Tennessee Space Grant Consortium
Lead Institution: Vanderbilt University
Director: Alvin M. Strauss
Telephone Number: 615-343-1148
Consortium URL: http://tn.spacegrant.org
Grant Number: NNX15AR73H
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 Tennessee Space Grant Consortium is a Designated Consortium funded at a level of $760,000 for fiscal year 2016.

B. PROGRAM GOALS

NIFS: "Our common purpose and objective is to guide motivated and academically qualified students to further educational opportunities in STEM areas in preparation for their eventual entrance into the STEM workforce. Our goal for our NIFS programs… is to retain at least 80 percent of these students in STEM fields."

Specific: Assist a competitive and diverse group of STEM undergraduate and graduate students with their educational funding and experiences.

Measurable: Percentage of our NIFS students who pursue further STEM education and careers. (As stated above, 80 percent.)

Appropriate: Our NIFS programs fit in well with NASA areas of emphasis and API goals.

Realistic: We have sufficient funding set aside in our budget to fund approximately 25 students in the upcoming grant year and slightly fewer in the ensuing two years.

Time-Specific: We will know whether we have met our goals when each NIFS student finishes their current degree and moves on to their next step.

Higher Education: "Our main goal is for student participants in our Higher Education projects to have experiences that encourage them to continue on with STEM education and eventually seek employment in STEM fields… We will track the students' next steps with the goal of 75 percent following a STEM path."

Specific: Create and maintain a hands-on Higher Education program that leaves student participants wanting more.

Measurable: Our goal is for 75 percent of our Higher Ed. students to pursue further STEM education and careers.

Appropriate: Our Higher Ed. program is composed of projects that fit directly into NASA areas of emphasis and API goals.

Realistic: We have sufficient funding set aside in our budget to fund the Higher Ed. projects proposed for the coming grant period.

Time-Specific: We will know whether we have met our goals when each participating (significantly-supported) student finishes his or her current degree and moves on to his or her next step.

Research Infrastructure: "Our goal is for the student participants' (in our RI programs) experiences to inspire them to continue on a path of STEM education and careers. We also have the goal of each project producing at least one paper or conference presentation…. We will track the students' next step with the goal of 75 percent staying within the STEM realm."

Specific: Create and maintain a Research Infrastructure program that fits in with NASA scientific priorities and enable students to experience actual scientific research.

Measurable: Our goal is for 75 percent of our RI students to pursue further STEM education and careers. We also aim to have at least three publications/conference presentations per year that are the direct result of this program.

Appropriate: Our RI program is composed of projects that fit directly into NASA scientific priorities.

Realistic: We have sufficient funding set aside in our budget to fund the research projects proposed for the coming grant period.

Time-Specific: We will know whether we have met our goals when each participating student finishes their current degree and moves on to their next step. Additionally, we will see the number of resulting papers/presentations at the end of the grant period.

Precollege Programs: "It is our goal to help provide Tennessee teachers and preservice teachers with the information and tools to inform and inspire our K-12 students to focus on STEM education and careers…. Our goal is to engage with at least 500 children in STEM engagement activities."

Specific: Present teachers, students and preservice teachers with opportunities for development in STEM areas.

Measurable: Number of teachers participating and percentage of those who return to their classrooms and use NASA resources.

Appropriate: Our Precollege Ed. program is composed of projects that fit directly into NASA areas of emphasis and API goals.

Realistic: We have sufficient funding set aside in our budget to fund the Precollege Ed. projects proposed for the coming grant period.

Time-Specific: We will know whether we have met our goals when each participating teachers report back to us whether they are using NASA materials.

Informal Education: "Our goal is to work with at least three of Tennessee's NASA Museum Alliance members during the grant period…. Our intent is to increase learning, to educate students, educators and the general public on specific STEM content areas and to expand the nation's future STEM workforce."

Specific: Present residents of Tennessee with learning opportunities outside of the classroom.

Measurable: A goal of 60 percent of participants who express increased in STEM areas and NASA at the conclusion of the particular project.

Appropriate: Our Informal Ed. program is composed of projects that fit directly into NASA areas of emphasis and API goals.

Realistic: We have sufficient funding set aside in our budget to fund the Informal Ed. projects proposed for the coming grant period.

Time-Specific: We will know whether we have met our goals when participants demonstrate their increased interest in STEM areas and NASA at the conclusion of their projects.

C. PROGRAM/PROJECT BENEFITS TO PROGRAM AREAS

Informal Education: Vanderbilt Student Volunteers for Science (VSVS) members go into local K-12 classrooms to teach hands-on science experiments. One of their other activities is to go into patients' rooms or clinics at Vanderbilt Children's Hospital and teach relevant science experiments. VSVS lessons and kits were modified to meet the needs of the hospital setting. They also film and stream oVSVS lessons in the Vanderbilt Children's Hospital Seacrest studio for hospitalized children and their families who cannot tolerate in-person lessons.

