

FY 2019 Year 5 Extension Annual Performance Document

South Dakota Space Grant Consortium

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Consortium URL: <http://sdspacegrant.sdsmt.edu>

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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 South Dakota Space Grant Consortium is a Capability Enhancement Consortium funded at a level of \$581,400 for fiscal year 2019.

B. PROGRAM GOALS:

SDSGC's Strategic Plan was updated and streamlined in August 2019. For the goals listed below, quantitative targets are established for the various objectives and strategies and many of them are reflected in the Summary Table of SMART Goals, Objectives, and Targets included in SDSGC's FY2019 base proposal. For example, targets for awards to, and participation of, women and minorities, are set at 40% for females and 15% for minorities based on the latest National Center for Education Statistics enrollment data for SD. **Consortium Management:** *Ensure quality and fairness in all Consortium programs and alignment with the needs of NASA, the affiliate organizations, and the state of SD.* **NIF:** *Provide internships and fellowships, that enhance educational and research opportunities to students from diverse backgrounds who are pursuing degrees in fields of science, technology, engineering, and mathematics (STEM) that align with NASA's priorities and those of SDSGC affiliates.* **Research Infrastructure:** *Improve research programs and capabilities of Consortium affiliates with an emphasis on the fields of aerospace, earth science, and supporting STEM disciplines.* **Higher Education:** *Build interdisciplinary programs related to NASA's Mission Directorates at the state's institutions of higher education and support related programs that serve to strengthen STEM education in SD.* **Diversity of Participants:** *Empower minority groups (emphasis Native Americans), women and persons with disabilities (collectively referred to as "underrepresented groups" henceforth) with the knowledge and tools they need to pursue a career in STEM.* **Workforce Development:** *Provide students a pathway to careers that will contribute to a highly-trained and diverse workforce for NASA and expand South Dakota's and the nation's research and development capacity.* **Evaluation and Longitudinal Tracking (Learning Agenda):** *Evaluate the short-*

term and long-term impact of SDSGC programs in relation to their goals and objectives. **Minority Serving Institutions:** *Ensure that Minority Serving Institutions in South Dakota, which are exclusively Tribal Colleges and Universities, are represented in the planning and implementation of all Consortium programs.* **Precollege:** *Increase South Dakota pre-college student and teacher awareness and understanding of, and access to, authentic STEM experiences, NASA's mission, work and people, and career opportunities in aerospace, earth science, and supporting STEM disciplines.* **Informal Education:** *Strengthen public understanding of NASA's mission and work by complementing community efforts in STEM education and inspiring citizens of diverse backgrounds through the excitement of scientific exploration and discovery.*

C. PROGRAM/PROJECT BENEFITS TO PROGRAM AREAS:

The following highlight reflects impacts in alignment with the NIF Program Area and SDSGC's Objective B.1.1 to: *“Competitively award NASA internships and fellowships to provide students with mission-driven authentic learning experiences and research opportunities with NASA's people, work and facilities, EROS, and aerospace industries.”*

Jacob Pagel, a freshman and Aviation Maintenance Technician major at SDSGC affiliate Lake Area Technical Institute (LATI) in Watertown, SD, conducted a summer 2019 internship titled: “Armstrong Aircraft Mechanic and Technician project” at NASA Armstrong Research Center through a \$7,300 Space Grant internship stipend. In this internship, Jacob was provided a multiple position opportunity in the Aircraft Maintenance Division. Specific work varied with his position mentor and aircraft. Jacob received hands-on experience performing maintenance repair and integration of flight experiments on support and experimental aircraft including periodic rotations in experimental fabrication engine maintenance shops. Upon completing the internship, Jacob was interviewed by a local television news crew and expressed what an excellent opportunity he was provided, but the quote we include here is from a thank you note his mother, sent to SDSGC Management Team after selecting Jacob for Space Grant funding: *“Thank you so much for choosing my son Jacob Pagel for the internship stipend. I would have never been able to afford to send him to California for the NASA Armstrong Flight Research Center Internship this summer. You have helped make his Dream a reality and that is priceless!”*

