The Student Spaceflight Experiments Program (SSEP) was designed to be a way cool science program. We wanted to let students take ownership in a real science investigation of their own design, and to truly be given the opportunity to slip on the shoes of real scientists. We also wanted to do it in a way that generated excitement for not just students, but for their teachers, parents, and entire community. What better way than to provide students the opportunity to use a real research mini-laboratory aboard the International Space Station?

SSEP is about providing a window on the real process of science, and hopefully inspiring many of the participating students to consider becoming America’s next generation of scientists and engineers.

For a student team participating in the SSEP, the opportunity boils down to some very specific tasks—

- **Background Research**: gaining an understanding of the kinds of science experiments that can be conducted in microgravity;

- **Knowing Your Equipment**: gaining an understanding of the operation of the mini-lab in which the student experiments will fly, and the constraints imposed by its operation in space aboard the International Space Station;

- **Critical Thinking**: posing a good scientific question, and developing a hypothesis that can be tested with an experiment in orbit;

- **Experiment Design**: creatively designing an experiment, together with experiment procedures for how it is to be conducted, in order to address the question posed;

- **Submitting a Proposal Like a Real Scientist**: writing a 5-page proposal that effectively communicates the science you are proposing to conduct in orbit, and submitting the proposal to a real proposal review board;

And if your experiment flies—
Conducting the Experiment: mixing your experiment samples (fluids and/or solids) in the exact concentrations you defined in your proposal; placing the samples inside the experiment mini-lab that will fly aboard the International Space Station; and harvesting your experiment samples from the mini-lab after its return to Earth;

Data Analysis: analyzing your samples and comparing to the results of identical ‘ground truth’ experiments you may have performed on Earth. This allows you to compare the results of the experiment conducted in microgravity to that conducted in the normal gravity environment on the surface of Earth;

Data Interpretation and Reporting of Results: based on the experimental analysis, seeing if you can reach some conclusion to the question you originally posed, and writing a paper to share your results with your peers and the greater scientific community;

And if your experiment doesn’t fly—HEY, still plenty of GREAT stuff for you to do!

Conducting your ground truth experiment: you can still conduct your experiment on the ground and report results at your science fair, or some other venue that your community might make available. In fact, we invite you and your team down to the SSEP National Conference in Washington, DC, where you can present your experiment design and ground truth results!

This program is truly designed to let students BE scientists.

A good place to start your thinking is to carefully read the following page at the SSEP website: http://ssep.ncesse.org/about-ssep/designing-the-flight-experiment/

So … are YOU ready to be a scientist? Are you up to the challenge of being a young scientist designing an experiment to fly aboard the International Space Station?

2. Requirements for Your Student Team:
Here are the basic requirements for submitting a proposal:

a. A Teacher Facilitator: There must be a teacher serving as a “Teacher Facilitator” for each submitting student team. It’s fine for a single educator to be the facilitator for multiple student teams.

b. Team Members: It is possible that the students on a team have different levels of responsibility. This is often the case for a professional science research team.

You can choose to identify up to 3 levels of student participation:

- Co-Principal Investigators—students that are taking a leadership role in designing the experiment, or are involved in all aspects of designing the experiment,
- Co-Investigators—students whose job is to address important specific aspects of the experiment, and
• **Collaborators**—students with a supporting role on the team, providing either resources or expertise as needed.

Typically there is at least one Co-Principal Investigator (if just one, then designated the Principal Investigator) who provides the leadership for the team.

You will be identifying your team structure on the Student Team Members Page. The template for this page is part of the SSEP Proposal Guide.

c. **Responsibilities:** The proposal is to be written, and the experiment designed, by the student team and not by the Teacher Facilitator, another teacher, parent, researcher, or other adult, so that the experiment is student-designed and student-proposed.

However, we recognize that the student team will need lots of help with their thinking from the team’s Teacher Facilitator, other teachers, and both local area and national researchers. This is not only encouraged but is really important if students are to get the needed guidance on the process of scientific inquiry, experimental design, how to do background research in relevant science disciplines, and on writing the proposal. In fact, we highly recommend that the student team contact local and national professional scientists and have them act as science advisors on the proposal. These researchers can provide invaluable guidance to the team in all areas of experiment design, such as: helping the team obtain samples (fluids and solids) for the experiment; guiding the development of appropriate analysis methods for the returned samples; and making available sophisticated laboratory equipment for analysis.

Regarding writing the proposal, a student team might consider a single writer, with content provided from across the team, so there is a common voice and writing style. The Teacher Facilitator, and any science advisors, can serve as editors but **not** as writers.

3. **Evaluation of the Proposal:**
Proposals will undergo a 2-step proposal review process. All proposals received from across your community will first be reviewed by a Step 1 Review Board that is convened by your community. The Step 1 Review Board will select 3 finalist proposals to be sent to the National Center for Earth and Space Science Education. We will then convene a Step 2 Review Board that will meet at the Smithsonian in Washington, DC, to select the flight experiment for your community, as well as the flight experiment for each of the other participating communities.

Both Review Boards will use the same evaluation criteria. As is the case with real science proposals submitted by scientists, proposals need to be evaluated on a point system. The proposal with the highest number of points wins the competition.

Proposals submitted to SSEP will be evaluated in three areas with the total possible number of points equal to 100.
<table>
<thead>
<tr>
<th>Area of Evaluation</th>
<th>Number of Points</th>
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</thead>
<tbody>
<tr>
<td>a. Question to be Addressed by the Experiment</td>
<td>25</td>
</tr>
<tr>
<td>b. Experiment Design</td>
<td>50</td>
</tr>
<tr>
<td>c. Communication Skills</td>
<td>25</td>
</tr>
</tbody>
</table>

**TOTAL POSSIBLE: 100**

All reviewers are provided a formal list of objectives that should be met in each of the 3 areas of evaluation, so they can assign points. This list is what is called the “evaluation criteria”. If you would like to see the formal evaluation criteria, your teacher should have a copy. If your teacher does not, have them contact your community’s SSEP Community Program Director.

After the Step 2 Review Board has completed their review, all finalist student teams will receive written feedback on their proposals. The review comments are meant to provide the Board’s view of how well the proposal delivered against the formal evaluation criteria. The Board spends a lot of time providing thoughtful feedback for each proposal, far more than is typical of Boards reviewing real research proposals. This is an important part of the SSEP, since the feedback is a teachable moment which allows student teams to reflect on their proposal, assess how well they addressed the review criteria, and take note of what is expected as part of a formal research proposal submission and review. This is science as it is truly conducted by the professional research community. A real research team will learn from the feedback, and likely resubmit an improved proposal for the next announcement of opportunity. Because the point scores are only used by the Review Board to help in the selection of the winning proposal, they are not released after the review.