

Thoughts from DOCE – the Federal STEM Education Initiative



The Federal STEM (Science, Technology, Engineering, and Mathematics) Education 5-Year Strategic Plan, introduced in 2013, is well beyond its mid-way point. NIFA staff have been active in the federal coordination of STEM Education Taskforce teams that address the plan's five national goals. These goals range from improving K-12 STEM education, to enhancing graduate training for tomorrow's scientific workforce. Improving STEM education is critical to the nation and its economic future for several reasons. First, the jobs of the future are STEM jobs. Second, our K-12 system is "in the middle of the pack" in international comparisons. Third, progress in STEM is critical to building a just and inclusive society. This issue of Ed-Facts

reviews what has been accomplished at the federal level so far.

The Division of Community and Education (DOCE) has launched several activities that address the goals of the federal STEM initiative. In FY 2016, a new grant program called Professional Development Opportunities for Secondary School Teachers will help improve STEM instruction applied to agriculture. The Research and Extension Experiential Learning for Undergraduate Fellowships, launched in FY 2015 with \$4.3 million in funding, enhanced STEM experiences for 116 undergraduate students at 16 institutions. NIFA's Predoctoral and Postdoctoral fellowships increases annually. Last year, NIFA gave 98 institutions \$6.2 million to support the graduate and postgraduate education. NIFA has a portfolio of programs targeted for minority-serving institutions. Last fiscal year ***NIFA's grants to these institutions represented 24.55 percent of all awards made to institutions of higher education.*** More information on NIFA's education initiatives is available on the NIFA website's [Education](#) page.

We look forward to the next two years of results from this important initiative. Please let DOCE Director [Suresh Sureshwaran](#) know if you have any suggestions as to how NIFA can enhance STEM education through better partnerships with other federal agencies.

GOAL 1: Improve STEM Instruction

KEY METRIC: Prepare 100,000 excellent new K-12 STEM teachers by 2020, and support the existing STEM teacher workforce

NIFA Contact: Jim Kahler, national program leader, STEM, Agricultural Science, and Technology, 4-H National Headquarters, Division of Youth and 4-H

This team focused on supporting K-12 teachers and plans to provide them with an online portal where teachers would have "one-stop" access to federal resources and materials that support STEM education. So far, 10 agencies have submitted summaries of material to be included in this resource. Jim Kahler reports that the group plans to hold a series of webinars throughout the spring and summer to inform teachers about this new resource. These efforts will make more teachers aware of the funding opportunities and educational materials that NIFA and other USDA agencies offer to support formal STEM education.

In addition, Jim reports that this group is conducting a literature review on the latest research about effective training for STEM educators at the pre-college level. This literature search will allow the working group to develop a resource to guide federal agencies involved in supporting professional development for these teachers.

NIFA has long been a leader in providing online teacher resources. Its support of Ag in the Classroom (AITC) helps to provide teachers a database of ag-related lesson plans by grade level, topic, or state education standard. Teachers can incorporate agricultural science into their math, science, history, and art lessons. AITC reports that this program reached 171,000 teachers and 5,299,566 students. In addition, more than 500 educators from around the country participated in the National Agriculture in the Classroom Organization's National Conference.

GOAL 2: Increase and Sustain Youth and Public Engagement in STEM

KEY METRIC: Support a 50 percent increase in the number of U.S. youth who have an authentic STEM experience each year prior to completing high school

NIFA Contact: Amy McCune, national program leader, 4-H, 4-H National Headquarters, Division of Youth and 4-H

From the NIFA perspective, being involved with any interagency working group allows us to learn more about what other federal agencies are doing, assess how this work aligns with NIFA's work, and determine potential collaborations. Collaborations allow agencies to leverage their resources toward common goals that result (ideally) in a greater impact in serving the public. 4-H National Headquarters (located within NIFA) is engaged in two projects with NASA. The first is working on their SMAP (Soil Moisture Active Passive) program. A group of 4-H teens are reviewing the youth citizen science materials related to this program and are making recommendations on how to engage more youth. Once the recommendations are received, NASA and NIFA will work to disseminate new engagement strategies. The second project involves the development of a workforce readiness curriculum for youth. NASA's Expeditionary Skills curriculum teaches astronauts self-care, team care, communication, leadership/followership, and teamwork with cultural understanding woven into the lessons. The youth curriculum shows how astronauts use these Expeditionary Skills, then provide skill development before challenging the youth to create a scenario that demonstrates how youth use these same skills in their life.



As the 4-H National Headquarters, NIFA provides national program leadership to identify, develop, and manage high quality youth development programs through the land-grant extension system. 4-H is the nation's largest positive youth development program, empowering six million young people in the United States through 4-H clubs, camps, and after school and school enrichment programs in every county and parish in the nation.

