



NASA Glenn Research Center – Office of STEM Engagement STEM Collaboration Opportunities

Summer 2021 Solicitation

Solicitation posted:	March 24, 2021
Solicitation URL:	https://www.nasa.gov/feature/stem-collaboration-opportunities-summer-2021-solicitation
Proposal form URL:	https://tinyurl.com/NASA-Glenn-STEM-Proposal-Form
Proposal receipt deadline:	April 21, 2021, 5:00 PM Eastern Time
Notification of awards:	May 19, 2021
Virtual workshop dates:	June 16 & 18, 2021
Implementation dates:	June 18, 2021 - August 31, 2021
Student presentation deadline:	August 31, 2021
Final report deadline:	September 15, 2021

PROJECT OVERVIEW

OPPORTUNITY DESCRIPTION

NASA is taking steps to begin the next era of exploration, to push the boundaries of human exploration forward to the Moon and on to Mars. As we carry heavier loads farther into space, rockets require more thrust. Cryogenic propellants are the best option to achieve this thrust. Liquid hydrogen and other cryogenic propellants must be kept at extremely cold temperatures, ranging from -243°F to -423°F . Any outside energy threatens to raise the temperature of the fuel and cause it to evaporate, reducing the efficiency of the rocket. NASA's Evolvable Cryogenics project (eCryo) is managed by NASA Glenn and works to combat this problem with a variety of techniques, including reflective multilayer insulation and vapor cooling channels.

NASA Glenn's Office of STEM Engagement has developed a new engineering design challenge (EDC) called *Keep It Cool* that guides students through the engineering design process. They must design, test, and improve systems to maintain cold temperatures within a simulated cryogenic propellant tank.



The Space Launch System's Interim Cryogenic Propulsion Stage will use liquid hydrogen and liquid oxygen to give the Orion spacecraft the in-space push needed to fly beyond the moon. Image Credit: NASA/MSFC/Brian C. Massey

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NASA Glenn's Office of STEM Engagement has an interest in engaging local Ohio audiences to achieve the Agency's science, technology, engineering and mathematics (STEM) education goals. Goals include advancement of the STEM education and workforce pipeline and increasing and enhancing STEM knowledge for students, particularly those currently underrepresented and underserved in STEM education and/or fields. As part of the celebration of the 80th Anniversary of the NASA Glenn Research Center, the Office of STEM Engagement is soliciting proposals from youth-serving organizations and formal/informal education institutions in Ohio to receive professional development and implement NASA STEM content.

This solicitation is requesting proposals to:

- Implement STEM content in formal or informal settings
- Support students in grades 5-9
- Attend a professional development workshop on the offered Engineering Design Challenge (EDC): *Keep It Cool*
- Conduct the EDC activity with a proposed group of students between June 18, 2021 and August 31, 2021

The content received via this opportunity will allow students to work on real-world problems in a collaborative, team-based environment. Students apply lessons learned to solve problems that STEM professionals may face while gaining a deeper knowledge of how NASA is a part of their everyday lives.

Funding will be awarded through a competitive application process in which NASA Glenn anticipates funding up to 20 awards each up to \$2,500.00. Based on available funding, Paragon TEC, Inc., the Education Support Services contractor for the NASA Glenn Office of STEM Engagement, will issue awards on behalf of the Office of STEM Engagement. The Office of STEM Engagement may elect to make full or partial awards.

This opportunity is designed to provide organizations with:

- Funding for materials and supplies needed to support the EDC student experience.
 - Organizations will propose a number of students to participate fully in the NASA content. Content may be delivered through either a virtual format or in-person sessions as circumstances allow.
 - Organizations will also propose a total amount of funding for materials and supplies to implement the NASA content.

The total funds requested for materials support are not to exceed \$2,500.00.

- EDC activity content documents and sample student resource kits
- Help-desk support to assist educators as needed in facilitating the content
- Opportunities for live web-based connections with NASA professionals

BACKGROUND

ELEMENTS OF A QUALITY OUT-OF-SCHOOL TIME STEM PROGRAM

These opportunities will be offered to organizations and programs that indicate the greatest potential to offer high-quality OST STEM programs utilizing evidence-based best practices. Organizations who have not previously offered STEM learning experiences but would benefit from the support that NASA content and professional development could provide are also encouraged to apply.

