives: 5.1, 6.1, and 6.2

INFORMAL EDUCATION (GENERAL PUBLIC)

Contribute space-related resources to help increase the number of citizens who are aware of:

1. How the application of math and science enable or enhance common activities, NASA's contributions to our standard of living (beyond Velcro®), and NASA's mission.

   SMART Objective – On an annual basis, collaborate with Florida museums and/or science centers to facilitate/conduct engaging space-related learning events held in public venues. A minimum of two events per year will be held. At least 200 members of the public will attend one or more of these events per year.

This goal positively impacts NASA Education Objective: 6.4

Progress FSGC is making in achieving our program goals

- Percentage of students whom have taken their next step and have been successfully tracked though their next step vs last year of SG support.
  - 95% for 2006
  - 86% for 2007
  - 81% for 2008
  - 75% for 2009
  - 82% for 2010
  - 94% for 2011
  - 100% for 2012
  - 100% for 2013
  - n/a for 2014 – all participants sill enrolled
  - 83% for 2006-2014
- 83% of students significantly supported by went onto next steps in STEM disciplines

PROGRAM/PROJECT BENEFIT TO OUTCOME (1,2, and 3)

Receiving the Florida Space Grant has allowed me to focus on research during my graduate studies. I have made significant progress toward research projects during my first and second year in my PhD program, and plan to submit results for publication during the summer of 2014. (Zoe Landsman - on 12/20/13, 2013 Space Grant Fellowship, 2013 Space Grant Fellowship, 2014 Space Grant Fellowship) – Outcome 1

I am thankful that Dr. Mukherjee from the Florida Space Grant help support me in going to intern at NASA GSFC. The Florida Space Grant lessened my financial burden allowing me to focus on preparing for the internship at NASA. I have also participated in the NASA Space Florida Academy which is also sponsored by the Florida Space Grant. Dr. Mukherjee has also came to speak to my club members when I was President of the Small Satellite Design Club. The Florida Space Grant is doing an excellent job of motivating students about aerospace. I am doing my Master's in Aerospace Engineering at the University of Florida. Due to the success of my internship at NASA GSFC last semester, I am doing my Master's thesis with NASA. I look forward to doing my thesis and hope to have an impact on designing the next generation spacecraft. (Sahadeo Ramjatan - on 03/20/15, 2014 Space Grant Scholarship, NASA Goddard Spaceflight Center - Internship) – Outcome 1

It gave me the real world research experience necessary to succeed in the real world, and I used this experience to found two companies. I currently work with Florida Hospital and hope to one day work with NASA. I founded (and received funding) a company developing a non-mechanical, liquid thermal control and am in the process of founding a second company that is developing a polymer light trapping device for solar cells. (Branson Carpenter - on 03/11/15, 2014 Space Grant Research Award, Fourier Electric - Head of R & D) – Outcome 1

PROGRAM ACCOMPLISHMENTS

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals: (Employ and Educate)*

Fellowships and Scholarships

Among the students significantly supported and will be supported from FY14 fellowship and scholarship funds are:

- 2 SLSL interns (Starting June 2, 2015)
- 5 graduate fellows
- 28 scholars
- 2 at NASA centers in the Fall of 2014 and Spring of 2015
- 5 Interns at NASA (Starting June 2, 2015)

Through our fellowship program, graduate students, enrolled in a Ph.D or Masters program, are provided a year-long fellowship. Under this program, we funded 5 graduate fellows (3 women and 0 under-represented minority). – met our fellowship goal for gender equity but did not meet our under-representative goals for the fellowship program. However, we did exceed the minority goals for the total fellowship and scholarship program (see section below)

Through the scholarship program, FSGC funded undergraduate students at Florida universities and NASA centers. 28 students were provided scholarships at our affiliate universities. 2 students have interned or is interning at NASA centers In addition, 5 students will be interning at NASA centers starting June 2nd and 2 students at the Space Life Sciences Lab. Among the 30 scholars and interns, 27 students were under-represented minorities and 22 were women. This was well above our goals for both under-represented minorities and gender.

Internship Program at the Space Life Sciences Building

The NASA Florida Space Grant Consortium (FSGC) and Space Florida (SF) are partnering in an Internship Program at the Space Life Sciences Laboratory (SLSL), Exploration Park KSC, during summer 2015. The 2015 program will comprise 2 SLSL internships of 10 weeks duration. The 2015 internship program will commence on June 2, and conclude on August 8, 2015. We have not yet made the selection of students and hence do not have their demographics. The goal of the Internship program will be to train and recruit Florida science/engineering students (US citizens only) into the aerospace & aviation workforce as future employees, while encouraging further study and academic achievement. Particular emphasis will be directed towards building and strengthening allegiances between Space Florida, Florida Space Grant Consortium, NASA-KSC, Florida Universities, as well as Space Life Sciences Laboratory & Exploration Park tenants. The organizations at the SLSL building include CASIS, Dynamac Corp., Molecular Power Systems, Cella Energy, Innovative Health Systems, QinetiQ North America, Kentucky Space, University of Florida, Micro Aerospace Solutions, Space Florida and with Bionetics and Lighting Sciences moving in shortly.

