VA_FY16_Year 2_APD

Virginia Space Grant Consortium
Lead Institution: Virginia Space Grant Consortium
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Lines of Business (LOBs): NASA Internships, Fellowships, and Scholarships; Stem Engagement; Institutional Engagement; Educator Professional Development

A. 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 Virginia Space Grant Consortium (VSGC) is a Designated Consortium funded at a level of $760,000 for fiscal year 2016.

B. PROGRAM GOALS

VSGC Goal 1 - Conduct quality scholarship and fellowship programs including a bridge program for freshman and sophomore students, research awards for undergraduate and graduate students, community college STEM scholarships and teacher education STEM scholarships. 1.A: Each academic year, award students in all four categories with scholarships and fellowships. Students will be competitively selected by review panels consisting of representatives from member institutions. **1.B:** Award at least the minimum amount required by NASA in scholarship and fellowships to at least 60 students each academic year. **1.C:** Each academic year, provide a percentage of awards to underrepresented minority and female students that is consistent with the diversity target as established by NASA (currently 24.6%). **1.D:** At least 90% of students receiving research awards will attend and present at the annual VSGC Student Research Conference. **1.E:** Longitudinally track 100% of all students receiving significant awards to identify their next step in academia or the workforce. **1.F:** At least 60% of students receiving significant awards will be employed by NASA, an aerospace contractor, higher education or other educational institutions. **1.G:** At least 45% of undergraduate students receiving significant support from VSGC will move on to advanced education in NASA-related disciplines.

VSGC Goal 2 - Offer quality higher education programs including internship programs in partnership with our member institutions and partners. 2.A: Each academic year, provide paid internships for at least four students at NASA Centers or with industry partners. **2.B:** Conduct at

least one higher education project in partnership with Virginia's community colleges. **2.C:** Each year, conduct at least two higher education projects in partnership with VSGC member institutions.

VSGC Goal 3 - Promote diversity in all programs and activities by encouraging participation by underrepresented minority and female students and faculty. 3.A: Each year, conduct at least one outreach event in partnership with Hampton University (HBCU) to promote programs and opportunities to students and faculty. **3.B:** Each year, conduct at least one outreach event in partnership with a non-member minority institution to promote programs and opportunities to students and faculty. **3.C:** Each academic year, provide a percentage of student awards to underrepresented minority and female students that meets or exceeds the diversity target as established by NASA (currently 24.6% for underrepresented minorities and 40% females). **3.D:** Provide at least one STEM program each year for special needs faculty or students. **3.E:** Undertake at least one collaborative program with a non-member minority serving institution.

VSGC Goal 4 – Undertake programs that foster research capabilities at our member institutions and serve as a catalyst for linking university researchers to NASA and other opportunities. 4.A: Conduct a New Investigator award program each year targeting tenure track faculty who are within the first five years of their academic career. At least five awards will be given annually and the research will have NASA relevance. **4.B:** Disseminate at least 20 research opportunity announcements to statewide networks each year. **4.C**: Facilitate at least five meetings with university researchers and NASA personnel, as appropriate, resulting in at least two collaborative proposals being submitted. **4.D:** Support at least two experiential student research, mission and design programs each year.

Goal 5 – Provide quality precollege educational opportunities including professional development for precollege and pre-service educators and student-focused programs for students throughout the precollege pipeline. 5.A: VSGC will provide professional development in STEM and using NASA resources to at least 40 teachers each year. **5.B**: VSGC will reach over 100 students by conducting selected student-focused programs and activities promoting participation in STEM and related careers. **5.C**: At least 75% of precollege educators participating in more than two days of professional development will use NASA resources in their classroom following the workshop. **5.D:** At least 60% of precollege educators receiving NASA resources or participating in VSGC-led short duration activities will use NASA resources in their classroom. **5.E:** At least 50% of all precollege students participating in VSGC-sponsored programs will express an interest in STEM careers.

Goal 6 - Conduct Informal Science Education programs in partnership with informal education members and partners. 6.A: Sponsor at least one program each year with the Virginia Air and Space Center or the Science Museum of Virginia. VSGC will consider other appropriate informal science education opportunities as funding and partnerships permit with the goal of providing at least one other activity per year if funding and resources permit.

Goal 7 - Serve as an effective steward of Consortium resources and a strong partner for STEM programs. 7.A: Effectively leverage NASA Space Grant resources. **7.B:** Network with other Space Grants and Space Grant organizations. **7.C:** Network with NASA Headquarters and

NASA Centers for program implementation. **7.D:** Build and sustain effective strategic partnerships, including relationships with state and federal legislators and officials.