In addition, NIFA's grant recipients have addressed this priority, including Dine College, a 1994 land-grant institution, Diné took action when Arizona reported that American Indian children had the lowest math achievement scores in state tests. It used a NIFA Equity grant to improve math teacher training and provided activities to better prepare students. The Baa Hozho Engineering Festival for 6-to-12th-grade students drew 298 youth and 26 teachers for 15 sessions on STEM that were run by Diné College students and other Navajo Nation community-based organizations.

GOAL 3: Enhance STEM Experience of Undergraduate Students

KEY METRIC: Graduate one million additional students with degrees in STEM fields over the next 10 years

NIFA Contact: Victoria LeBeaux, national program leader, AITC Program and the Secondary Education, Two Year Post-Secondary Education, and Agriculture in the K-12 Classroom Challenge Grants Program (SPECA), Division of Community and Education

The National Science Foundation (NSF) has taken the leadership role for the Undergraduate Inter-Agency Working Group. To address the goals for this population, NSF launched the Annual Community College Innovation Challenge. This is the second year of the competition in which teams of community college students, working with a faculty mentor and a community or industry partner, propose innovative STEM-based solutions to real-world problems. Competition finalists will attend an Innovation Challenge Boot Camp in Arlington, Va., in June.



NIFA contributed \$4.5 million through its Higher Education Challenge Grant program. The funding supports undergraduate learning in the food and agricultural sciences. In 2015, a project began at the University of Minnesota that will provide 160 students and 80 faculty with new ag-related curriculum and enhanced instructional delivery systems. The Agriculture and Food and Research Initiative (AFRI) Research and Extension Experiential Learning for Undergraduate Fellowships program provides hands-on experiences in food and agriculture, especially to students in STEM fields.

GOAL 4: Better Serve Groups Historically Under-Represented in STEM

KEY METRIC: In the next 10 years, increase the number of students from underrepresented groups to graduate with STEM degrees and improve the participation of women in areas of STEM where they are significantly underrepresented.

NIFA Contact: Edwin Lewis, national program leader, 1890 Institution Teaching, Research, and Extension Capacity Building Grants Program, Division of Community and Education

This working group is developing a summary document of best practices, challenges, and recommendations designed to guide federal investments in STEM education diversity. In addition, this group is exploring how changes in campus culture can will foster STEM diversity at post-secondary institutions.



The working group has set a diverse set of goals for FY 2016. Members are working on standard language to add to requests for applications across federal agencies that will encourage greater opportunities for under-represented minorities in STEM. Members of the working group will also serve as liaisons to other working groups to identify concrete collaboration activities that will result in more minorities engaging in STEM.

NIFA's minority-serving institution portfolio, when you include capacity programs such as Evans-Allen, amounts to roughly \$166 million. This funding covers research, teaching, and extension among numerous minority-serving schools.

NIFA offers targeted funding to several different types of minority-serving institutions, such as federally recognized, historically black colleges and universities, (the 1890 land-grants universities). It also has programming for Hispanic-serving institutions, federally recognized tribal colleges (the 1994 land-grants), Alaskan and Hawaiian institutions, and colleges and universities located in the insular areas.

GOAL 5: Design Graduate Education for Tomorrow's STEM

KEY METRIC: *Provide graduate-trained STEM professionals with basic and applied research expertise, options to acquire specialized skills in areas of national importance, mission-critical workforce needs for the CoSTEM agencies, and ancillary skills needed for success in a broad range of careers.*

NIFA Contact: *Ray A. Ali, national program leader, Multicultural Scholars Program, National Needs Graduate Fellowships, and the AFRI NIFA Fellowships, Division of Community and Education*

The Graduate Working Group has mainly focused on sharing information among its members and with other groups, such as the Council of Graduate Schools (CGS). CGS is an organization representing graduate deans and other corporations and nonprofit organizations with strong investments in graduate education. CGS has been a leading organization in developing best practices in graduate education and gave a presentation to the working group on university education.

The Graduate Workgroup goals was able to create common cross-agency evaluation measures that will allow federal agencies involved in graduate education to set agreed-upon standards of quality in graduate training. In addition, the group is developing a portal for graduate students and their supporting faculty so that they can learn about grants, internships, and other opportunities. The Graduate Group is developing its priorities for FY 2016.

AFRI is NIFA's newest resource for graduate education, through its Education and Literacy Initiative. The Pre and Post-Doctoral Fellowships program supports approximately 125 students each year. The National Needs Fellows grants have been supporting graduate educations for over 30 years. In 2015, NNF provided 15 institutions more than \$3 million to support their students seeking advanced degrees.

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