Interns at NASA centers

FSGC will be supporting 3 interns at the NASA Kennedy Space Center, one intern at JSC and 1 intern at Goddard Space Flight Center. One student has already interned at GSFC in the Fall of 2014 and one student is interning at Langley in the Spring of 2015.

SMART Objective – On an annual basis, at least 20 undergraduate and/or technical training awards and 3 graduate fellowships will be competitively awarded to students who wish to pursue space/aerospace/aeronautics training. At least six of these awards will be offered to minority candidates and at least 8 to female students. At least 70% of awardees will continue to the next step in their chosen STEM disciplines (academia/NASA/industry).

FSGC has awarded 5 graduate fellowships, and 30 scholarships. In addition we will be supporting 7 more students in internship programs starting in May Among the 35 students that we have supported so far, 27 students are under-represented minorities and 25 were women. According to the National Center for Education statistics webpage (http://nces.ed.gov/programs/digest/d11/tables/dt11_239.asp), 42.3% of the students enrolled in degree granting Florida institutions in 2011 are under-represented minorities. For FSGC, 77% of the students supported as scholars or fellows are under-represented minorities. If one takes into account all the students directly supported by FSGC through fellowships, scholarships, and research projects, then the percentage of

under-represented minorities is 60% which is above the Florida total student minority distribution. Among the direct funded fellows and scholars, 71% are women and among all directly funded students (fellows, scholars and research), 51% are women.

Higher Education

The goal of our Higher Education projects is to provide students the opportunities to engage in hands-on activities that requires working in a group and inter-disciplinary topics. We achieve this by supporting senior design projects and student groups taking part in NASA Competitions like Robotic Mining Competition, Student Launch Initiative, RASC-AL ROBO-OPS Student Competition and Microgravity University. In addition, FSGC runs 2 competitions for college students. One is the Hybrid Rocket Competition and the other is the Florida University Student Satellite Design Competition. Details of our higher education programs are as follows

Senior Design Projects; FSGC has supported 4 senior design project teams, 3 from the University of Central Florida and 1 from Florida State University. The projects included a Centrifugal Dust Experiment (CEDEX), simulated planetary science device, design and construction of an RC aircraft, and Magnetically Coupled Mixer/Pump System for Cryogenic Propellant Tank Destratification. The last project is in collaboration with Marshall Space Flight Center. Total of 25 students ((19 Males, 6 Females, 4 Underrepresented minorities) participated in the projects

Hybrid Rocket Competition: 102 students in 12 teams from 10 universities (Univ. of Central Florida, Univ. of Florida, Univ. of Miami, Florida Institute of Technology, Univ. of South Florida, Embry-Riddle Aeronautical University, Florida International University, University of West Florida, University of North Florida and Daytona State College) took part in this competition. The objective of the competition is to build and launch a hybrid powered rocket. There are two categories in the competition. The first category consists of launching a hybrid rocket to the maximum altitude. The second category challenges the teams to fly their rocket closest to 2000 feet in altitude. The launch day is April 12, 2015 at Bunnell Florida. This program is also supported by the North East Florid Rocket Club. This competition is a stepping stone for students to participate in the University Student Launch Initiative competition. This project is sponsored by FSGC. Among the 102 participants are 15 females and 17 under-represented minorities.

Robotic Mining Competition: NASA's Fifth Annual NASA Robotic Mining Competition is for university-level students to design and build a mining robot that can traverse the simulated Martian chaotic terrain, excavate Martian regolith and deposit the regolith into a Collector Bin within 10 minutes. The competition will be held at the Kennedy Space Center Visitor Complex from May, 2015. There are 49 US teams participating in the competition and 6 are from Florida. FSGC is partially supporting 2 of the Florida teams. The teams represented are University of Central Florida and University of Florida. 36 students (21 Males, 15 Females, 4 Under-represented minorities) are participating from these 2 universities.

NASA Student Launch

The NASA Student Launch, or SL, is a researched-based, competitive, experiential exploration activity. This year's project offers multiple challenges reaching a broad audience of middle and high schools, colleges and universities, and non-academic teams across the nation through an eight-month commitment to design, construct, and fly payloads and vehicle components and/or to design, construct, and operate ground support equipment. The teams launch the experiments on high-power rockets and share the research results, which will be used in future design and development of NASA projects. The NASA SL will be held **April 7-11, 2015**, in Huntsville, Alabama.

FSGC is sponsoring a team from the University of Central Florida. 19 students (15 Males, 4 Female, 5 Under-represented minorities) are participating in the competition.

2015 University Student Rocketry Challenge

The 2015 University Student Rocketry Challenge (USRC) is a multi-stage competition that challenges students to design, build, and launch a multi-stage rocket carrying a payload of 0.50 lb to 3000 ft. The SEDS chapter of the University of Central Florida is participating in the competition, partially funded by FSGC. There are 8 students (7 Males, 1 Female, 1 Under-represented) participating in the competition. The USRC is designed so that it can be successfully completed by teams with no to little experience in high-powered rocketry, but also to pose a challenge to teams who have rocketry experience. Teams will be awarded points for both reaching higher altitudes and flying rockets with more stages, allowing teams to determine which approach is optimal for them. Teams must also document their design and fabrication through engineering reports, which will be submitted for review by the judging panel and scored.

