Training Educators to Teach the Sun and Space Weather Using a Kit of Tools

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Introduction

NASA provides a wealth of data from Heliospheric missions to the public, but educators face several challenges to using such data in the classroom. These include the knowledge of what is available and how to use it, a full understanding of the science concepts the data demonstrate, ability to obtain and maintain products to access data, and access to technology (such as computer labs) for anything other than testing. To surmount these challenges, the Educator Resource Center at NASA’s Independent Validation and Verification (IV&V) Program in Fairmont, WV has developed an operational model that focuses on housing, maintaining, and lending out kits of necessary equipment along with training educators in the science concepts and use of kit materials. Following this model, we have developed a Sun and Space Weather kit and an educator professional development course that we have presented several times. The kit includes a classroom set of tablets utilized to access data from NASA missions and other sources as well as create video reports for project-based outcomes, a set of telescopes for safe solar viewing, and materials to explore magnetic fields and the electromagnetic spectrum.

One-day and One-week Training Offered to Educators

The Educator Resource Center and Dr. Keesee have offered one-day and week-long workshops to educators in West Virginia. The one-day workshop provides an introduction to the physics of the Sun and space weather and training in the use of kit materials. The week-long workshop provides more in-depth discussion of the physics, training in additional resources available from the ERC, and additional activities provided in partnership with Troy Cline of the NASA Magnetospheric Multiscale (MMS) mission. The week-long workshops, offered in July of 2012 and 2014, included a tour of NASA Goddard Space Flight Center facilities where MMS was being assembled. A teacher that attended the 2012 week-long workshop partnered with Troy and NASA to have the students at Paw Paw Schools build a full-size model of a MMS satellite. Participants also assisted with the MMS booth at the 2012 AGU Exploration Station. The societal impact of space weather is emphasized to ensure connections are made between the exciting science and the economic and public security need to support such research. Students also have the opportunity to “ask a scientist” questions through Skype calls with Dr. Keesee.

Apps Used to Collect Data

3D Sun
NASA SWx
NASA Space Weather Media Viewer (Sun Viewer)
SWAi
DREAM Space Weather App
SoHO Viewer
SDO (Solar Dynamics Observatory)
SWx
SpaceStorms
SpaceWx*

*All apps are free except SpaceWx which costs $1.99.

Telescopes for Safe Solar Viewing

The kit includes four types of solar telescopes.

Kit Used for Education and Public Outreach

Dr. Keesee teaches a Kindergarten class about the Sun using the kit
Students at Mingo High School learn about the Sun from the tablets
Students at Mingo High School view sunspots with Dr. Keesee
Paw Paw students built a full-scale model of an MMS satellite, in partnership with Troy Cline and NASA
Kit materials were used for public viewing events of the Transit of Venus held at WVU (shown) and NASA IV&V


 Tablets for Data Collection and Video Reporting

The kit includes a class set of 12 iPads preinstalled with several apps that can be used to collect solar and magnetospheric data from NASA and other missions. The iMovie app is also installed and used to combine screenshots, pictures, and video into a single report. Typical reports are designed as a space weather “forecast” to emphasize the potential impact of the observations.

Educators learn to use the solar telescopes at the week-long workshop, July 2012
Educators learn to use the solar telescopes at a one-day workshop, May 2014

Pre-service educators learn to use the solar telescopes at a one-day workshop, May 2014

Carol Coryea attended the 2012 week-long workshop and has implemented the Sun and Space Weather curriculum at Paw Paw Schools. Her students delivered a hands-on workshop on the Sun and Space Weather at the 2013 National Science Teachers Association meeting