C. PROGRAM/PROJECT BENEFITS TO PROGRAM AREAS

Patricia Jackson, an underrepresented minority Thomas Nelson Community College student pursuing her associate degree in Mechanical Engineering Technology, was selected to participate in the 2016 STEM Takes Flight NASA Research Experience Program. She worked with NASA Engineering Directorate researcher, Carrie Rhoades and two other STF student researchers on the inflatable reentry cubesat project. The summer program was a short 10 week session, but long enough for NASA managers to realize Patricia was a real asset with her gift for mathematics and science. As a result of her exceptional experience in the STEM Takes Flight Program, Patricia was selected for the prestigious NASA Pathways Program which started fall 2016 immediately following her summer session. In addition to her academic and NASA endeavors, once a month on weekends and for two weeks every summer, she is a senior airman in the Air Force Reserves. We thank Patricia for her service and look forward to following her future successes with NASA.

Christopher Van Ostrand has proven himself to be a shining star as a participant in the Commonwealth STEM Industry Internship Program (CSIIP). He completed his first two years of higher education at Tidewater Community College and then transferred to Old Dominion University. Christopher was selected through CSIIP as a mechanical engineering intern for Jacobs Technology. During his internship, he was able to apply his classroom knowledge to the workplace. Participating in CSIIP solidified his decision to pursue a career in mechanical engineering. Upon completion of his Bachelor's degree, Christopher plans to attend graduate school, complete the professional engineer's exam and start his own engineering firm.

VSGC funded and established the Small Sat Virginia Initiative. Small Sat Virginia is a 31-member collaboration of education institutions, NASA, and industry to support the development and integration of small satellites in all five Consortium member institutions. NASA Langley and NASA Wallops are partners as well as many industry collaborators including Virginia Commercial Space Flight Authority/Mid-Atlantic Regional Space Port (MARS), National Institute of Aerospace, The American Institute of Aeronautics and Astronautics and the American Astronautical Society, Aerojet Rocketdyne, Cubic Aerospace, HawkEye 360, and dozens more. As the project and funding expands, VSGC will continue to add companies and non-Consortium member universities.

D. PROGRAM ACCOMPLISHMENTS

VSGC actively works with its members and many external partners to accomplish Consortium goals. NASA's funding investment is heavily leveraged by non-Space Grant funding from federal and state agencies and other nongovernmental sources. This funding enhanced the VSGC's ability to staff and run a wide range of programs in concert with NASA goals.

NASA Internships, Fellowships, and Scholarships:

(Goal 1.A and 1.B) - For the 2017-18 academic year, VSGC competitively awarded 80 scholarships and fellowships through four different programs to students attending member institutions. VSGC exceeded the diversity target by awarding 46% of all direct awards to minorities and 40% to female students. A total of $204,000 went to 34 students for Graduate

Research Fellowships and $80,000 went to 14 students for Undergraduate Research Scholarships. A total of $25,000 was awarded to 25 sophomore and junior students majoring in STEM through the Undergraduate STEM Bridge scholarship program and $10,000 was awarded to five community college students majoring in STEM. VSGC will also support one intern to participate in the NASA Space Grant/Science Mission Directorate internship program in the summer of 2017 and three student interns at NASA Centers through the NASA's One-Stop Shop Initiative.

Higher Education Projects:

(Goal 1.D) -VSGC coordinates an annual Student Research Conference at which research scholars and fellows present their research. The College of William and Mary is hosting the 2017 conference and sponsoring a luncheon in honor of the awardees. Graduate Fellows present 15-minute oral presentations while Undergraduate Scholars present posters. The event is attended by faculty and NASA personnel, industry representatives, and state legislators. Attending and presenting at the Research Conference is a requirement of all awardees.

(Goal 2.A, 2.B, and 2.C) - The VSGC-led Commonwealth Industry Internship Program (CSIIP) program continues to address the increasing demand for skilled STEM workers in Virginia by linking undergraduate STEM students to paid internship positions with companies throughout Virginia. CSIIP operates with support from the Commonwealth of Virginia, in partnership with Virginia Regional Technology Councils and in collaboration with Virginia companies and Virginia higher education institutions. CSIIP provides spring, summer and fall internship positions for undergraduates and recent graduates. Companies make the selections and employ the interns. A total of 184 companies offering paid internships are currently registered with CSIIP. Nearly 601 student applicants are in the applicant pool at this time. In fall 2016 and spring 2017, 11 students were placed at seven different companies, and other employers are still interviewing candidates and making internship placements.