Worldview

FSGC, through the University of Central Florida, entered into a mutual non-disclosure agreement with World View Enterprises LLC to launch a student built payload from a Florida University at no cost to FSGC, except for the construction of the payload. World View offers a gentle, comfortable, and life-changing travel experience to the edge of space for private citizens, and frequent and affordable access to near-space for researchers, educators, private companies and government agencies.

World View had selected three initial Pathfinder payloads to fly on its delivery platforms begining in late 2014. The payloads was transported to altitudes as high as 120,000 feet via high-altitude balloon for the collection of scientific data. The initial Pathfinder payload institutions, payloads, and their Principal Investigators (PIs) included:

- Space Environment Technologies: Dr. W. Kent Tobiska; Stratospheric Automated Radiation Measurements for Aerospace Safety
- SETI Institute: Dr. Peter Jenniskens; Meteor Imager
- Florida Space Grant Consortium: Dr. Jaydeep Mukherjee; Student Ozone Monitor

The Florida payload was a University of North Florida (UNF), student built ozone sensor using an experimental nanocrystalline gas sensor. The Arizona-based company World View sent the parafoil 102,200 feet (31,151 meters) into the air during a test flight on Feb. 20, 2015. It also carried 2 payloads from the Montana State University. 5 students participated in the project. All 5 were Caucasian and there was 1 women in the UNF team.

ACM International Conference

FSGC was one of the sponsors of the Association of Computing Machinery (ACM) International Conference held in Orlando from November 3-7, 2014. Other sponsors included University of Central Florida, Google, NSF, IBM Research, Microsoft Research, and Yahoo Labs. Since the founding of ACM SIGMM in 1993, ACM Multimedia has been the worldwide premier conference and a key world event to display scientific achievements and innovative industrial products in the multimedia field. ACM Multimedia 2014 celebrated its twenty-second iteration with an extensive program consisting of technical sessions covering all aspects of the multimedia field in forms of oral and poster presentations, tutorials, panels, exhibits, demonstrations and workshops, bringing into focus the principal subjects of investigation, competitions of research teams on challenging problems, and also an interactive art program stimulating artists and computer scientists to meet and discover together the frontiers of artistic communication. About 700 people registered for the conference

Ballooning project at Broward College

The goal of this project was for the S.T.E.M. Club at Broward College (MSI) to design and build two experiments to be attached to a weather balloon and sent into the stratosphere. The first payload consisted of a spectrophotometer, comprised of a cell phone with a gradient lens to collect spectrophotometer information and a cell phone converted into a cosmic ray detector. The second payload will be equipped with a location awareness system. The S.T.E.M. club formed two teams to design and build each payload to be attached to a weather balloon that will reach 100,000 feet and return safely to earth. The payloads are expected to be launched in late April. 15 students (1 female and 7 under-represented minorities) are participating in this project.

Micro-g Neutral Buoyancy Experiment Design Teams (Micro-g NExT) program

Micro-g Neutral Buoyancy Experiment Design Teams (Micro-g NExT) program challenges undergraduate students to design build, and test a tool or device that addresses an authentic, current space exploration problem. The overall experience includes hands-on engineering design, test operations, and educational/public outreach. Test operations are conducted in the simulated microgravity environment of the NASA Johnson Space Center Neutral Buoyancy Laboratory (NBL). Teams will propose design and prototyping of a tool or simulant identified by NASA engineers as necessary in space exploration missions. Professional NBL divers will test the tools and students will direct the divers from the Test Conductor Room of the NBL facility.

FSGC is partially sponsoring a joint team from Embry-Riddle Aeronautical University and Duke University. The title of their experiment is Asteroid Regolith Simulant Design and Development. There are 6 students in the team (4 males and 2 females, 1 under-represented minority).

SMART Objective – On an annual basis, involve at least 100 students, representing a minimum of five Florida-based higher education institutions, including at least one minority serving institution, in collaborative space-based interactive learning experiences. *215 students from 12 universities, including 2 Hispanic serving institution are participating in Higher Education Projects. Among the participating students 45 are women and 39 are under-represented minorities.*

Research Infrastructure

Florida Space Research Program: In 2014, FSGC has funded 15 space research and education grants under the Florida Space Research Program (FSRP) totaling of $295K which includes $100K from Space Florida. Matching funds totaled $321K. The FSRP combines both Federal and State funds for projects that diversify Florida's space industry and research efforts, while also supporting aerospace workforce development statewide. The program is comprised of three categories – The Space Education & Training Program, Space Exploration & Spaceport Technical Development, and Space-Based Research and Payload Development. The State of Florida and Space Florida have been significant contributors to the Florida Space Research Program for five years. The FSRP 2014 awardees include 10 Florida universities: the University of Florida, University of Central Florida, Florida Institute of Technology, Florida International University, Bethune-Cookman University, University of South Florida, University of North Florida, University of Miami, Embry-Riddle Aeronautical University and Florida Gulf Coast University. A total of 33 proposals were received. Each submission was independently evaluated by a team of experienced professionals from Kennedy Space Center and other universities and NASA centers. In 2014, 18 students were directly funded through research grants. **5 students were under-represented minorities and 5 female students. Please note that some of the awards were made a few months ago as we did not receive our matching funds from Space Florida until the beginning of this year. We will have all the required information before the OEPM submission date**

