Consensus Study Report

HIGHLIGHTS

March 2020

NASA's Science Activation Program: Achievements and Opportunities

As one of the United States' leading federal science, technology, engineering, and mathematics (STEM) agencies, NASA plays a critical role in the landscape of STEM education. Education programs in NASA's Science Mission Directorate (SMD) are one of the major ways that the agency has engaged the public in the excitement of the agency's science missions.

In 2015, NASA's SMD created the Science Activation (SciAct) Program to: (1) improve the Directorate's education efforts, (2) support more effective, sustainable, and efficient use of SMD science discoveries for education, and (3) enable NASA scientists and engineers to engage more effectively in the STEM learning environment with learners of all ages. As SciAct transitions into its second round of funding, NASA is reflecting on the program's accomplishments and evaluating its current portfolio, including ways for improving future work. To accomplish this, NASA's SMD asked the National Academies of Sciences, Engineering, and Medicine to conduct a review of the SciAct portfolio, provide direction on how well the program has met its objectives, and make recommendations for strengthening future work.

WHAT IS THE SCIENCE ACTIVATION (SCIACT) PROGRAM?

SciAct represents a new approach to education and outreach in SMD, aimed at sharing "the story, the science, and the adventure of NASA's scientific explorations of our home planet, the solar system, and the universe beyond, through stimulating and informative activities and experiences created by experts, delivered effectively and efficiently to learners of many backgrounds via proven conduits, thus providing a return on the public's investment in NASA's scientific research." SciAct has four main objectives: (1) to enable STEM education, (2) to improve U.S. scientific literacy, (3) to advance national education goals, and (4) to leverage efforts through partnerships.

The current SciAct Program includes 24 projects that together leverage the science assets of the agency's work in astrophysics, earth, heliophysics, and planetary science in order to support learning in STEM in

both formal and informal settings. The current SciAct awardees have an option to extend their funding by 5 years into Phase 2 of the program beginning in 2020. The current study provided an assessment of the program in meeting its objectives and offered advice for improving the program in the next phase.

STRENGTHS AND ACCOMPLISHMENTS OF THE SCIACT PROGRAM

The committee determined that the SciAct portfolio of investments plays a unique and valuable role in the national landscape of efforts to support STEM learning and engagement. The scope and diversity of SciAct projects are reaching a wide swath of learners across the country and employing a myriad of strategies for engaging potential participants. At its core, the SciAct Program aims to bring unique NASA expertise and assets, including people, missions, products, data, and scientific results, to a diversity of learners effectively and efficiently. The SciAct awardees represent a critical piece of that vision by providing the educational expertise to translate NASA science to different types of learners and users.

The SciAct Program is supporting a range of creative ways to use and engage NASA's considerable assets. Through implementation of SciAct projects, awardees have the potential to both expand NASA's reach into new communities and bring underrepresented groups into the NASA enterprise. This commitment to supporting projects as they attempt to meet the needs of specific communities is a strength of SciAct's design: In allowing local needs to inform the direction of the individual awards, SciAct as a whole is more likely to maintain both its relevance and its potential for impact.

SciAct projects engage a variety of audiences, including families, K–12 students and teachers, adults, children, and teens in formal education, informal education and community settings. Overall, about one-half of SciAct projects engage learners in informal learning environments, such as museums and out-of-school programs, and the other one-half engage learners in formal educational settings, primarily through K–12 schools and teachers.

In addition to engaging a wide range of audiences, looking across the portfolio, SciAct projects have established strong partnerships with scientific experts, educational experts, community organizations, professional organizations, among others, and multimedia platforms as a means of creating and disseminating learning programs and resources. Some projects have even cross-collaborated and thus broadened their dissemination efforts or leveraged expertise in using NASA resources and developing learning content.

SciAct projects are encouraged to collaborate as part of a network of educational projects, capitalizing on one another's strengths. This breadth of partnerships brings new external education providers and other entities into the NASA family of programs—broadening and expanding the expertise of the agency. The committee acknowledges the critical role that SciAct has played in building this community and the importance of this model in advancing STEM learning going forward.