(Goal 2.A, 2.B, and 2.C) – As part of its plan to sustain the highly successful NASA research experiences for community college students implemented as part of our competitive Space Grant Community College award – STEM Takes Flight at Virginia's Community Colleges (STF), VSGC supported six community college students for summer research experiences at NASA Langley. These additional six students were supported with VSGC funds of $30,000 and allowed VSGC to leverage the STF funding for further impact.

(Goal 2.A, 2.B, and 2.C) – VSGC is funding the University of Virginia (UVA) and Virginia Tech (VT) to participate in the 2017 North American Solar Eclipse Ballooning Project. VSGC is providing nearly $22,000 in support to UVA for a student-led experiment in the southern Appalachians during the solar eclipse. Instruments will be deployed and various data sets will be analyzed including multiple radiosonde balloons, instrumented unmanned quadcopters and surface weather stations. A ground-based Doppler lidar will be deployed to measure winds and satellite data will be analyzed for surface temperature and boundary layer height analysis.

VT is being supported with $24,000 to deploy multiple low-cost receiver nodes on the ground and aboard balloon payloads to monitor beacons from the existing amateur radio satellites as well as the NOAA weather satellites. Modelling of the target spacecraft orbits coincident with the eclipse interval will be conducted in order to optimize receiver locations and support the science goals of

the eclipse experiment. The data will then be post-processed at VT to analyze changes in the ionosphere resulting from the eclipse event.

(Goal 2.A, 2.B, and 2.C) – VSGC is providing $10,000 in funding to the College of William and Mary (WM) for a small satellite project using ThinSats. The student-led project will physically tether seven small (4in x 4in x 0.5in) satellites to conduct scientific experiments. WM is managing two satellites and several local schools also are responsible for a satellite. The satellites will be launched on a future ISS resupply mission. WM faculty serve as mentors for the local schools. Each satellite has a GlobalStar transmitter and power, sensors, and components.

(Goal 2.C) – VSGC supported an undergraduate team from Virginia Tech to participate in the Intercollegiate Rocket Engineering Competition for the 2016-2017 Academic Year. The team will be developing a sounding rocket with a CubeSat-style payload to launch to an altitude of 10,000 feet at Spaceport America in Las Cruces in June 2017. VSGC is contributing $7,000 to help fund research and prototyping costs, construction of launch vehicle and payload systems, and competition fees. This event is one of the most prestigious rocket engineering competitions in the world and will motivate and train students for careers in the aerospace industry.

(Goal 2.C) - VSGC, in partnership with Colorado Space Grant Consortium, offers the annual RockOn! workshop hosted by NASA Wallops Flight Facility each summer. RockOn! is a workshop for faculty and students in which participant teams learn to build a small sounding rocket payload from kits and launch it on a sounding rocket. VSGC provided $5,500 in funding to support one student-led team from ODU to participate in the RockSat-C program. VSGC is supporting the half-canister cost, student lodging and travel expenses.

(Goal 2.A and 2.B) – VSGC sponsored the Engineering Early Advantage Program for Women (EEAP) at Old Dominion University (ODU). EEAP is a summer residential experience for female engineering majors prior to their freshman year in college. VSGC has supported this project since its inception in 2001 and provided $10,000 to support the 12 student stipends and some other program costs. EEAP consists of four weeks of academic- and career-enhancing activities in a unique engineering setting. ODU's Virginia Modeling, Analysis and Simulation Center (VMASC) hosts the experience. Participants work on projects in partnership with faculty and graduate students and several industry partners support the program by providing tours and resources.

(Goal 2.A and 2.C) – Since the 2015 STEM Takes Flight (STF) faculty professional development workshop was so successful and impactful to participants, VSGC contributed personnel time and funding to support a second workshop in 2016. NASA Wallops hosted the workshop for Virginia's community college faculty and also contributed significant personnel time and resources.

The STF workshop was a 2.5-day professional development hands-on institute for 20 community college STEM faculty. This residential workshop focused on the integration of STEM in the NASA workplace and helping faculty in educating students on the importance of teamwork, technical skills, and problem solving. Briefings and tours highlighted the suborbital and orbital missions and launches conducted at NASA Wallops and around the world. The importance of the collaborative work of engineers, scientists, technicians, safety and range control personnel was demonstrated. The participants experienced two case studies on team work, troubleshooting and

real-time decision making. Upon completion of a post-workshop survey, participants received an $800 stipend.