SMART Objective – *On an annual basis, at least 12 research projects will be competitively awarded. At least three of these research project awards will be awarded to a minority serving institution and/or include minority participation. At least 12 undergraduate or graduate students will be supported by the projects, including at least 5 women and 4 under-represented minorities*

15 awards were made to 10 universities involving 18 undergraduate and graduate students. **5 students were under-represented minorities and 5 female students.(incomplete data and will be updated by end of May.)**

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty: (Educate and Engage)*

2015 Florida Engineering Education Conference (FEEC)

The Florida Engineering Education Conference (FEEC) has been hosted by the College of Engineering and Computer Sciences (CECS) at the University of Central Florida since its beginnings in 2005. In 2013, the event was transitioned to the Center for Initiatives in STEM (iSTEM), a collaborative effort between the Colleges of Education and Human Performance, Engineering and Computer Science, and Sciences focused on coordinating STEM initiatives across the university and surrounding community.

An event that has been described as unique in the state of Florida, the FEEC strives in bridging the engineering workforce and the academic sector, through a series of workshops, hands on activities, and networking sessions. In 2014, the topic was broadened beyond the typical engineering disciplines to address a more comprehensive STEM agenda. The 2015 conference follows on from the success of all previous FEEC events, and continues to adhere to the original goals of the program: (1) to highlight the importance of articulating pre-college STEM education with the "day to day" workforce applications; (2) to showcase both formal and informal STEM education models or programs; (3) and to serve as an information hub for educators, administrators, and industry partners alike. We hope that these three goals will make an impact in the pedagogy of STEM curricula.

The 10th annual FEEC will be held at the UCF Student Union on April 24, 2015. The FEEC website will be created to serve as the epicenter for all activities related to the event (i.e. agenda, updates, and registration). The 2015 FEEC will remain a single day event with the agenda addressing topics in STEM education. Differing from past years and addressing the feedback from participants, the 2015 FEEC will consist of hands-on, activity driven sessions providing teachers with take-home lessons for the classroom rather than conference style information only sessions. The event is open statewide to K-12 STEM teachers, administrators, practicing professionals, and other (informal) educators who are interested in attending.

Girls in Engineering, Math and Science (GEMS): GEMS is a program for middle school girls led by female STEM faculty at Florida Gulf Coast University dedicated to addressing the underrepresentation of girls in STEM fields. Now entering its 8th year, GEMS continues the classic wonders of space theme, with several new facets: 1) expanding the program to 5 counties (Charlotte, Collier, Glades, Hendry, and Lee), 2) including a workforce component by engaging female professionals as role models for STEM careers, and 3) engaging female STEM faculty in the development of activities. The project includes 300 girls from high needs counties, 45 undergraduates and 8 STEM professionals. Middle school teachers are invited to attend GEMS activities allowing them to implement the activities in their classrooms. The first workshop was held on November 1, 2014, the second was held on February 28, 2015 and the third will be held on April 11, 2015

Next Generation Robotic workshop:

The Challenger Center in Tallahassee is creating and executing STEM Curriculum for upper elementary and middle school students and teachers utilizing LEGO robotics and NASA initiatives. This includes providing LEGO robotic EV3 curriculum and instruction to upper elementary and middle school students in combination with the Space Activity Pack and Challenge Set. Through this program students explore, plan, and develop robots around three fundamental challenges facing NASA engineers and scientists today: how to ensure humans can survive in space, how humans can create energy in space, and how robots can help humans explore space. This program is also providing training to teachers to use this advanced equipment and curriculum in their own classroom, through the previously funded, FSGC Teacher Resource Room located at the Challenger Learning Center. The curriculum will be set to current NASA missions and in alignment with the activities of the Human Exploration and Operations (HEO) Mission Directorate.