Leading research indicates that quality OST STEM programs should include learner-centered, participatory activities that provide opportunities for participants to engage in STEM practices, explore their interests, and identify with STEM professionals. Activities should reflect the nature of OST STEM program learning environments by providing opportunities for choice, autonomy, ownership, active involvement, wonder, and discovery. Activities should be age appropriate, varied, interesting, enjoyable, challenging, connected to real work, and flexible (Fredricks, 2011; Graves, 2016; Kesidou & Koppal, 2004; PEAR, 2016; Stocklmayer, Rennie, & Gilbert, 2010).

The NASA content for this opportunity was developed to align to these best practices and support organizations that are equipped to provide high-quality OST STEM programming. Additional information on current research related to quality OST STEM learning can be found at the National Research Council's [*Identifying Supporting Productive STEM Programs in Out-of-School Settings*](#).

NASA GLENN'S OFFICE OF STEM ENGAGEMENT

NASA Glenn's Office of STEM Engagement delivers tools for young Americans and educators to learn and succeed. The office seeks to create unique opportunities for students and the public to contribute to NASA's work in exploration and discovery; build a diverse future STEM workforce by engaging students in authentic learning experiences with NASA people, content, and facilities; and strengthen public understanding by enabling powerful connections to NASA's mission and work. To achieve these goals, NASA's Office of STEM Engagement strives to increase K-12 involvement in NASA projects, enhance higher education, support underrepresented communities, strengthen online education, and boost NASA's contribution to informal education. The intended outcome is a generation prepared to code, calculate, design, and discover its way to a new era of American innovation. For more information about STEM engagement at NASA Glenn Research Center, visit <https://www.nasa.gov/centers/glenn/stem>.

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NASA GLENN'S ENGINEERING DESIGN CHALLENGE: KEEP IT COOL

Using the Engineering Design Process, students will design, construct, and test systems to minimize heat transfer to the interior of a simulated cryogenic propellant tank. They will test their design against a control to see how well their insulators worked. Students will submit their final solutions through a short video or capstone presentation document.

Information about NASA Glenn Engineering Design Challenges can be viewed at <https://www.nasa.gov/centers/glenn/stem/glenn-engineering-design-challenges>.

While the offered EDC content below was designed for Out-of-School Time programming, in-school programs are also eligible to propose for this opportunity provided their dates of implementation fall between June 18, 2021 and August 31, 2021.

NASA CONTENT SUMMARY

Module	Standards-Based Content Focus	Synopsis
Engineering Design Challenge: <i>Keep It Cool</i>	NGSS: Engineering and Physical Science MS-PS1-4, MS-PS3-3, MS-PS3-5	Using the Engineering Design Process, students design, construct, and test systems to minimize heat transfer to the interior of a simulated cryogenic propellant tank. The teams will evaluate and improve the prototype, and present their final model, key design features, and how it improves the efficiency of rocket propulsion. <i>Estimated time to complete: 10 contact hours</i> <i>Estimated cost per student participant in a virtual environment: \$25.00</i>

As part of the facilitator workshop, organizations will receive a sample kit of parts for one student team, which includes:

- Straight-sided single-walled 5 oz. stainless steel cup
- 5 oz. paper cups
- Mid-sized two-speed hair dryer
- Plastic 25-ml graduated cylinder
- 10" Scissor Tongs
- Variety of potential insulating materials which may include felt, Styrofoam cups, cardboard, aluminum foil, and/or dried beans

Facilitating organizations may use any additional insulating materials.

BENEFITS FOR PARTICIPATING ORGANIZATIONS

FACILITATOR WORKSHOP

Facilitators or staff trainers will be provided a required two-day virtual facilitator workshop hosted by NASA Glenn Research Center in Cleveland, OH. The workshop will consist of three two-hour virtual webinar segments, occurring June 16 & 18, 2021.

- Organizations will propose one or more facilitators to attend the workshop.
- Proposing organizations should consider reasonable facilitator-to-student ratios when proposing the number of facilitators to be trained.