(Goal 2.C) - VSGC provided the cash prizes to the first, second and third place winners at Virginia Tech's annual Office of Geographic Information Systems and Remote Sensing Symposium. Higher education students participated in poster competitions to develop informative graphics and posters on issues related to lidar, geospatial data and other remotely sensed data. Awardees were selected by a panel of subject-matter experts.

Research Infrastructure Projects:

(Goal 4.A) - The New Investigator Program (NIP) is designed to strengthen Virginia's research infrastructure by providing startup funding to VSGC university personnel who are conducting research that is directly aligned with NASA's mission. NIP is open researchers within their first five years as faculty. Five faculty members from VSGC-member institutions received an award of $10,000 each for their research project.

(Goal 4.D) - VSGC provided $7,000 of support for a collaboration between Virginia Tech and NASA Johnson Space Center (JSC). The collaboration involves student projects in intelligent textiles and wearable technologies for space flight. Staff at JSC will specify project topics for the students, and the students will work on developing concepts and prototypes based upon those specifications. The project will culminate with a one-day symposium at JSC where the students will present their concepts and prototypes, attend presentations about related work at JSC, and tour the facilities. The 10 students participating are from many different majors including: architecture, industrial design, computer science and computer engineering. The student projects will be conducted as part of a senior/masters level course.

Precollege Projects:

(Goal 5.B) - The Virginia Aerospace Science and Technology Scholars (VASTS) program is an interactive online STEM learning experience, highlighted by a seven-day residential summer academy at NASA Langley Research Center. High school juniors selected to participate in the program are immersed in NASA-related research through interaction with scientists, engineers and technologists. Top performing students in the online course are selected to attend one of three residential summer academies hosted by Langley. A total of 400 students are participating in the online course and 180 will attend the three summer academies. The program is a partnership between the VSGC and NASA Langley with sponsorship from the Commonwealth of Virginia. VASTS is modeled after the NASA-award winning Texas Aerospace Scholars program developed by NASA Johnson Space Center.

(Goal 5.A) - VSGC supported the annual professional development conference hosted by the Virginia Association of Science Teachers (VAST) in fall 2016. This conference is attended by over 600 science teachers and administrators from Virginia. VSGC sponsorship supported a keynote presentation by NASA Chief Scientist, Ellen Stofan and also a keynote presentation by Dianna Cowern, creator of the Physics Girl website and YouTube channel. VSGC also exhibited and presented Space Grant programs and opportunities at the conference.

(Goal 5.B) - VSGC coordinated four STEM Exploratory Saturday programs for middle school grade students and parents through the Greater Peninsula Governor's STEM Academy (GPGSA)

in partnership with Thomas Nelson Community College, NASA Langley, Canon Virginia, and ECPI. All four partners hosted a Saturday event and provided speakers and career planning information. Newport News Shipbuilding was also a partner and provided instruction for several student sessions. More than 275 students and 250 parents attended the Saturday series.

(Goal 5.B) - VSGC created and offers the Building Leaders for Advancing Science and Technology (BLAST) program for ninth- and tenth-graders statewide. Supported with funding from the Commonwealth of Virginia, the program provided hands-on STEM activities ODU, University of Virginia (UVA), and Virginia Tech for 320 students. Offered free of charge, BLAST provides a three-day, on-campus residential summer program designed to bring STEM alive through a series of innovative, hands-on experiences facilitated by university faculty, students and staff. Near the end of this fiscal year, VSGC was asked by the State Council for Higher Education in Virginia (SCHEV) to coordinate and offer two additional BLAST sessions for 80 students participating in the Gear Up Virginia project funded by the US Department of Education for 28 underserved middle schools in Virginia.

(Goal 5.B) - With funding from the Commonwealth of Virginia through VSGC-member Old Dominion University, the VSGC established the Virginia Space Coast Scholars (VSCS) program. VSCS is designed to inspire high school sophomores that possess latent science and technical skills to participate in a dynamic online STEM learning experience. VSCS is an informal online learning experience highlighted by a seven-day residential summer academy at NASA Wallops Flight Facility for qualifying students. A total of 330 students are currently participating in the online modules and 120 students will attend the three Academies.

(Goal 5.B) - Virginia Earth System Science Scholars (VESSS) engages students in real world investigations of the Earth and its highly dynamic systems through the use of the latest NASA and NOAA research and data. VESSS provides a one-semester online course for Virginia high school juniors and seniors. High performing students are invited to a one-week residential summer academy at NASA Langley. A total of 80 students are participating in the program. College credit is available through Thomas Nelson Community College at no cost to students for both the online course and the summer academy.