THE PATH FORWARD: RECOMMENDATIONS FOR STRENGTHENING THE SCIACT PROGRAM

Building on the strengths of the SciAct portfolio, the committee identified several ways that it could be improved moving forward into its second phase.

1. While SciAct identifies a broad vision for the program, specifying and setting actionable targets would strengthen the portfolio and enable evidence of impact to be gathered systematically across programs.
2. There is a wide range of approaches used to support STEM learning and leverage NASA's assets (i.e., content, subject matter experts, and existing infrastructure), which is a strength of the portfolio. Requiring awardees to be more explicit about learning outcomes, and how NASA assets will be used to achieve those outcomes, would help strengthen the program. Currently, the lack of specificity makes it difficult to look across the portfolio and understand what activities are most successful for leveraging NASA assets for learning and why they are successful.

3. SciAct would benefit from an overall logic model that can continually guide design and dissemination activities across the portfolio. A well-specified logic model could also help to develop an integrated understanding of how and why designed activities influence learning and teaching in the STEM education ecosystem at a local, regional, or national scale.
4. Keeping current with and strategically applying research on learning and design and evidence-based approaches to broadening participation and clearly articulating how those strategies are intended to reach desired outcomes could strengthen the overall impact of the portfolio.

Based on these considerations, the committee offers the following specific recommendations for moving forward:

Recommendation 1. SciAct should go through a visioning process that brings the portfolio up to date with current research on learning and design, the new federal STEM plan, and evidence-based approaches to broadening participation. This process should also consider how SciAct fits within and contributes to the larger STEM education ecosystem, and should provide the foundation for developing actionable and measureable portfolio goals.

Recommendation 2. SciAct should articulate how it expects that the portfolio will leverage NASA assets, how partnerships and networks will be built, and an associated theory of change that hypothesizes how these actions will lead to desired, measurable outcomes.

Recommendation 3. SciAct must consider whether the development of a coordinated learning network of awardees across its portfolio is a program priority. If it is a priority, then the program must provide the necessary infrastructure to support a more active network of projects. At the very least, SciAct needs to develop more systematic mechanisms for projects to share best practices and learn from successes and failure.

Recommendation 4. SciAct should use the opportunity provided by Phase Two to reflect on the current portfolio within the context of the new vision, goals, and logic model. This process should critically review and guide existing projects, be explicit about the rationale and criteria for including new projects, and consider how best to integrate them into the existing portfolio. One important area for consideration is how to ensure that underserved communities receive more focused attention in the next phase of the program.

Recommendation 5. SciAct should deepen its commitment to broadening participation by using evaluation measures that go beyond counting numbers of individuals who represent specific groups. In order to do this, SciAct must identify ways that the portfolio as a whole could draw upon and implement evidence-based strategies for broadening participation.

Recommendation 6. SciAct should build ongoing opportunities for dialogue with NASA Science Mission Directorate's missions and scientists.

Recommendation 7. SciAct should create an independent mechanism to obtain ongoing, real time advice from individuals with expertise in learning and design, the larger policy context of STEM education, partnering with local communities, broadening participation in STEM, and science content relevant to the missions of NASA's Science Mission Directorate. Among other responsibilities, these experts should inform the new visioning and planning process.

Recommendation 7a. With input from these experts, SciAct should consider whether and how a portfolio-level evaluation could strengthen the focus of the program and ensure that projects in the portfolio are effectively meeting overarching SciAct Program goals and objectives.

COMMITTEE TO ASSESS THE SCIENCE ACTIVATION PROGRAM

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For More Information . . . This Consensus Study Report Highlights was prepared by the Board on Science Education based on the Consensus Study Report, *NASA's Science Activation Program: Achievements and Opportunities* (2020). The study was sponsored by the National Aeronautics and Space Administration. Any opinions, findings, conclusions, or recommendations expressed in this publication do not necessarily reflect the views of any organization or agency that provided support for the project. Copies of the Consensus Study Report are available from the National Academies Press, (800) 624-6242; http://www.nationalacademies.org/scienceactivation.

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