



Student Spaceflight Experiment Program (<http://ssep.ncesse.org>)

A Program of the National Center for Earth and Space Science Education (<http://ncesse.org>), and the Arthur C. Clarke Institute for Space Education (<http://clarkeinstitute.org>),

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*Created to address U.S. Strategic Need in Workforce Development for the 21<sup>st</sup> Century: a high caliber STEM education program tuned to Next Generation Science Standards; designed as a pedagogical model for inspiring and engaging the next generation of American scientists and engineers; utilization of the International Space Station for STEM education; a bold new commercial space venture*

The Student Spaceflight Experiments Program (SSEP) was launched in June 2010 by the National Center for Earth and Space Science Education (NCESSSE) in strategic partnership with NanoRacks, LLC. Designed as a model U.S. national Science, Technology, Engineering, and Mathematics (STEM) education initiative, the program gives students across a participating community the ability to design and propose real microgravity experiments to fly in low Earth orbit (experiments conducted in a “weightless” environment). SSEP was first carried out aboard the final two flights of the U.S. Space Shuttle Program in 2011 (STS-134 Endeavour, STS-135 Atlantis). In 2012 SSEP transitioned to operations on the International Space Station (ISS) – America’s newest National Laboratory.

*SSEP is the best real life application program that my students have ever experienced*

- Alison Thammovongsa, 7th grade science teacher, Peoria Unified School District

- SSEP is suitable for students in pre-college grades 5-12, 2-year community colleges, and 4-year colleges and universities. For pre-college grades 5-12, each community typically engages 300+ students (at least 100) in microgravity experiment design and proposal writing. For an undergraduate community, it is expected that at least 30 students will be engaged.
- Each community participating in SSEP is provided a flight slot to fly one student team designed microgravity experiment to ISS where it is operated by the astronauts.
- Mirroring how professional research is done, each community conducts a **Flight Experiment Design Competition**, where student teams (typically 50-80 teams in a pre-college community) each submit a formal proposal for a microgravity experiment. All proposals go through a formal review to select the flight experiment for the community. The design competition – from program start, to experiment design, to submission of proposals by student teams – runs 9 weeks.
- True STEM Education Initiative: real experiment design across all science disciplines (physical, chemical, and biological); seamless fusion with technology, engineering, and mathematics; required interdisciplinary skills: technical writing, oral communication, and art and design.

- Systemic Initiative: applicable across an entire school district, addressing state and local strategic needs in STEM education, Next Generation Science Standards, and applicable across grades 5-16.
- Community Engagement Model for STEM Education: SSEP is designed to engage students across grades K-16, teachers, families, civic and business organizations, and research institutions.

- Track Record: 17 SSEP flight opportunities have been undertaken since program inception in June 2010 with **191 participating communities** in the U.S. (reflecting 42 States and the District of Columbia), Canada (5 Provinces), and Brazil.

*This might be the best experience I have ever had. The opportunity to work with others that enjoy science as much as I do was great. It opened my eyes to how the scientific method is used in real life. This has shown me that if you work as a team and bounce ideas off each other you can accomplish anything.*

- Alex A., Grade 8, Mendenhall MS, Guilford County, Greensboro, NC

Data available through the first 17 opportunities: **128,300 grade 5-16 students** were fully immersed in microgravity

experiment design and proposal writing; and **26,003 flight experiment proposals** were received from student teams. To date, **308 experiments have flown** on the final two Space Shuttle flights and to ISS, with **11** more flying in Spring/Summer 2021.

- Authentic Immersion in Scientific Research: SSEP precisely models the breadth and depth of real research by the professional community, including definition of a research program by a research team with PIs, Co-Is and Collaborators; writing proposals against a real proposal guideline with a formal evaluation rubric; a real 2-step proposal review process; formal NASA flight safety review for selected experiments; and an annual research conference at the Smithsonian National Air and Space Museum.
- Deep Investment in Partnership: over 1,270 Local Partners, including: school districts, private schools, 34 NASA Space Grant lead colleges and universities, businesses, foundations, private philanthropists, and local research institutions providing science advisors.
- High Profile National Partners: Smithsonian National Air and Space Museum, NanoRacks, International Space Station U.S. National Laboratory, Subaru of America, Inc, and Magellan Aerospace.
- High Profile Program: garnering significant media coverage at local, regional, and national levels, over 1,200 articles to date; transport to the International Space Station aboard next generation commercial carriers: SpaceX Dragon, from Kennedy Space Center, FL, and Northrop Grumman Cygnus, from Mid-Atlantic Regional Spaceport, VA; student delegations at launches; experiments aboard U.S. National Lab on the International Space Station and overseen by an astronaut.
- Breaking New Ground in Commercial Space: SSEP is the first pre-college STEM education program that is both a U.S. national initiative and implemented as an on-orbit commercial space venture.
- Expansion internationally in 2012, with 14 communities that have participated to date in Canada (in Manitoba, Ontario, Alberta, Nova Scotia, and British Columbia), and 1 in Brazil.

The Student Spaceflight Experiments Program is a program of the National Center for Earth and Space Science Education (NCESS) in the U.S. and the Arthur C. Clarke Institute for Space Education internationally. It is enabled through a strategic partnership with NanoRacks LLC, which is working with NASA under a Space Act Agreement as part of the utilization of the International Space Station as a National Laboratory.