The following highlight reflects impacts in alignment with SDSGC's Workforce Development Program Emphases Goal to: *“Provide students a pathway to careers that will contribute to a highly-trained and diverse workforce for NASA and expand South Dakota's and the nation's research and development capacity.”*

Arjun Ayyangar, a Dec. 2019 graduate of SDSM&T, was a 2016-2019 Space Grant Fellow and NASA Solar System Ambassador who received his BS degree in Applied Mathematics and went on to gain an MS degree in Computational Sciences and Robotics. He immediately gained employment in the aerospace and defense industry at Lockheed Martin in Moorestown, NJ. During summer 2018, Arjun conducted a NASA internship at KSC funded by a \$7,500 Space Grant stipend. His KSC research project titled *“Augmented/Virtual Reality Technology Development”* pursued the capabilities of several leading-edge technologies in the realms of augmented and virtual reality and natural user interface. He worked on integrating these technologies into an environment designed to explore alternative human-computer interaction methodologies. In working on converting 3D models, he created a new plugin in Python for a software product called Blender that allows Collada files exported from CATIA V5 to be imported into Blender. His NASA mentor was very pleased with his accomplishments and

plans to continue work with the plugin that Arjun developed. Arjun also completed an internship during summer 2016, with IT Coalition at the Center for Climate Simulation at NASA Goddard where he modeled climate data using Python's clustering algorithms. Arjun's story is an excellent example of how these Space Grant opportunities lead him to two internships at NASA Centers and, upon graduation, a valuable job in the aerospace industry.

The following highlight reflects impacts in alignment with the Precollege and Diversity of Participants Program Areas and SDSGC's Strategic Plan Goal to: *"Increase South Dakota pre-college student and educator awareness and understanding of, and access to, authentic STEM experiences, NASA's mission, work and people, and career opportunities in aerospace, earth science, and supporting STEM disciplines"* and Diversity Objective C.1.4 to: *"Facilitate the entry of members of underrepresented groups (women, minority groups, and persons with disabilities) into STEM careers."*

Women in Science (WIS) conferences in FY2019 – Through its \$29,552 FY19 subaward with affiliate SD Discovery Center, SDSGC partnered with local businesses to support (with \$14,000) seven Women in Science (WIS) conferences during FY19 in the following cities with 2,797 middle and high school girls participating: Sioux Falls, Rapid City, Aberdeen, Pierre, Yankton, Watertown, and Spearfish. Of the 2,797 female student participants, 96% were middle school and 4% high school. 29% were minority. The planned FY19 WIS conference in Mitchell, SD, was cancelled, but will be held in 2020. Each conference is organized with volunteers committed to inspiring middle/high school girls to continue with courses in math and science and to consider STEM careers. Professional women give presentations on STEM careers and the girls participate in programs that feature women from NASA. 607 teachers, parents, and adult volunteers participated in the seven FY19 WIS events for a total of 3,404 participants.

D. PROGRAM ACCOMPLISHMENTS:

The performance *Goals* for NIF, Higher Education, Research Infrastructure, Precollege, and Informal Education are listed above under B (Program Goals). The specific SMART Objectives from Appendix 3 in SDSGC's 2015 base proposal and the Consortium's Strategic Plan that are applicable to the accomplishments listed below are given in *italics*.

