

**SSEP Flight Experiment Proposal Guide for  
SSEP Mission 7 to the International Space Station**

**Proposal Title:** Will Sunflower Seeds Grow in Microgravity?

**Grade Level(s) of Submitting Student Team:** 6th and 7th

**Team Name:** N.O.W. A.S. S.S.E.P

**Submitting School:** Crossroads Academy of Kansas City

**Submitting School District:** Crossroads Academy of Kansas City

**Submitting Teacher Facilitator:**

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**Proposal Summary:** Will sunflowers germinate in microgravity? We think that they germinate. We think this because they are going to have purified water and potting soil. We will open the clamp for the water to go into the soil with the seeds and shake vigorously for 30 seconds. We are doing this because sunflower seeds are healthy, and can feed people. By the time the FME comes down from outer space we will see if it has grown roots and has begun germination.

## **II. Student Team Members Page**

A list of all students who are members of the Team submitting this proposal:

### **Co-Principal Investigators**

Name: Saul Rodriguez  
Grade level: 6th

### **Co-Investigators**

Name: Kevin Alvarez  
Grade level: 7th

Name: Jorge Ortiz  
Grade level: 7th

### **Collaborators**

Name: Michyla Westbrook-Samuels  
Grade level: 7th

Name: Nautica Wiggins  
Grade: 7th

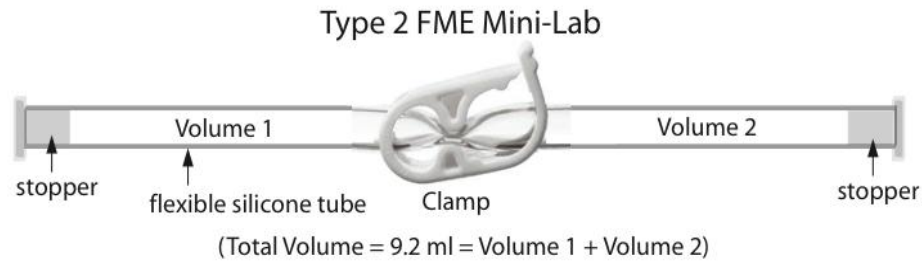
### **III. Experiment Materials and Handling Requirements Page**

1. Fluids Mixing Enclosure (FME) Type proposed to be used:

Type 2 FME (2 experiment volumes: one clamp used)

2. List of Proposed Experiment Samples (Fluids and Solids to be used)

Type 2 FME



#### **Volume 1**

2 Sunflower seeds and  $\frac{1}{3}$  gram of dry potting soil

#### **Volume 2**

3.5 ml of purified water

**IMPORTANT: Are any of the proposed samples human in origin?**

- No

3. **Special Handling Requirements during Transportation**

No special handling required.

4. **Proposed Timeline of Crew Interactions – Your Proposed Crew Interaction Days and Crew Interactions aboard ISS**

Provide Below Your Proposed Timeline of Crew Interactions:

1. A=0 unclamp clamp A and shake vigorously for 30 seconds

#### **IV. The Question to be Addressed by the Experiment**

- The question that we are asking is will sunflowers germinate in microgravity?
- This will be done in microgravity because we want to see if sunflower seeds will at least germinate so maybe NASA will grow sunflowers in space. Also because they're healthy and edible.
- A way how they are healthy is that they control cell damage.
- They play a role in preventing cancer. They also have a good source of selenium, magnesium, and copper.
- They can keep you calm and lower your stress and blood pressure. They also are a good source of Vitamin E, which contains bone healthy minerals.
- They ease every condition that's inflammatory in nature.
- We think that if the sunflower germinates that it will grow so that the space station will have healthy sunflower seeds.
- We are testing germination instead of plant growth because the FME is too small for a full grown sunflower to grow.



- Growing plants in space will be useful because we will know if plants and natural like things can germinate or even grow in microgravity. So if the sunflower germinates then we will know that it is possible for fruit plants or vegetables to grow as well. Also it will be healthy for the astronauts to eat fruits and vegetables instead of fattening foods.

## **V. Experiment Design**

- This proposed experiment will address the question because if the seeds germinate and grow roots then you will know that sunflowers can grow without gravity.
- Our materials are two sunflower seeds, purified water, and potting soil. We chose to use two sunflower seeds because if one of them is dead before arriving to the ISS, the other one will still be alive and germinate. We chose purified water because that's what they use in the space station. We chose potting soil because it is used for feeding plants and making them grow strong and healthy. We can get everything from Wal-Mart. None of these materials require special documents.
- We are doing this same experiment at the same time on earth because we want to see if the sunflower will grow more on earth or in microgravity. The experiment done on Earth is called the ground truth experiment. This will allow gravity to become the independent variable.

### **Procedure:**

#### **The supplies we are going to put in the FME are:**

1. We're going to put 1/3 of a gram of potting soil in volume A
2. Two sunflower seeds in volume A
3. A clamp in the middle
4. Then on the other side we're going to add 3.5 ml of purified water.

#### **What you're supposed to do when the FME gets to the ISS**

1. When the FME gets to the ISS, unclamp the stopper and shake for 30 seconds
2. When the FME gets to the ISS, we are going to do the same thing as on step #1 to our second FME experiment back on earth. (unclamp and shake)
3. After the FME returns to Earth, we will record take measurements of the roots and mass of the seeds from both Earth and the FME on the ISS. We will record our observations on how big the roots got in millimeters and the mass of the seed in grams on the table below.

#### **growth of sunflower seeds**

	Length of roots (mm)	mass (g)
Seed 1 in microgravity		
Seed 2 in microgravity		
Seed 1 in gravity		
Seed 2 in gravity		

## **VI. List of Reference Publications**

- <http://www.whfoods.com/genpage.php?tname=foodspice&dbid=57>,
- <http://www.nutrition-and-you.com/sunflower-seeds.html>,
- <http://www.davidseeds.com/>,
- <http://www.care2.com/greenliving/5-super-health-benefits-of-sunflower-seeds.html>,  
<http://www.nuts.com/snacks/sunflowerseeds/>,

## VII. REQUIRED Letter of Certification by the Teacher Facilitator

November 11, 2014

I certify that the student team designed the experiment described herein and authored this proposal, and not a teacher, parent, or other adult. I recognize that the purpose of this letter is to ensure that there was no adult serving to lead experiment definition and design, or write the proposal, and thereby provide content and/or professional expertise beyond that expected of a student-designed and student-proposed experiment.

I also understand that NCESSSE recognizes that facilitation of thinking across the student team through advice and counsel by the team's Teacher Facilitator, other teachers, and local area and national researchers, is not only to be encouraged but is absolutely vital if students are to receive the necessary guidance on the process of scientific inquiry, experimental design, how to do background research in relevant science disciplines, and on writing the proposal. I also understand that it is appropriate for the Teacher Facilitator and other teachers to provide editorial comment to the student team on their proposal drafts before proposal submission.

I also certify that the samples list and the special handling requests listed in this proposal are accurate and conform to the requirements for SSEP Mission 7 to ISS. I confirm that the team, after reviewing their procedure and budget for obtaining the samples for the experiment, is certain that they will be able to obtain the necessary samples for their experiment in time to meet the deadline for shipping the flight-ready FME to NanoRacks. If using human samples, the team is aware that these samples must be tested for prohibited viruses before the experiment can be selected for flight. Finally, the Teacher Facilitator certifies that the student team will have access to the proper facilities to prepare the FME mini-laboratory for flight and to analyze the samples after the flight.

Kristen Marriott

Teacher Facilitator