The first teacher workshop was held in the Fall of 2014 with a focus on current and future spaceflight, and NASA's use of robotics. The second workshop will be held in Spring of 2015 with a focus on physical science concepts associated with spaceflight and robotics. The student robotic workshops will be held in the late Spring and summer of 2015

AMF-ISS Workshop

University of Central Florida (UCF) Resident Teacher Professional Preparation Program

The Kennedy Space Center (KSC) Educator Professional Development (EPD) team provided a summer workshop for a cohort of teachers related to the UCF Masters degree teaching program on June 23-27, 2014. KSC's EPD collaborated with the KSC ISS Ground Processing and Research Project Office to include current biological research capabilities on the ISS. The Education Office and educator specialists from the Astronauts Memorial Foundation structured the workshops to include ISS build activities and investigating space microbes on assorted vegetables and fruits for consumption aboard the ISS. The participants received an in-depth look into new research being conducted on the ISS, tours of KSC research labs, as well as resources for hands-on activities that they can incorporate into their classrooms. NASA Education partnered with the Florida Space
Grant Consortia to provide workshop materials such as seeds, space garden kits, petri dishes, etc. Audience: 38 pre-service teachers (Grades K-12) and 1 university faculty

Daytona State College (DSC) Professional Development Workshop

Kennedy Space Center's (KSC) Educator Professional Development (EPD) team provided a summer workshop for DSC pre-service students, educators and faculty personnel on July 14-18, 2014. KSC's Education office collaborated with the KSC ISS Ground Processing and Research Project Office (UB) to include current biological research capabilities on the ISS. Education and educator specialists from the Astronauts Memorial Foundation (AMF) structured the workshops to include ISS build activities and investigating space microbes on assorted vegetables and fruits for consumption aboard the ISS. The participants received an in-depth look into new research being conducted on

the ISS, tours of KSC research labs, as well as resources for hands-on activities that they can incorporate into their classrooms. NASA Education partnered with the Florida Space Grant Consortia to provide workshop materials such as seeds, space garden kits, petri dishes, etc. Participants also received lunar certifications, enhancing their knowledge of current NASA plans for future exploration of Mars and bodies beyond. Audience: 10 pre-service teachers (Grades K-12) and 3 university faculty.

SMART Objective – On an annual basis, conduct and/or facilitate space-related pre-service and in-service teacher training opportunities focused on space-related math and/or science curricula. A minimum of 50 Florida teachers per year will attend this training. *So far, 4 faculty, 16 undergraduate students, 75 middle school girls and 12 middle school teachers have been involved in pre-college projects. In addition, 96 teachers and administrators have registered for the Eighth Annual Florida Engineering Education Conference to be held on April 25.*

Outcome 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission: (Engage and Inspire)*

Orlando Science Center

Over the past three years, the Orlando Science (OSC) has created six strategically placed interactives throughout the museum that bring each exhibit hall to life in a way that encourages hands-on, playful learning and competition. These STEM Challenge exhibits reflect emerging research that Applied Learning—identifying needs/problems, and then brainstorming, building and testing solutions—is one of the best ways to increase interest in STEM fields while delivering content knowledge. When participants engage in this kind of learning, they develop 21st century skills in critical thinking, creativity, analysis, communication and leadership. The six STEM Challenges (gravitron, wind tubes, pinewood derby, water table, earthquake shake tables, Dino Dig pit) are located throughout the Science Center and allow students and visitors to collaboratively solve real world problems using the engineering design cycle. This year, OSC is creating a new STEM Challenge that, when completed, will deliver engaging STEM content, awareness and literacy to visitors from ages five through adulthood helping us effectively support Florida's citizenry and the 7 school districts they serve.

This new challenge, Glider Challenge, utilizes the engineering design cycle of ask, imagine, plan, create, and improve to step students, and visitors alike, through the process engineers use to solve the problems posed to them. In this interactive exhibit, the visitor will be tasked with building an air glider (paper airplane) that will have the capabilities of navigating several unique target challenges. Visitors are set to compete against one another in mastering the forces of lift and drag, and defying gravity for as long as possible. Each visitor is encouraged to test and retest their designs to ensure they have achieved a successful glider challenge, and work their way to more difficult design builds. This design challenge will become the seventh challenge stationed throughout the Science Center with the purpose of providing our visitors and students the ability for a

more in depth and engaging exhibit experience. Anticipated number of visitors that will experience the Glider exhibit is 270,000 including walk-ins, members and field trips.

3-D topography of alien worlds – Embry Riddle Aeronautical University
FSGC has sponsored the display of fifteen 3-d posters showing the topography of alien worlds. This is displayed, at present, at the ERAU public observatory for their Astronomy Open House. Later these posters will be also be shared with the Museum of Arts and Sciences in Daytona Beach. These posters went on display on March 27, 2015. There were 150 visitors to the open house despite it being overcast. These open houses are held once a month and the total number of annual visitors are expected to be greater than1500. Also, once the posters are shared with the museum, there will be more visitors. The museum will be sharing its numbers with FSGC. In addition, on March 31, 2015, 400 middle school girls attended the open house to celebrate Women in Aviation Day.

SMART Objective - On an annual basis, collaborate with Florida museums and/or science centers to facilitate/conduct engaging space-related learning events held in public venues. A minimum of two events per year will be held. At least 200 members of the public will attend one or more of these events per year. *This year, FSGC supported 1 event targeting middle and high school students and the general public. Information on the number of participants will be received by the OEMP due date*

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Diversity**:
  FSGC has been directly supporting 53 students from 7 institutions, including 1 HBCU and 1 Hispanic Serving Institution.. Among the 53 students are 30 women and 32 under-represented minorities. 15 university faculty (2 women and 5 under-represented minorities) are involved in these projects involving directly funded students. In addition, 215 students from 10 universities, including 2 Hispanic serving institutions, are participating in Higher Education Projects. Among the participating students are 45 women and 39 under-represented minorities.