- NASA Internships, Fellowships, and Scholarships:

SMART Objective: Statewide competition offered at all 10 higher education affiliates including three Tribal Colleges; emphasis on internships with NASA, aerospace industry, SURF, and EROS. [At least 55 awards (\$1-12K); all awardees enter longitudinal tracking system; at least 15% minority, 40% female, five NASA/aerospace industry interns, and five EROS interns]

A total of \$173,629 was made available for NIF student funding through SDSGC's FY19 base and augmentations awards. This exceeded the minimum required amount of \$133,950 by \$39,679. Similar to SDSGC's FY2017 and 2018 OEPM and APD reports, there is a difference in the FY2019 reporting period between the OEPM and APD reports. FY19 OEPM report complies with NASA's new OEPM reporting period of Fall 2018 and Spring/Summer 2019. The FY19 APD reporting period is April 23, 2019 through Feb. 22, 2020 (only 10 months because the anniversary date was changed Year 5). Space Grant NIFS awards are provided in three stipend categories: 1) Internships, 2) Graduate Research Fellowships, and 3) Educational stipends. Research stipend awardees are expected to produce a publication or poster and Internship awardees are expected to produce a final report on their internship project. \$186,200 of the

FY19-budgeted NIF amount of \$173,629 was awarded in FY19. The additional \$12,571 came from other Space Grant participant funds that were available.

72 applications were received from students at 9 of the Consortiums universities in competition for the FY19 NIF awards. The Consortium's 10-member Management Team reviewed the applications and made selections. Awards were provided to 51 university students from 8 of SDSGC's institutes of higher education, including affiliate Tribal Colleges Oglala Lakota College and Sinte Gleska University and Community College/Technical School Lake Area Technical Institute (LATI), for a total of \$162,200. Additionally, three \$8,000 "Research Experience for Teachers" (RET) awards totaling \$24,000 were awarded to two high school teachers and one middle school teacher for summer 2019 RET projects at SDSGC universities. That brought the NIF award total to \$186,200 stated above. Four of the 51 university student awardees were graduate level (8%); 47 undergraduate (92%). SDSGC exceeded its goal of 15% of awards to minority students: 8 of the 51 awards (15.7%) went to minority students. Twenty-three (23) of the 51 awards (45%) were provided to female students, exceeding the targeted goal of 40% of awards to females. Three NASA internships were funded by Space Grant during the FY19 OEPM reporting period at the following three NASA Centers: Armstrong Flight Research Center (Aviation Maintenance Freshman Jacob Pagel of LATI for \$7,300), Langley Research Center (Mechanical Engineering Junior Jonah Sayre of SDSM&T for \$8,800), and Marshall Space Flight Center (Human Factors PhD candidate Denis Kozhocar of USD for \$14,400).

- Higher Education projects:

SMART Objective: Statewide competition for Project Innovation Grants for course development or workshops offered at all 10 higher education affiliates including two Tribal Colleges; emphasis on NASA disciplines. [At least one award for course development/workshops \$5-20K]

Eight proposals totaling \$166,325 in requested **Project Innovation Grant (PIG)** funding were received from SDSGC affiliates during FY19. After review, the SDSGC Management Team competitively selected three winning proposals for funding in the program area of Higher Education. A total of \$80,749 in NASA funding was budgeted for PIGs in SDSGC's FY19 budget and a total of \$67,993 was awarded to the following consortium institutions for the following four projects: **SDSM&T** received three awards totaling \$54,285 for their projects titled: a) *NASA Apollo 50th: Apollo Next Giant Leap Student Challenge* (\$20,000), b) *Computational Astronomy 2* (\$14,796), and c) *Cross Comparison of Virtual Reality Systems for Education and Research Suitability* (\$19,489), and **Augustana University** received \$13,708 for its project titled: *Designed Laboratory Instrumentation for Education and Outreach*.

SMART Objective: Support interdisciplinary student engineering design teams in NASA priority areas. [At least four engineering design teams: SDSM&T Aero Design, NASA Robotic Mining Competition, and Sounding Rocket teams, and SDSU Robotics Team]

SDSGC supported the following nine multi-disciplinary university student teams during FY19, most of which participate at national competitions. Support included either team or individual student funding/mentoring: *SDSM&T's* and *SDSU's CubeSat Teams*, *SDSM&T's* and *BHSU's High Altitude Balloon Teams*, and the following five SDSM&T teams: *SD Catching Rays Team* (NASA HASP), *Moonrockers* (NASA Robotics Mining Competition) team, *Mines Association of Rocketeers (MARS)* team, *Unmanned Aerial Vehicle Team*, and *Autonomous Underwater Vehicle Team*. SDSM&T's student chapter of *Students for the Exploration and Development of Space* (SEDS) was also supported and conducted significant precollege mentoring with the StarLab planetarium and other STEM programs.