Awarded organizations will confirm their workshop attendance upon notification of award.

- Some content may be provided for facilitators to review in advance of workshop attendance. This could include webinar sessions or instructional videos, outlining characteristics of quality STEM programming or demonstrating specific technology platforms to be used during the workshop.
- The facilitator workshop will focus on the NASA activity based on the pre-workshop content. Participants will have the opportunity to work through the content to gain knowledge on execution of activities, STEM learning background information, and delivery techniques.

FUNDING

As part of the proposal process, organizations will choose to apply as a funded or unfunded collaborator. Funded collaborators must submit a budget outlining expected materials costs to implement this NASA activity. Unfunded collaborators will attend the same facilitator workshop and have access to the same implementation supports as funded collaborators.

- Organizations will propose a number of students to receive the NASA content through either a virtual format or in-person sessions.
- Organizations can have an unlimited number of students participate in NASA programming; however, total funding provided through this opportunity will not exceed \$2,500.00.
- Organizations that did not successfully fulfill the requirements of previously awarded solicitations will be subject to additional review to determine eligibility for funding.

Upon successful completion of the facilitator workshop, initial funding will be provided consisting of 75% of the awarded amount. The remaining 25% will be provided upon submissions of final student team solution presentations (video or slide presentations) by August 31, 2021 and submission of final reporting requirements by September 15, 2021.

IMPLEMENTATION SUPPORT FROM NASA EXPERTS

Awardees will receive support throughout implementation via email and phone conversations with NASA education specialists. Sites can request specific web-based facilitator training sessions as needed. As a collaborating organization with NASA Glenn, sites can request virtual connections between their students and NASA professionals to discuss the scientific and engineering concepts related to the NASA content and STEM careers.

ELIGIBILITY REQUIREMENTS

NASA Glenn is seeking:

- Organizations located in Ohio.
- Organizations that will reach students in 5th to 9th grade. Greater consideration is given to organizations who are able to reach underrepresented and underserved students. For purposes of this solicitation, groups underrepresented in STEM fields include Hispanics and Latinos, African Americans, American Indians, Alaska Natives, Native Hawaiians and Pacific Islanders, the economically disadvantaged, people with disabilities, and women and girls.
- Organizations that will facilitate the entire EDC content during the timeframe of June 18, 2021 through August 31, 2021.
- Organizations that can recruit and retain the proposed number of students through the full NASA activity implementation. Organizations with greater student reach are highly desirable.
- Organizations who are committed to providing their staff with professional development opportunities, including the virtual facilitator workshop.

The proposed program must:

- Serve students in grades 5-9.
- Provide all proposed students with the EDC content including creating and submitting student solution presentations.
- Be conducted during the implementation period of June 18, 2021 through August 31, 2021.

Selected organizations must agree to the following:

- One or more designated facilitators must participate in the virtual facilitator workshop hosted by NASA Glenn Research Center in Cleveland, OH.
- Organizations must complete the NASA activity with the number of students in their proposal. Groups of up to four students work through an iterative design process to build a solution to the given problem. Each group must present their work accomplished through the design process and their final solution in the form of a short video or a slide presentation submitted to NASA.

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Evaluation Requirements:

All awarded organizations must provide a final data report. Details and reporting template will be provided to awarded organizations. The final data report must include the following:

- A brief narrative of the implementation of the activities with the students
- Student and facilitator participation data (anonymized)
 - Number of students (by each grade level)
 - Number of educators/facilitators (certified teachers, pre-service teachers, informal educators)
 - Demographic data (gender, ethnicity, and race)
- Model of implementation
 - When and where did the program take place (after school every day, half-days on Saturday, etc.)?
 - How were NASA content activities used?
 - When did virtual connections with NASA professionals occur?
- Signed budget summary
- Stories, images and media release forms of all participants whose likenesses are featured
- Any partnerships and/or collaboration data pertaining to the NASA content implementation

Selected sites may be asked to participate in one or more of the following evaluation activities to help improve NASA's STEM programming opportunities. By applying, your organization agrees to participate in the following:

- Complete facilitator surveys
- Participate in focus groups between NASA evaluators and site facilitators
- Have students complete participation surveys

SUBMITTING YOUR PROPOSAL

All proposals are to be submitted through the online proposal form, which is located at <https://tinyurl.com/NASA-Glenn-STEM-Proposal-Form>. Proposals must be submitted by 5:00 PM Eastern on April 21, 2021. Only proposals submitted online will be accepted.

