



## Introduction for Students: Curriculum Overview

### Solar Dynamics Observatory (SDO) Project Suite Background

Imagine being part of an active team of student-scientists that uses sophisticated, real-time data of our nearest star, the Sun, just like solar physicists, cosmologists, and astronomers do! By taking part in the *SDO Project Suite* your team plans its own course of research by engaging in a range of exciting activities to study the Sun including:

- Designing a Solar Science movie, image sequence, and more created from real-time solar imagery and data from NASA's SDO satellite;
- Predicting space weather using actual SDO solar data to make a forecast
- Building and investigating with instrumentation used to study the Sun;
- Presenting an interactive Solar Science exhibit to a community audience to explain and demonstrate the Sun's effects on Earth's life and society.

The *SDO Project Suite* engages you and your team members in these innovative types of learning experiences. Your team will determine its own solar exploration pathway to investigate and understand the science of our Sun and to apply that knowledge to solve tomorrow's solar situations. The *SDO Project Suite* presents your team with real-world, project-based Solar Science activities that integrate STEM (science, technology, engineering & math) with language arts, social studies, and art. Your team will build 21st century skills such as digital and media literacy, critical thinking, and problem solving through collaboration with peers, just like scientists do every day in their own research!

### NASA Living With a Star Program: The SDO Mission



Image: NASA

Heliophysics is the study of the Sun and its interactions with Earth and the solar system. NASA's Heliophysics science program consists of two main programs: 'Solar Terrestrial Probes' and 'Living with a Star' (LWS). LWS emphasizes the science necessary to understand those aspects of the Sun and space environment that most directly affect life and society on our planet. The first LWS mission is the Solar Dynamics Observatory, which was launched on February 11, 2010. LWS missions research the interconnected systems between the Earth and Sun with the ultimate goal of enabling a

predictive understanding of the causes of solar activity and its effects on Earth. SDO observes how the Sun's magnetic field is generated, structured, and how stored magnetic energy is converted and released into the heliosphere in the form of solar wind, fast-moving solar particles, and sunlight.



## SDO Solar Modules 1, 2, 3

Activities A, B, C

Attention, future Solar Scientists! Your team is on a mission to learn about the structure of the Sun, explore how and why we study the Sun, and determine what effects our neighborhood star has on our planet Earth.

The main objective of the *SDO Project Suite* is to build knowledge, apply learning, and demonstrate understanding of Solar Science through real-world activities. Your team works together as a group to choose and complete one activity (A, B, or C) from each of the three Solar Modules (1, 2, and 3).

### SDO Solar Module Student Guide Components:

#### Overview

This provides your team with essential background information and the science and purpose of each *SDO Project Suite* Solar Module.

#### Team Goal

The goal clearly states what your team's objective is upon successful completion of each *SDO Project Suite* Solar Module.

#### Materials

Materials and equipment are listed to support your team in completing each *SDO Project Suite* Solar Module activity.

#### Engage & Explore!

Depending upon the three SDO Solar Module Activities that your team selects, each module is broken down into the following steps that develop skills in order to:

- BUILD Knowledge
- APPLY Learning
- DEMONSTRATE Ability
- CREATE Resources & CONNECT to the Real World



## SDO Module 4 Performance Project

### 3-D Solar Exhibit

The fourth and final module is the 3-D Solar Exhibit, which is a performance-based assessment. Each team's exhibit is part of a whole class SDO Exploration Museum. To showcase your team's Solar Science expertise, your group designs an exhibit that presents the previous three Solar Module activities that you completed. The activity artifacts are incorporated into a creative and interactive team exhibit that engages "museum visitors" in learning about the Sun and SDO. During the museum event, student teams curate their own 3-D Solar Exhibit and visit other teams' exhibits to share and build knowledge about Solar Science.

Timely group "check-ins" throughout the final module with your team members and teacher will help monitor and support your group's progress and success. A teacher-completed Content & Exhibit Rubric and a Group Self-Evaluation Rubric are provided for evaluating your team's 3-D Solar Exhibit performance-based project.

## Summative Performance-based Assessment

### 3-D Solar Exhibit Elements

- Videos
- Demo Stations
- Models
- Dioramas
- Posters & Murals
- Slide Shows
- Interactive Exhibits
- Podcasts
- Digital Exhibits
- Students-as-Curators

## Solar Exhibit Components & Sequence:

### Part 1: Solar Exhibit Planning

- 1) Identify Completed Solar Module Content Activities
- 2) Select Solar Exhibit Design Format

### Part 2: Solar Exhibit Preparation

- 3) Write Draft - Content, Image & Artifact Descriptions
- 4) Cite Sources - Content, Images & Artifacts
- 5) Type Final Copy - Content, Image & Artifact Descriptions
- 6) Prepare Images & Artifacts for Exhibit

### Part 3: Solar Exhibit Creation & Evaluation

- 7) Create 3-D Solar Exhibit (following exhibit guidelines)
- 8) Content & Exhibit Rubric and Group Self-Evaluation Rubric

### Part 4: SDO Exploration Museum

- 9) Attend Class SDO Exploration Museum Event
- 10) Congratulations, SDO Module 4 is finished!