- Research Infrastructure projects:

SMART Objective – (Research support) Support new and developing research, especially multidisciplinary and collaborative projects, in fields aligned with NASA’s mission. [At least two SDSGC fellowships or scholarships are awarded each year for students to work on NASA EPSCoR or other NASA-related research projects.], and

SMART Objective – Support collaborative research proposals in NASA areas. [At least one collaborative proposal submitted]

Working in concert with SD NASA EPSCoR, SDSGC’s SDSM&T and University of South Dakota collaborated with Nebraska Indian Community College, University of Minnesota, Sandia and Argonne National Laboratories, several industry companies, and NASA GRC, LaRC, and KSC on a proposal titled: “2D Materials and Meta-Surfaces for Space Applications” submitted to the FY2019 NASA EPSCoR Major Research Grant competition.

SMART Objective – Increase participation of women/underrepresented groups in statewide research programs and facilitate their entry into STEM careers. [SDSGC fellowship/ scholarship funds for research or design experiences at SDSGC academic institutions, EROS, and NASA Centers will equal or exceed 15% to minorities and 40% to females.]

Davis-Bahcall Scholarships at Sanford Underground Research Facility (SURF) -

This four-week summer program supported by SDSGC gives students the opportunity to see cutting-edge, real-world applications of science while learning from experts, helping them to determine whether science is the right career path for them. The program accepts eight South Dakota students who just entered STEM education fields and have demonstrated leadership in their communities. The summer 2019 Davis-Bahcall Scholars toured the SURF facility in Lead, SD; EROS and Sanford Health Research in Sioux Falls, SD; MISCO and the University of Minnesota in MN; the University of Wisconsin’s IceCube Neutrino Observatory and Viz Lab in Madison, WI; Fermilab and Argonne National Laboratory near Chicago, IL.; and the final week was spent in Italy where the students visited Gran Sasso National Laboratory located under the Italian Apennines mountain range. Two of the eight 2019 Davis-Bahcall Scholars (Nolan Maher, a Physical Science sophomore at BHSU, and Curtis Petersen, a Native American Math Education sophomore at BHSU from Eagle Butte, SD) were fully-funded by \$5,000 Space Grant NIF stipends to participate in the program. Since 2009, 129 students have participated in the Davis-Bahcall Scholars Program. Begun as a physics-oriented learning experience, the program has evolved to include students from a variety of STEM majors.

Augustana University’s STEM Pipeline and Trustees Scholars Programs – Given expansions in the state of South Dakota’s graduate programs that include a new graduate program in physics, there remains a need for new graduate students with a strong research background. Augustana University STEM Pipeline and Trustees Scholars Programs help fill this need by providing exceptional undergraduates with an opportunity to perform research that prepares them for graduate work. This project includes support for student stipends as well as other support, such as supplies or travel if warranted by the individual student project. Three FY19 female students were supported with a total of \$53,000 (\$6,000 more than the FY19 budgeted amount) in nonfederal matching funds under Augustana’s competitive Trustees scholarship program (\$17,500 to Biology undergraduate Sophia Connelly, \$17,500 to Biology undergraduate Taylor Barrett, and 18,000 to Chemistry undergraduate MaKenna Koble).

Additionally, although \$9,000 in NASA funding was budgeted in Augustana's FY19 subaward to support their STEM Pipeline program, that budget category was overspent in previous years so only \$4,844 was provided in FY19, benefitting one student double-majoring in Physics and Math. Administrative Space Grant funds were also provided through Augustana's FY19 Space Grant subaward to support Dr. Drew Alton in supervising the STEM Pipeline Program students.