- **Minority-Serving Institution Collaborations:**
  We are continuing our partnership with Bethune Cookman University in partly sponsoring their scholarship program. A total of 23 students are partially supported by FSGC with the rest of the scholarship funding coming from Bethune Cookman. The students are majoring in Biology, Chemistry, Mathematics, and Computer Engineering. In addition, we are supporting 1 faculty, Dr. Cho from Bethune Cookman on a $25,000 research project titled "Detection, Quantification and Mapping of Algal Blooms in the Indian River Lagoon, FL. This award was under our Florida Space Research program and was competitively selected from a pool of 33 proposals. As a result of this award, FSGC has started working closely with Dr. Cho and is collaborating with heron a proposal submitted to NASA MIRO program titled "Research Academy Center for Advanced Space-based Earth Sciences"

We are also supporting a team from Florida International University that is participating in the NASA Student Launch program. Also, a team from FIU is participating in our Hybrid Rocket Competition. Through our research program, we are supporting a project from FIU led by Dr. Zhe Cheng titled "Environmental Friendly Processing of Low Cost Flexible Copper Zinc Tin Sulfide Solar Cells"

FSGC has also helped start a ballooning project at Broward College. The goal of this project was for the S.T.E.M. Club at Broward College (MSI) to design and build two experiments to be attached to a weather balloon and sent into the stratosphere. The first payload consisted of a spectrophotometer, comprised of a cell phone with a gradient lens to collect spectrophotometer information and a cell phone converted into a cosmic ray detector. The second payload will be equipped with a location awareness system. The S.T.E.M. club formed two teams to design and build each payload to be attached to a weather balloon that will reach 100,000 feet and return safely to earth. The payloads are expected to be launched in late April.

- **NASA Education Priorities:**

  - Authentic, hands-on student experiences in science and engineering disciplines – the incorporation of active participation by students in hands-on learning or practice with experiences rooted in NASA-related, STEM-focused questions and issues; the incorporation of real-life problem-solving and needs as the context for activities.

    FSGC conducts a couple of programs involving hands-on student participation. One is the Hybrid Rocket Competition where students design and build hybrid rockets over 2 semesters and then launch their rockets in a competition at the end of the spring semester. 12 teams from 10 universities are participating in this year's competition. The other design competition managed by FSGC is the Florida University nanosatellite design competition. This year, the University of Florida, winner of the competition in 2014, are building the flight model. In addition, FSGC supports senior design projects in Florida universities and partly sponsors student teams to NASA competition like Robotic Mining, Student Launch Initiative and the Micro-G NExT program.

  - Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise. Capabilities for teachers to provide authentic, hands-on middle school student experiences in science and engineering disciplines (see above).

    The Challenger Center in Tallahassee is creating and executing STEM Curriculum for upper elementary and middle school students and teachers utilizing LEGO robotics and NASA initiatives. The first teacher workshop was held in the Fall of 2014 with a focus on current and future spaceflight, and NASA's use of robotics. The second workshop will be held in Spring of 2015 with a focus on physical science concepts associated

with spaceflight and robotics. The student robotic workshops will be held in the late Spring and summer of 2015

FSGC also supported 2 teacher workshops in collaboration with the Educator Resource Center at the Kennedy Space Center

- Summer opportunities for secondary students on college campuses with the objective of increased enrollment in STEM disciplines or interest in STEM careers.

  GEMS is a program for middle school girls led by female STEM faculty at Florida Gulf Coast University dedicated to addressing the underrepresentation of girls in STEM fields. Now entering its 8th year, GEMS continues the classic wonders of space theme, with several new facets: 1) expanding the program to 5 counties (Charlotte, Collier, Glades, Hendry, and Lee), 2) including a workforce component by engaging female professionals as role models for STEM careers, and 3) engaging female STEM faculty in the development of activities. The project includes 300 girls from high needs counties, 45 undergraduates and 8 STEM professionals. Middle school teachers are invited to attend GEMS activities allowing them to implement the activities in their classrooms. The first workshop was held on November 1, 2014, the second was held on February 28, 2015 and the third will be held on April 11, 2015

- Community Colleges – develop new relationships as well as sustain and strengthen existing institutional relationships with community colleges.

  Most of the community colleges in Florida have been converted 2 4 year colleges. From an original list of 22 colleges, only 4 are community college. We have relationship with 3 community colleges which have now become 4 year colleges. Brevard Community College has become Eastern Florida State College, Santa Fe Community College has become Santa Fe College and Broward Community College has become Broward College. Broward College and Eastern Florida State College are our affiliates. We are supporting a project at Broward College. Through the Competitive Grant Program for Community Colleges, we are supporting students from 3 community college (North Florida Community College, Florida Keys Community College, and Hillsborough Community College) to participate in hands-on projects. Even though this is not through the regular Space Grant funds, we plan to continue are partnership with these colleges after the end of the Competitive Grant program

- Environmental Science and Global Climate Change – research and activities to better understand Earth's environments.