Proposals must be completed in full at the time of submission, so it is encouraged to prepare responses prior to beginning the online proposal form. [A list of the proposal form questions for reference is available here.](#)

A budget document must be submitted as part of your proposal, indicating both funds requested from NASA and a description of any funds or supplies to be leveraged from other sources. [An editable budget template is available here.](#) The Facilitator Travel category does not apply to this opportunity and should be left blank.

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PROPOSAL REVIEW PROCESS

Proposals are reviewed by a panel of experts. Full or partial funding may be granted. Award funds are distributed after participation in the facilitator workshop.

Proposals will be evaluated to determine likelihood of project success using the following criteria:

- Number of proposed student participants
- Percentage of students from underrepresented populations as defined in the solicitation
- Plans to recruit and retain student participation in the program
- Alignment of the program's goals and objectives to those of this opportunity
- Reasonability of funding requested based on expected numbers of participants and leveraging of additional resources beyond this solicitation
- Likelihood for delivery of quality STEM programming demonstrated through relevant in-school/OST and STEM experience

Proposing organizations will be notified of their award status by May 19, 2021. A subset of organizations who are not selected to receive direct funding will be eligible to participate in all aspects of the unfunded collaboration opportunity.

AWARD ADMINISTRATION INFORMATION

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POINT OF CONTACT

If you have questions about the project or the online proposal form, contact:
NASA Glenn Research Center Office of STEM Engagement
GRC-Ed-Opportunities@mail.nasa.gov

REFERENCES

- Afterschool Alliance. (2016). America after 3pm: The growing importance of afterschool in rural communities. Retrieved from http://www.afterschoolalliance.org/AA3PM/Afterschool_in_Rural_Communities.pdf
- Bell, P., Lewenstein, B., Shouse, A. W., & Feder, M. A. (Eds.). (2009). Learning Science in Informal Environments: People, Places, and Pursuits. Committee on Learning Science in Informal Environments National Research Council. Washington DC: National Academies Press.
- Chi, B., Dorph, R., & Reisman, L. (n.d.). Evidence & impact: Museum-managed STEM programs in out-of-school settings. National Research Council Committee on Out-of-School Time STEM. Washington, DC: National Research Council.
- Fredricks, J. A. (2011). Engagement in school and out-of-school contexts: A multidimensional view of engagement. *Theory into practice*, 50(4), 327-335.
- Friedman, A. (Ed). (2008). Framework for evaluating impacts of informal science education projects. Arlington, VA: National Science Foundation.
- Graves, C (2016). Case study of the science, engineering, mathematics, and aerospace academy: participant and parental perceptions. (Doctoral dissertation).
- Hussar, K., Schwartz, S., Bioselle, E., & Noam, G. (2008). Toward a systematic evidence-base for science in out-of-school time. Retrieved from http://www.peecworks.org/PEEC/PEEC_Inst/01796300-001D0211.0/Hussar%20et%20al%202008%20Assessment%20of%20Science%20OST.pdf
- Kesidou, S., Koppal, M. (2004). Supporting goals-based learning with STEM outreach. *Journal of STEM Education: Innovations and Research*, 5(3/4), 5.
- National Research Council. (2015) Identifying and Supporting Productive STEM Programs in Out-of-School Settings Committee on Successful Out-of-School STEM Learning. Board on Education, Division of Behavioral and Social Science and Education. Washington, DC: The National Academics Press.
- Partnerships in Education and Resilience (PEAR) Institute. (2016, July 27). Dimensions of success. Retrieved from <https://www.thepearinstitute.org/dimensions-of-success>
- Stockmayer, S.M., Rennie, L.J., & Gilbert, J.K. (2010). The roles of the formal and informal sectors in the provision of effective science education. *Studies in Science Education*, 46(1), 1-44.