- Precollege projects:

SMART Objective – Support statewide precollege robotics programs, including resources, teacher workshops, and state competition. [30 teams at SD FLL state competition: 400 students]

SDSGC's annual **Daniel Swets Robotics Materials Award** is a competitive K-12 teacher/educator award. The "call-for-applications" for \$13,000 included in SDSGC's FY19 budget (to fund calendar-year 2020 robotics projects) was released statewide to teachers and informal educators on Nov. 12, 2019, with applications due by Jan. 9, 2020. SDSGC's Management Team will review the applications and select award winners on Jan. 24, 2019. Awards will be presented on February 7, 2020, during the awards luncheon at the "South Dakota STEM Ed" annual conference, a gathering of over 200 South Dakota science and math teachers.

11th Annual SD FIRST LEGO® League (FLL) Robotics Championship Tournament

– SDSGC continued to provide funding and staff support to various robotics programs across South Dakota during FY19, including FLL, BEST, VEX, and 4-H Robotics. Among 64 elementary and middle school SD FLL teams (428 students), 36 teams qualified at their respective regional competition to advance to the 11th Annual SD FLL Robotics State Championship tournament which will be held at affiliate Augustana University on Feb 1, 2020. We expect all 36 teams, over 240 students, and about 75 coaches to participate in the tournament supported by \$9,000 in to Augustana's FY19 Space Grant subaward.

SDSGC's affiliate SDSU hosted the **Jackrabbit BEST Robotics Hub Competition** in Oct. 2019 with 15 teams (245 students) in attendance, and facilitated the **4-H Robotics/Engineering Challenge at the SD State Fair** in Sept. 2019 with 12 teams (50 students). **South Dakota 4-H** held statewide training sessions for robotics coaches in January, March, June, and September 2019 with Space Grant support, reaching 82 coaches.

SMART Objective – Sponsor statewide competition for precollege STEM teacher grant. [At least one precollege teacher grant (\$5,000)]

Kelly Lane Earth & Space Science Grant – This annual grant, raised from \$5,000 to \$10,000 in FY2019, is competitively awarded by SDSGC to SD science or math teachers in recognition and support of outstanding teaching and innovative STEM educational programs at the precollege level. The FY2019 "call-for-applications" (to fund calendar-year 2020 projects) was released statewide to teachers on Nov. 12, 2019, with applications due by Jan. 9, 2020. SDSGC's Management Team will review the applications and select award winners on Jan. 24, 2020. Awards will be presented on Feb. 7, 2020, during the awards luncheon at the "SD STEM Ed" annual conference, a gathering of over 200 South Dakota science and math teachers.

SMART Objective – Support teacher training workshops in NASA priority areas. [At least eight teacher workshops (200 teachers)]

Teacher Training – SD Discovery Center's (SDDC's) FY19 Space Grant subaward provided \$10,522 in support of space and earth science teacher training in

which 180 teachers/educators participated in STEM workshops held at various locations around the state including on-going STEM Curriculum Enhancement Training with teachers at Eagle Butte and Rosebud Elementary schools on American Indian Reservation lands.

Sanford Underground Research Facility's Education and Outreach Department (SURF E&O) reached a total of 476 K-12 teachers in FY19 through professional development workshops ranging from 4-8 hour in-service workshops for individual school districts to 3-5 day summer workshops to semester-long online courses. All the workshops were focused on pedagogy; how to engage all students in science learning that is engaging, relevant and equitable using examples of NASA-related content connected to Sanford Lab. In FY19, three new curriculum units were developed by Sanford Lab, all of which are related to NASA areas of interest:

- *As a Matter of Fact* addresses second grade physical science standards on the properties of matter and includes an engineering design activity;
- *Too Much; Too Little* addresses fourth grade earth science standards. Students study historic precipitation maps, learn about floods and droughts with an emphasis on their local area, and develop an engineering solution for floods or drought in their community.
- *Ghost Particles* addresses fifth grade physical science standards on the nature of matter, with a conceptual change in understanding that matter is made of atoms too small to see.