  We are not directly involved in Environmental science activities, but have awarded a project at Bethune Cookman University titled "Detection, Quantification and Mapping of Algal Blooms in the Indian River Lagoon,

FL". We have also partnered with Bethune Cookman University in the submission of a proposal to NASA MIRO program titled "Research Academy Center for Advanced Space-based Earth Science". The Center research focus will be the use of remotely sensed data to study the atmosphere, coastal land and water along Florida's east coastal region in order to leverage several research projects of PI and partners' previous, current, pending efforts.

- Enhance the capacity of institutions to support innovative research infrastructure activities to enable early career faculty to focus their research toward NASA priorities.

  FSGC manages and co-sponsors a research program called Florida Space Research Program whose main objective is to provide seed funding to faculty to conduct research in their institution so that they are able to use the results to get further funding from other sources. The projects have to be aligned with NASA's priorities (included in the Request for Proposal). This program is co-sponsored by Space Florida (quasi state government entity). In FY2014, we supported 15 projects in 10 universities

IMPROVEMENTS MADE IN THE PAST YEAR

We have not had any significant changes in our consortium. The only thing different this year was our program with 3 new community colleges to provide scholarships to students to participate in 3 hands-on space activities.. This was a result of an award under the Competitive Opportunity for Partnerships with Community Colleges and Technical Schools. We plan to continue our partnership with these 3 colleges after the 2-year award. Though this is not considered a change, FSGC did host the Southeast Regional Meeting on October 23-24, 2014. There were 50 people who registered for the meeting. The theme was "Interaction between NASA Centers and Space Grant".

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Listed below are all of FSGC's affiliates. Funds are not provided directly to affiliates for implementation of programs. FSGC awards are all competitive and awards are given to the respective PI's in their institution. The affiliate institution is responsible for sending final reports and all other relevant documentation to the FSGC offices. The only roles the affiliates have is to ensure that information from the FSGC office is being sent to all interested faculty and students and to ensure timely technical and financial reports to the FSGC office. In addition, the FSGC advisory Board, comprising of representatives from all 21 affiliates meet twice a year to approve the budget and FSGC programs.

Bethune-Cookman University (4-year college awarding exclusively baccalaureate degrees): Bethune-Cookman University is a historically Black, United Methodist Church-related college offering baccalaureate degrees.

Broward College (4-year college Bachelor of Science degrees in addition to their 2-year degree programs) Broward College is a Hispanic serving institute. Broward College offers Associate & Bachelor degrees & certificate programs at many locations in the Greater Fort Lauderdale /Broward County community. Specialized programs include online degrees, Health Sciences and Continuing Education.

Embry-Riddle Aeronautical University (University awarding baccalaureate and master's degrees): Embry-Riddle Aeronautical University, a private university, teaches the science, practice, and business of the world of aviation and aerospace.

Eckerd College (4-year college awarding exclusively baccalaureate degrees): Eckerd College is a private, coeducational college of liberal arts and sciences. Eckerd College is one of only 40 schools listed in Loren Pope's Colleges That Change Lives. In 2003, Eckerd was named one of 13 Institutions of Excellence in the First College Year by the Policy Center on the First Year of College. Eckerd College is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award the Bachelor of Arts and Bachelor of Science degrees.

Florida Atlantic University (University awarding degrees up through the Ph.D): Florida Atlantic University is the first public university in southeast Florida and the first in America designed for upper division students only. FAU is earning a reputation as a top research institution in areas ranging from biomedicine and biotechnology to ocean engineering and coastline security.

Brevard Community College (Community/Junior College awarding associate degrees): Situated on Florida's Space Coast, BCC has four integrated campuses – in Cocoa, Melbourne, Palm Bay and Titusville – an aerospace program at the Kennedy Space Center and a Virtual campus. An accredited institution, BCC is recognized as one of America's leading community colleges for quality in instruction, organization, and its innovative and leading-edge programs. It was one of the first community colleges in the country to offer the AA degree online.

Florida Gulf Coast University (4-year college awarding baccalaureate and graduate degrees): FGCU, a member of the State University System of Florida, is a comprehensive university created to address the educational needs of the rapidly growing Southwest Florida population. Florida Gulf Coast University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award associate, baccalaureate, master's, and doctoral degrees. In addition, the university is actively seeking accreditation for the undergraduate engineering programs in the U.A. Whitaker School of Engineering, its Bachelor of Science in Social Work, its Bachelor of Science in Resort and Hospitality Management, and its Bachelor of Science in Clinical Laboratory Science.

Florida Institute of Technology (University awarding degrees up through the Ph.D): Florida Institute of Technology is an independent technological university that provides

quality education, furthers knowledge through basic and applied research, and serves the diverse needs of our local, state, national and international constituencies. FIT is the only independent, technological university in the Southeast, A Barron's Guide "Best Buy" in College Education, listed among America's best colleges in U.S. News & World Report and named one of the nation's top 13 technological institutions in the Fiske Guide to Colleges.