## Solar Dynamics Observatory: Solar Module Matrix

SDO Solar Module Topics	Activity A	Activity B	Activity C
Module 1 What are the features of the Sun?	1 A. Structure of Earth's Star	1 B. Observing the Sun	1 C. Solar Research: Pinhole Camera
	<ul style="list-style-type: none"> <li><a href="#">Intro to SDO Video</a></li> <li><a href="#">SDO Science Overview Video</a></li> <li><a href="#">Sun 101 Video</a></li> <li><a href="#">The Sun's Energy Video</a></li> <li><a href="#">Colors of the Sun Video</a></li> <li><a href="#">Sun Comparison Activities</a></li> <li><a href="#">Sun Trek Fact-ary</a></li> <li><a href="#">Sun Origami Model</a></li> </ul>	<ul style="list-style-type: none"> <li><a href="#">Intro to SDO Video</a></li> <li><a href="#">SDO Science Overview Video</a></li> <li><a href="#">Solar Space Telescopes Video</a></li> <li><a href="#">Sunspot Quiz</a></li> <li><a href="#">Galileo's Claim Student-Scientist Investigation</a></li> </ul>	<ul style="list-style-type: none"> <li><a href="#">Intro to SDO Video</a></li> <li><a href="#">SDO Science Overview Video</a></li> <li><a href="#">How to Safely View the Sun Video</a></li> <li>Create a Pinhole Camera</li> </ul>
Module 2 How and why do we study the Sun?	2 A. The Sun & EM Spectrum	2 B. Solar Activity & Magnetism	2 C. Solar Research: Spectroscope
	<ul style="list-style-type: none"> <li><a href="#">SDO AIA Video</a></li> <li><a href="#">SDO EVE Video</a></li> <li><a href="#">EM Spectrum Tour</a></li> <li><a href="#">The Sun &amp; EM Spectrum Video</a></li> <li><a href="#">How to Use Helioviewer Video &amp; User Guide</a></li> <li><a href="#">Helioviewer Activity</a></li> </ul>	<ul style="list-style-type: none"> <li><a href="#">The Dynamic Sun Video</a></li> <li><a href="#">SDO HMI Video</a></li> <li><a href="#">Solar System Magnetism</a></li> <li>Magnetic Solar System PowerPoint</li> <li>Making Sense of Magnetism Activities</li> </ul>	<ul style="list-style-type: none"> <li><a href="#">Spectroscopy in Action Video</a></li> <li><a href="#">Spectroscopy Explained</a></li> <li><a href="#">Graphing the Rainbow Activity</a></li> <li>Build a Spectroscope</li> </ul>
Module 3 How does the Sun affect the Earth?	3 A. Sun-Earth Interactions	3 B. Space Weather	3 C. Solar Research: Magnetometer
	<ul style="list-style-type: none"> <li><a href="#">Our World: Sunsets and Atmosphere</a></li> <li><a href="#">Launchpad: Aurora Lights</a></li> <li><a href="#">Real World: Monitoring Earth's Energy Budget</a></li> <li><a href="#">What is the tilt of Earth's Axis?</a></li> <li><a href="#">Why are days longer in the summer?</a></li> <li><a href="#">Why are days hotter in the summer?</a></li> <li><a href="#">Why are there four seasons on Earth?</a></li> <li><a href="#">What causes the seasons?</a></li> <li>Reasons for Seasons Activity</li> </ul>	<ul style="list-style-type: none"> <li><a href="#">Solar Wind and Storms Video</a></li> <li><a href="#">The Threat to Earth Video</a></li> <li><a href="#">NOAA Space Weather Videos</a></li> <li><a href="#">NOAA Space Weather Poster &amp; Booklet</a></li> <li><a href="#">Camilla Space Weather Forecast</a> &amp; SDO Solar Storm Prediction Data Sheet</li> </ul>	<ul style="list-style-type: none"> <li><a href="#">Earth's Magnetic Shield Video</a></li> <li><a href="#">NASA Space Weather Media Viewer: Videos "Magnetosphere #1-6"</a></li> <li><a href="#">NASA Space Weather Media Viewer: Illustrations "The Magnetosphere"</a></li> <li>Make a Magnetometer</li> </ul>
Module 4 SDO Exploration Museum Performance Project	3-D Solar Exhibit		
	Summative performance-based assessment of SDO curriculum: <ul style="list-style-type: none"> <li>Three Solar Module artifacts – at least one artifact from each SDO module</li> <li>Explanation, and demonstration of SDO artifacts</li> <li>Jigsaw “museum tour” between student team 3-D Solar Exhibits</li> <li>Group self-evaluation rubric</li> </ul>		