A total of 12,476 K-12 students took part in Sanford Lab outreach programs from July 1, 2018 through June 30, 2019, including in-depth usage of curriculum units (3,598), Sanford Lab staff classroom visits (6,704), field trips to Sanford Lab (1,117), and other programs such as Women in Science workshops and career fairs.

SMART Objective – Support summer STEM programs for precollege students on college campuses with emphasis on Native American students. [At least four summer STEM precollege programs (350 students)]

28th Annual Aerospace Career and Education (ACE) Camp 2019 – Hosted at SDSU every July, this four-day residential camp provided 12 high school students the opportunity to get an early start on aviation and aerospace engineering careers. Of the 12 participants from five states (SD, MO, IA, WI, GA), three were female (25%) and 9 male (75%). One student was African American (8%). Seven counselors (four of which were SDSU aviation students) and 15 volunteers assisted with the 2019 ACE Camp. SDSU's Space Grant subaward was a significant supporter of ACE Camp. Eleven (11) scholarships were awarded to all students who qualified. Student campers flew airplanes, built multiple rockets of different sizes, visited Lake Area Technical Institute (SDSGC affiliate), talked to aviation professionals, studied the principles of aerodynamics, flew a single engine flight simulator, and interacted with Unmanned Aerial Systems and model aircraft builders.

SDSM&T hosted the **week-long 42nd Annual Engineers Week on campus**, including a keynote presentation to 510 middle and high school students and 50 teachers on Feb. 21, 2019 by SDSGC's Tom Durkin titled: *50th Anniversary of Manned Apollo Spaceflight*.

SMART Objective – Support programs that expose K-12 students to hands-on experiences and to educational/career opportunities in aerospace, earth science and technology.

During FY19, affiliate SDDC provided Digitarium Planetarium programs to 3,169 precollege students (1,649 girls and 1,520 boys, of whom 41% were minority) and 348 teachers/parents. As part of the Journey Museum and Learning Center's FY19 "precollege" planetarium program, an additional 5,254 students were reached. Additionally, on Feb. 21,

2019, students from SDSM&T's chapter of Students for the Exploration and Development of Space (SEDS) provided StarLab Planetarium programs to 150 middle school students visiting SDSM&T's campus as part of the 42nd annual Engineers Week events.

- Informal Education projects:

SMART Objective – Partner with informal education affiliates to disseminate NASA content, share NASA educational resources, and host major NASA science education events. [15 informal education providers and 500 students share NASA resources; 150 teachers, 2,200 students participate in NASA science education events]

South Dakota Space Days 2019 at Badlands Astronomy Festival was held at Badlands National Park (BNP) for the eighth consecutive year on July 5-7, 2019, reaching 3,350 members of the public with family-friendly STEM educational presentations, evening public stargazing opportunities, safe solar viewing, and planetarium programs provided by SDSGC affiliate Journey Museum & Learning Center. SDSGC's Deputy Director presented "*Apollo 11 and 50th Anniversary of Manned Apollo Spaceflight*" to 377 members of the public.

During FY19, the Journey Museum and Learning Center reached 9,648 students and members of the public with informal planetarium programming using their portable **Uniview Planetarium** system at: Neutrino Days, Kids Fair, Badlands Astronomy Festival, Central States Fair, Black Hill Symphony, and other STEM events. The 9,648 participants include 789 members of the public who attended the Oct. 26, 2019, performance of the Black Hills Symphony Orchestra's "*Symphonic Space Odyssey*". The Symphony partnered with the Journey Museum which projected high-definition NASA space imagery from their Uniview Planetarium system on a large screen mounted above the orchestra at the Rapid City Performing Arts Center. This successful "STEAM" event combined space-themed classical music and NASA science.