Florida International University (University awarding baccalaureate and master's degrees, Hispanic Serving Institute): Florida International University is Miami-Dade County's first public, four-year university. FIU is ranked first in the nation among four-year colleges for awarding bachelor's and master's degrees to Hispanic students in the 2008 survey conducted by the Hispanic Outlook in Higher Education Magazine. FIU is the youngest university to have been awarded a chapter of Phi Beta Kappa, the nation's oldest and most distinguished academic honor society.

Florida State University (University awarding degrees up through the Ph.D): Florida State University's 16 colleges offer more than 300 undergraduate, graduate, doctoral, professional and specialist degree programs, including medicine and law, covering a vast array of disciplines critical to society today. FSU is a comprehensive, residential and coeducational institution of over 33,000 students located in Tallahassee, Florida.

Florida A&M University (University awarding degrees up through the Ph.D.; Historically Black College or University). Florida A&M University offers 108 undergraduate degrees in 64 undergraduate programs and 60 graduate degrees in 32 graduate programs (includes 1 professional and 7 doctoral degrees) within its 12 Schools and Colleges.The doctor of philosophy is offered in the College of Pharmacy and Pharmaceutical Sciences, College of Education and FAMU/FSU College of Engineering.

University of Central Florida – Lead University: (University awarding degrees up through the Ph.D). UCF has 12 colleges, including the newly established College of Medicine, and College of Graduate Studies. More than 50,000 students attend classes on UCF's main campus and its 11 regional campuses located throughout Central Florida. UCF offers 223 degree programs, it has become an academic and research leader in numerous fields, such as optics, modeling and simulation, engineering and computer science, business administration, education, science, hospitality management and digital media

University of Florida: (University awarding degrees up through the Ph.D): The University of Florida is a major, public, comprehensive, land-grant, research university. The state's oldest, largest and most comprehensive university, Florida is among the nation's most academically diverse public universities. With more than 51,000 students, Florida is now one of the five largest universities in the nation. It is one of only 17 public, land-grant universities that belongs to the Association of American Universities.

University of Miami (University awarding degrees up through the Ph.D): The University of Miami is the largest, most comprehensive private research university in the

southeastern United States with a well-earned reputation for academic excellence. Nearly 15,000 undergraduate and graduate students from every state and more than 140 nations around the world call UM home during the academic semester. With more than 9,400 full- and part-time faculty and staff, UM is the second largest private employer in Miami-Dade County. The University's 12 colleges and schools, along with the Division of Continuing and International Education, offer 114 bachelor's, 104 master's, 57 doctoral and four professional areas of study.

University of North Florida: (University awarding baccalaureate and master's degrees): The University of North Florida is a comprehensive public urban university whose mission is to educate students through a broad array of undergraduate and select graduate programs. UNF cultivates a learning environment that supports intellectual curiosity, academic achievement, and personal growth. This goal is supported by a strong academic curriculum comprised of 56 undergraduate, 27 masters, and 3 doctoral degree programs in the liberal arts and professional fields.

University of South Florida: (University awarding degrees up through the Ph.D): The University of South Florida is the second largest university in the southeast and among the top 20 largest in the nation. It is one of the nation's top 63 public research universities and one of 39 community engaged public universities as designated by the Carnegie Foundation for the Advancement of Teaching. The University offers 219 degree programs at the undergraduate, graduate, specialist and doctoral levels, including the doctor of medicine.

University of West Florida: (University awarding baccalaureate and master's degrees): UWF is a member of the State University System of Florida. The university offers undergraduate degrees in 50 different areas with 107 specializations, master's degrees in 24 different areas with 56 specializations, two specialist degrees and a doctorate in education with seven specializations. Long celebrated for its caring, nurturing approach to helping

Astronauts Memorial Foundation (Private 501(c)(3) not-for-profit organization): The Astronauts Memorial Foundation honors and memorializes those astronauts who have sacrificed their lives for the nation and the space program by sponsoring the national Space Mirror Memorial, and by implementing innovative educational technology programs. AMF is a private, not-for-profit organization approved by NASA to build and maintain two major facilities at the John F. Kennedy Space Center's Visitor Complex.

Kennedy Space Center (Federal Center): KSC is the NASA center of excellence for launch and payload processing systems as well as the lead center for acquisition and management of expendable launch vehicle services and payload carriers. Located at the Cape Canaveral Spaceport in Florida, KSC handles the checkout, launch and landing of the Space Shuttle and its payloads.

Orlando Science Center (Science Museum): Orlando Science Center offers hands-on fun for all ages through engaging interactive exhibits, live programming, giant-screen

films, school field trips and school-break camps. The science Center conducts the Informal Science program for FSGC

Space Florida (State/Local Government): Space Florida is the public-private partnership responsible for promoting and developing Florida's aerospace industry. Space Florida was created by the Florida Legislature to sustain Florida's position as the global space leader. As declared in its mission statement, Space Florida drives State economic development across the global aerospace enterprise. Space Florida provides $100K for the FSGC research program and $10K for the internship program at the Space Life Sciences Lab