Higher Education: Two teams from Middle Tennessee State University (MTSU) received awards in the NASA-sponsored competitions held March 31 to April 1st, 2017 at the U.S. Space & Rocket Center in Huntsville, Alabama. This event requires student teams to design, build, test and race human-powered rovers, driven by one male and one female.
The obstacles throughout the nearly three-quarter-mile course simulate terrain found on Mars, as well as other planets, moons and asteroids throughout the solar system. MTSU Team 2 was placed in the top 10 in the world (placed ninth overall and was sixth best in the U.S.) during the competition. MTSU Team 1 received the first-time Drive Train Technology Challenge Award and also the Safety System Award.

Research Infrastructure: The University of Memphis Space Grant funding has provided four undergraduate scholarships and Graduate Space Grant Fellowship for students performing space-based research with faculty member mentor. The scholarships and Fellowship have led to four student publications/presentations during the current year. One undergraduate student was awarded second place and a graduate student was awarded third place in their respective divisions at the AIAA Region 2 Student Conference in Starkville, MS in April, 2017.

D. PROGRAM ACCOMPLISHMENTS

- **NASA Internships, Fellowships, and Scholarships (NIFS):**
  "Our common purpose and objective is to guide motivated and academically qualified students to further educational opportunities in STEM areas in preparation for their eventual entrance into the STEM workforce. Our goal for our NIFS programs… is to retain at least 80 percent of these students in STEM fields."
  We will not have an accurate statistic for this objective for some time; the vast majority of our 2016 NIFS participants are still completing their degree programs. Though we do not yet have a specific count, a large portion of our 2015 NIFS graduates have gone on to further STEM education program or career fields.

- **Higher Education projects:**
  "Our main goal is for student participants in our Higher Education projects to have experiences that encourage them to continue on with STEM education and eventually seek employment in STEM fields… We will track the students' next steps with the goal of 75 percent following a STEM path."
  We will not have an accurate statistic for this objective for some time; the vast majority of our 2016 Higher Education participants are still completing their degree programs. Though we do not yet have a specific count, a large portion of our 2015 NIFS graduates have gone on to further STEM education program or career fields.

- **Research Infrastructure projects:**
  "Our goal is for the student participants' (in our RI programs) experiences to inspire them to continue on a path of STEM education and careers. We also have the goal of each project producing at least one paper or conference presentation…. We will track the students' next step with the goal of 75 percent staying within the STEM realm."
  We will not have an accurate statistic for this objective for some time; the vast majority of our 2016 Research Infrastructure participants are still completing their degree programs. Though we do not yet have a specific count, a large portion of our 2015 NIFS graduates have gone on to further STEM education program or career fields.
  Additionally, and again still without an accurate count, we know that many of our Research Infrastructure participants have produced papers and/or conference presentations. For example, RI students at Middle Tennessee State University presented a poster at the 12th Annual Interdisciplinary Network for Group Research Conference in St. Louis.

- **Precollege projects:**
  "It is our goal to help provide Tennessee teachers and preservice teachers with the information and tools to inform and inspire our K-12 students to focus on STEM education and careers…. Our goal is to engage with at least 500 children (including preservice teachers) in STEM engagement activities."
  At the University of Tennessee at Chattanooga, four pre-service mathematics workshops were planned. Three workshops were held during spring 2017, and two workshops will be held in July 2017. Additionally, two STEM Saturdays sessions were held in November 2016 for students in grades 3-8. Two half-day workshops were held for

middle grades, pre-service teachers during spring 2017. Both programs included solar eclipse activities. The middle grades, pre-service teacher workshop for robotics will be held in June 2017.

- **Informal Education projects:**
  "Our goal is to work with at least three of Tennessee's NASA Museum Alliance members during the grant period…. Our intent is to increase learning, to educate students, educators and the general public on specific STEM content areas and to expand the nation's future STEM workforce."
  One of our Affiliate Representatives, the Adventure Science Center, located in Nashville, is a part of the NASA Museum Alliance. With their TSGC funding, they purchased materials for development and implementation of special programming opportunities for school, teacher and public audiences on what causes a solar eclipse and safe methods for observing the 2017 Total Solar Eclipse. Materials were purchased and or developed to provide hands-on and interactive learning experiences for school, teacher, and public audiences. This special programming has been presented on three special event Saturdays reaching more than 4,000 Science Center guests, plus an additional 2,500 people through outreach events.

E. PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE GOALS

Include summary data for the bulleted list below:

- **Diversity**: Our goal for the current three year grant period is for our percentage of awardees who are members of underrepresented groups in our NIFS, Research Infrastructure and Higher Education programs to meet our exceed the percentage of students from underrepresented groups who are enrolled in Tennessee colleges and universities. As the current grant year is not yet complete, we do not yet have firm diversity statistics. That said, we are well on track to meet or exceed our goal. In addition to our two HBCU Affiliate Members (very active participants in the TSGC), our Affiliate Representatives at all of our institutions continually strive to include qualified diverse individuals in all our activities and programs. For example, at the University of Tennessee Space Institute, two thirds of the Space Grant Fellows represent under-represented groups in science and engineering. One of the three is of Native American decent, and another is female.

- **Minority Serving Institution Collaborations**: During the 2016 – 2017 grant year, we continued to have excellent relationships with Minority-Serving Institutions. Fisk University and Tennessee State University are HBCUs and are two of the founding members of our Consortium. Several of our other affiliate institutions continue to have active and meaningful collaborations with these schools, including a Fisk-Vanderbilt partnership and joint programs between Fisk and Austin Peay State University. Fisk and TSU also stand well on their own as TSGC Affiliate Institutions; each offers excellent programs that encourage participants to further their educations and careers in STEM areas.

- **Office of Education Annual Performance Indicators**:
    - API 2.4.1: ED-16-1 34
    - API 2.4.2: ED-16-2 80
    - API 2.4.4: ED-16-4 8
    - API 2.4.5: ED-16-5 1,500

F. IMPROVEMENTS MADE IN THE PAST YEAR

We strive to work as a unified Consortium to meet our goals and objectives at our individual Affiliate Institutions, as a statewide body and in concert with NASA priorities. We are looking forward to our upcoming statewide meeting that will include student presentations. At this event, our students from diverse institutions in various parts of the state will have the opportunity to meet one another and network among themselves, faculty members and industry/government representatives. We are working on new intra-Consortium partnerships and collaborations. We have redesigned our Consortium website and will shortly have new, fresh content on the pages, as well as a new page devoted to our ballooning program occurring in conjunction with the upcoming solar eclipse.

G. CURRENT AND PROJECTED CHALLENGES

Our challenges tend to be logistical; Tennessee is a very wide state from east to west. It is often difficult to get all of our Affiliate Representatives together for an in-person meeting. Everyone, of course, has very busy schedules, and it is prohibitive to travel over five hours one-way to attend a meeting. We are looking into various video conferencing technologies to assist us with this issue.
Additionally, though we have excellent and effective programs, we have historically had difficulties adequately reporting on and describing our successes and future plans. Going forward, we will make sure our documents are read and critiqued by neutral third parties before submitting to NASA.

H. PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Vanderbilt University, Lead Institution. National private research university granting degrees through the Ph.D. *NIFS, Management and Program Administration, Higher Education, Research Infrastructure, NASA Summer Program Management.*

Adventure Science Center, Affiliate Institution. NASA Museum Alliance Member. *Informal Education.*

Austin Peay State University, Affiliate Institution. Public master's level university. *Research Infrastructure.*

Christian Brothers University, Affiliate Institution. Private master's level university. *Higher Education.*

Columbia State Community College, Affiliate Institution. Two-year public community college granting Associate's degrees. *Currently active as a member of the Tennessee Space Grant Community College Consortium.*

East Tennessee State University, Affiliate Institution. Public Ph.D. level university. *NIFS, Research Infrastructure.*

Fisk University, Affiliate Institution. HBCU. Private master's level university. *NIFS, Higher Education.*

Middle Tennessee State University, Affiliate Institution. Public Ph.D. level university. *Research Infrastructure, Higher Education, Precollege.*

Oak Ridge Associated Universities, Affiliate Institution. A consortium of 99 doctoral-granting academic institutions. *No TSGC programming, currently.*

Rhodes College, Affiliate Institution. Private undergraduate liberal arts college. *No TSGC programming, currently.*

Tennessee State University, Affiliate Institution. HBCU, Land-grant school. Public Ph.D. level university. *NIFS, Informal Education.*

Tennessee Technological University, Affiliate Institution. Public Ph.D. level university. *Higher Education, Informal Education.*

The University of Memphis, Affiliate Institution. Public Ph.D. level university. *NIFS, Research Infrastructure, Higher Education.*

The University of Tennessee at Chattanooga, Affiliate Institution. Public Ph.D. level university. *Precollege.*

The University of Tennessee at Knoxville, Affiliate Institution. Land-grant school. National public research university granting degrees through the Ph.D. *NIFS, Higher Education, Research Infrastructure, Precollege, Informal Education.*

The University of Tennessee Space Institute, Affiliate Institution. Public Master's and Ph.D. level school. Only confers graduate degrees. *NIFS.*