Space Seeds: A Low Cost Science Kit Bringing the Experience of Suborbital Spaceflight to Classrooms Around the World

Ed Harris, Energy Made Visible, Houston, TX
Samuel E. Harris, Texas A&M University, College of Engineering

Abstract

Space Seeds is a simple but highly effective science kit for use in grades 3-12. Based upon and supporting existing biology curricula, *Space Seeds* kits provide teachers with an experiment in comparative seed germination and plant growth. *Space Seeds* kits include Cherry Belle radish seeds flown to space on a variety of suborbital vehicles. The kits are low cost, easily mass produced, and distributed free of charge to classrooms across the US and around the world upon request.

History of Space Seeds

First developed in 2015 by the spaceflight company Edge of Space, Inc. as a commercial educational product, Space Seeds was prototyped and tested across a variety of grades and schools in the Houston, TX and Southwest Louisiana areas. Science teachers in these schools contributed to the development of the lesson plans and support materials included in each kit. Between 2015 and 2019 *Space Seeds* kits were distributed to schools in Texas, Louisiana, Colorado, Virginia, New Mexico, and Hawaii. Working in collaboration with Finland-based company Space Nation, *Space Seeds* kits were adapted for and distributed to schools in Finland and Australia. Most recently, Edge of Space worked with a partner in Ecuador to adapt and distribute *Space Seeds* kits to classrooms throughout that country.

In 2021, the *Space Seeds* classroom project was converted from a commercial endeavor to a philanthropic project by the Houston-based nonprofit, Energy Made Visible (EMV). EMV was established in 2019 to support innovative STEAM initiatives in the US and global K-12, college/university, and citizen science communities. EMV secures philanthropic support each year for the continued development, production, and distribution of *Space Seeds* kits to classrooms across the US and in select countries. To date, EMV has raised more than $100,000 over the last three years to produce and distribute Space Seeds kits.

Seeds for use in this project have been flown as payloads on a variety of suborbital (primarily) and orbital vehicles, including: Up Aerospace Spaceloft, Blue Origin New Shepherd, Cygnus cargo vehicles to the ISS, and stratospheric balloon flights provided by Arete STEM Foundation.

Space Seeds Kits Contents and Use

Currently, each *Space Seeds* kit contains a small vial of space-flown Cherry Belle radish seeds; a package of non-flown Cherry Belle radish seeds as a control sample; petri dishes for seed germination; a flash drive containing lesson plans, instructions, teacher and student worksheets, flight photos and data, and links to videos of the actual spaceflights and to instructional resources. Students germinate and grow both space-flown and control seeds in their classrooms, using documents provided to record their observations as they learn the basics of scientific method. The experiment can be conducted successfully in as little as a few days or can last for weeks as students transfer radish plants to outside gardens for continued study. Each *Space Seeds* kit can serve a classroom of 20+ students at a cost of under $20 per kit.

Suggestions for schools that may want to receive *Space Seeds* kits may be sent to Ed Harris at EnergyMadeVisible@aol.com.

4th grade students from Awty International School, Houston, TX conduct the Space Seeds experiment in their classroom.