Two (2) week-long **Space Camps** were provided by the Journey Museum in August 2019, attended by a total of 52 students from ages 6-14. Two year-end "**Astronaut Camps**" were also held in December 2019 that enrolled 17 students engaged them in learning what it takes to be an astronaut including teamwork, critical thinking, and problem-solving to complete STEM challenges in space-related applications. Additionally, the Journey Museum participated in the NASA's national **Virtual Moon Shot** on July 18, 2019, which engaged 27 students and family members from South Dakota. The Journey Museum ranked among NASA's leaders on that day in their Social Media impressions and they appear to have had the longest rocket launch that day.

In addition to the public presentations mentioned above, SDSGC Deputy Director Tom Durkin provided three other informal education presentations during 2019 about NASA's Hubble Space Telescope and Apollo's 50th Anniversary at the Journey Museum and Learning Center, The Village senior citizen home, Sturgis Community Center's "NASA @ My Library" program, and the Black Hills Astronomical Society, reaching 130 members of the public. Arjun Ayyangar (SDSGC Fellow and 2016 and 2018 NASA Intern) continued his work as a NASA Solar System Ambassador in FY19, presented two Learning Forums at the Journey Museum on the James Webb Space Telescope and International Space Station to 80 members of the public.

E. MILESTONES:

The following "Activities" are clipped from Milestone Chart in SDSGC's 5th Year Extension Proposal [followed by a bracketed description of milestone status and whether Activity was met]

- National & Regional Space Grant meeting participation [Director and Deputy Director attended National (Feb/Mar 2019) and W. Regional (Sept 2019) meetings]
- Reverse site (Mega-PI) visit with NASA HQ [Dir. and Deputy Dir. attended (Aug 2019)]
- SDSGC Management Team monthly teleconferences and semi-annual meetings (Met two semi-annual face-to-face meetings and all but one monthly telecon)
- NIFS, L-3, Davis-Bahcall, Journey Museum, and RET stipends awarded [51 NIFs awarded: 2 of 3 L-3 awards, 2 Davis-Bahcall awards, and 1 Journey Museum Intern. 3 RETs (p. 3-5)]
- Dan Swets & Kelly Lane Teacher Awards [Selected 1/24/19 and awarded 2/7/20 (p. 6-7)]
- Multi-disciplinary teams supported: CubeSat/Robotics/Balloon [All teams funded in FY19]
- SD Space Days/BAF [Successfully held on July 5-7, 2019 (p. 8)]
- Project Innovation Grant (PIG) awards issued [4 FY19 PIGs selected March 2019 and issued May/June 2019 (p. 4-5)]
- 5 Subawards processed: SDSU, Augustana, BHSU/SURF, SDDC, and USD [All 5 FY19 subawards processed and issued]
- 8 Women in Science conferences [7 of 8 held in FY19; 1 postponed to 2020 (p. 3)]
- ACE Camp [Successfully held at SDSU in July 2019 (p. 7-8)]
- SD FLL State Tournament [To be held at Augustana University on Feb. 1, 2020 (p. 6)]
- NASA STEM Teacher Training [656 teachers trained in FY19 (p. 7)]
- FY19 Professional Evaluator contract secured [FY19 Evaluator contract executed 5/31/19]
- FY19 Longitudinal Tracking contract secured [FY19 license fee paid 11/14/18]

F. PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE

GOALS:

- **Diversity:**

Two of SGS GC's 10 Higher Education affiliates are Tribal Colleges: Oglala Lakota College and Sinte Gleska University. 15.7% of the FY19 fellowships went to minority students and 45% to females (exceeding the targets of 15% and 40%, respectively), and students at 80% of the Consortium's 10 higher education institutions received funding (meeting the target of 70%).

- **Minority Serving Institution Collaborations:**

SDSGC Management worked with OLC and SGU Space Grant representatives to encourage NIF applications from their students. In FY2019, six NIF applications from those minority institutions were received and three of those students received awards (50%).