(Goal 5.B) – VSGC provided tuition of $925 to support two middle-school students to participate in the Virginia Space Flight Academy. The one-week Academy is a middle-school program hosted near NASA Wallops where students build and launch model rockets, work with robotics, and other STEM activities. They also tour facilities and meet STEM professionals and role models.

Informal Education Projects:

(Goal 6.A) - VSGC provided support to the Virginia Air and Space Center to establish an aviation-inspired Maze. A new public engagement program will also be established by the Center to leverage the 3,500 square foot Maze and enhance the visitor experience. Visitors will search throughout the maze for answers to aviation and STEM-related questions and advance their knowledge in an unforgettable way.

(Goal 7.D) - The Director and staff annually brief Virginia Congressional and state legislators as part of Aerospace Day at the General Assembly. VSGC also works with state officials and legislators to assist with STEM and aerospace policy advocacy. The Director serves on the Governor's Aerospace Advisory Council and on the Joint Commission on Science and Technology Nanosatellites Advisory Committee. The Director is also a member of, and co-facilitates with the NASA Langley Center Director, the Informal Aerospace Working Group of about a dozen aerospace sector leaders including the NASA Wallops Flight Facility Director, the Directors of the Mid-Atlantic Regional Spaceport, National Institute of Aerospace and the Virginia Department of Aviation as well as industry representation. VSGC is a member of the recently formed Virginia Aerospace Business Association and also the Wallops Island Regional Alliance.

E. PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE GOALS

- **Diversity**: VSGC exceeded the diversity target by awarding 42% of all direct awards to minorities and 52% to female students.

- **Minority Serving Institution Collaborations**: VSGC partnered with Hampton University (HBCU) on a successful grant proposal to NASA's MIRO program. The project titled, Virginia Earth System Science through NASA, will allow the VSGC to offer the VESS online course. VSGC funded Virginia State University (VSU), and HBCU, to participate in the NASA Mining Competition at Kennedy Space Center. VSGC continues to seek partnerships with VSU and other HBCU's around big-data, cubesats, and other projects.

- **Office of Education Annual Performance Indicators**:

  - API 2.4.1: ED-16-1 ___40____
  - API 2.4.2: ED-16-2 ___40____
  - API 2.4.4: ED-16-4 ____2____
  - API 2.4.5: ED-16-5 ___1407__

F. IMPROVEMENTS MADE IN THE PAST YEAR

This was an excellent year for VSGC externally-funded programs with six proposals awarded and two still pending. VSGC was asked by the Virginia General Assembly's Joint Commission on Technology and Science Nanosatellite Technology Advisory Committee to provide a proposal to coordinate and lead a small satellite science and education consortium in Virginia. The proposal now includes more than 31 NASA, industry and academic partners and was unanimously endorsed by the committee and recommended for state funding. We currently have a budget amendment in the amount of $300,000 led by Senator Frank Wagner being considered to fund the initiative. Through this initiative and other programs, VSGC added many new partners from industry and other sectors and increased the number of community college contacts. VSGC added one full-time STEM Education Specialist to the VSGC staff through non-Space Grant funding.

G. CURRENT AND PROJECTED CHALLENGES

VSGC is concerned with developing mechanisms to sustain support for programs that were established with Space Grant competitive funding programs. The STEM Takes Flight program—for community college students and faculty, and the inSTEP program—for preservice teachers, were established with competitive grants with a two-year cycle. An additional current challenge is that existing Space Grant resources do not fully cover staffing needs for an active Consortium.

H. PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

VSGC members and partners play critical roles in project development and implementation. All 14 members are active in working with the VSGC to meet Consortium goals. In some cases, VSGC provides funding directly to member institutions for projects and the member institution has the lead. In other projects, VSGC staff may take the lead for project coordination working closely with partners for project execution. **VSGC Affiliate Members include: Academic Higher Education:** College of William and Mary, Hampton University, Old Dominion University, University of Virginia, Virginia Tech. **NASA:** NASA Langley Research Center, NASA Goddard Space Flight Center's Wallops Flight Facility. **State Agency:** State Council of High Education for Virginia (state agency for higher education), Virginia Community College System (higher education), Virginia Department of Education (state agency), Virginia's Center for Innovative Technology (statewide nonprofit that creates technology-based economic development strategies to accelerate innovation and the next generation of technology and technology companies). **Informal Education:** Science Museum of Virginia, MathScience Innovation Center and Virginia Air and Space Center.