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

- API 3.3.3: STEM 19-1 51
- API 3.3.5: STEM 19-5 31

G. IMPROVEMENTS MADE IN THE PAST YEAR:

2019 Affiliation with the Washington Pavilion of Arts and Science's Kirby Science Discovery Center – Kirby Science Discovery Center (KSDC) in Sioux Falls, SD, is nationally accredited by the Am. Assoc. of Museums, occupies 20,000 sq. ft. of exhibition space, features over 100 permanent exhibits, screens educational films in its 160-seat CineDome Theater, has an extensive history of involvement in NASA-related programming, and hosted over 100,000 patrons in 2019. In an effort to rekindle collaborations and leverage resources among precollege and informal STEM educational organizations in eastern SD, after dissolving a previous affiliation 15 years ago, SDSGC formally re-affiliated with KSDC in November 2019.

H. CURRENT AND PROJECTED CHALLENGES:

During the requested no-cost extension period, South Dakota will remain somewhat disadvantaged by having no significant aerospace industry partners within its borders. SDSGC continues its non-affiliate partnership with L-3 Communications in Salt Lake City, UT, by providing three \$4,000 stipends during the school year to SDSM&T students in departments from which L-3 recruits in return for matching funds provided by L-3 to summer student interns.

I. PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION:

SDSGC is a statewide network of 23 organizations from education, industry and government. An asterisk notes representation on the Consortium's 10-member Management Team.

Educational Affiliates

- * SDSM&T (Lead Institution, state univ. BS-PhD, science/engineering; all Program Areas)
 - * SDSU (state univ. BS-PhD, agricultural/STEM institution; Higher Ed/Research/ Precollege robotics/4-H)
 - * Augustana Univ. (BS private liberal arts/professional univ.; Higher Ed/Research/ Precollege robotics/STEM)
 - * USD (state univ. BS-PhD, medicine, law, fine arts, business; Higher Ed/Research)
 - Black Hills State University (BS state liberal arts; Higher Ed pre-service education)
 - Dakota State University (state university, Assoc.-PhD; Higher Ed computer management)
 - Northern State Univ. (state univ., BS-MS, business, education, arts and science; Higher Ed)
 - Oglala Lakota College (Tribal College, AA-MS STEM majors; Higher Ed/pre-service)
 - Sinte Gleska University (BS Tribal College; Higher Ed and pre-service education)
 - Lake Area Technical Institute (technical institute, Associate of Applied Science degrees, robotics and aviation maintenance; Higher Ed)
 - * South Dakota Discovery Center (science center; Precollege teacher-training)
 - * The Journey Museum and Learning Center (museum; Precollege and Informal Ed)
 - Badlands Observatory (private observatory; Research)
 - Black Hills Astronomical Society (astronomical society; Informal Ed)
 - South Dakota Air & Space Museum (museum; Informal, Precollege and Higher Ed)
 - Washington Pavilion Kirby Science Discovery Center (museum; Precollege/Informal Ed)
- State and Federal Government Affiliates
- * Sanford Underground Research Facility at Homestake (state organization under SD Science & Technology Authority; Research, Higher, Precollege, and Informal Ed)
 - * USGS Earth Resources Observation and Science (EROS) Center (data management, systems development, research field center; Land Processes DAAC for NASA EOS; operation of Landsat 8; Higher Ed/Research in remote sensing)
 - * South Dakota Board of Regents (BoR) – The following BoR offices: A) Office of Research and Economic Development, and B) Office of STEM Partnerships
 - South Dakota State Library, SD Dept. of Education (state government Precollege Ed.)
- Industrial Affiliates
- Raven Industries (high-alt. balloons/GPS; NASA contractor; aerospace R&D, Higher Ed student internships)
 - RESPEC (consulting & services: engineering, IT, water & natural resources; Research in remote sensing)
 - Missouri Breaks Industries Research, Inc. (private/tribal member-owned research STEM education company)