

## Authentic Data Integration Assignment (by Soyoung Chon)

a) Data Source: Provide a title for the data and the specific link for access.

**Lesson Plan:** “Exploring the Dynamics of Solar Activity: Understanding the Solar Cycle, Sunspot Numbers, and Solar Storms”

### **Data and Access link:**

Solar Cycle and Sunspot Numbers: <https://www.sidc.be/SILSO/datafiles>

ISES Solar Cycle and Sunspot Number Progression: <https://www.swpc.noaa.gov/products/solar-cycle-progression>

b) Lesson Enhancement: How does the data enhance your topic/lesson/unit? What new objectives can you address? Include one paragraph statement about your personal feelings regarding using data.

I have a passion for creating engaging curricula that incorporate historical scientific phenomena. In the upcoming year, I am planning to teach a lesson titled "Exploring the Dynamics of Solar Activity." To spark students' curiosity and promote active engagement, I will begin by sharing intriguing historical events related to solar storms, such as the Carrington Event in 1859 and the 1989 Solar Storm in Quebec, Canada. We will also discuss the growing concern surrounding geomagnetic storms and their potential to inflict significant damage on our highly interconnected modern society which heavily relies on advanced technology. As we approach the next solar maximum, which is projected to take place around 2025 according to predictions enabled by NASA's AI technology, we will explore the possible devastating effects of these storms and their implications for our technological infrastructure and everyday lives.

(<https://www.nasa.gov/feature/goddard/2023/sun/nasa-enabled-ai-predictions-may-give-time-to-prepare-for-solar-storms>).

As we discuss the dynamics of solar activity and its impact on Earth, I will introduce data on solar cycles and sunspot numbers obtained from reliable sources

(<https://www.sidc.be/SILSO/datafiles> and <https://www.swpc.noaa.gov/products/solar-cycle-progression>). By incorporating this data into the lesson, I expect enhancing students' learning experience in three significant ways.

First, the data will provide a "real-world relevance" by establishing a direct connection between the natural phenomena and our daily lives. Through the study of this data, students will be able to understand how solar activity influences Earth's climate and space weather.

Second, integrating data across various subjects, such as science, math, and history, will promote an engaging "interdisciplinary approach." Students will have the opportunity to explore the scientific aspects of solar cycles, analyze sunspot numbers patterns using mathematical modeling techniques, and investigate notable historical events like the 1989 Solar Storm in Quebec, which coincided with a solar maximum. This interdisciplinary integration will enable students to develop a holistic understanding of solar activity from various perspectives.

Lastly, actively working with solar cycle and sunspot numbers data will engage students in "mathematical modeling." This process of data analysis will enhance critical thinking skills, empowering students to identify patterns, make predictions, and draw evidence-based conclusions. These activities will not only strengthen students' mathematical proficiency but also provide them with essential skills to interpret and analyze data in various contexts.

Based on my previous educational experiences, which lacked the analysis of real-world phenomena, I have come to realize the importance of connecting theoretical concepts to practical applications in our daily lives. This realization has led me to firmly believe in the value of an authentic data-driven approach in the classroom, as it enhances students' learning experiences by bridging the gap between theory and reality. For example, by incorporating solar cycle and sunspot numbers data into my lesson, I can offer students a valuable opportunity to explore the dynamics of solar activity and its relevance in real-world contexts. This data-driven approach not only promotes a deeper understanding of the natural world and its impact on our lives but also encourages interdisciplinary exploration, cultivates critical thinking skills, and empowers students to draw evidence-based conclusions. In the long term, students with these practical skills will be able to effectively apply their knowledge in various real-world situations and gain leverage in handling everyday life problems.

- c) *Interdisciplinary context: Clearly explain how the data can be used to create interdisciplinary lessons and how can you connect to multiple content?*

The data on solar cycles and sunspot numbers can be utilized to create an engaging "interdisciplinary lessons" that connect to multiple content areas. By incorporating this data into various subjects, such as **science, mathematics, engineering, and even history**, students can gain a comprehensive understanding of the topic from various perspectives. Here are the possible ways how the data can be used to create interdisciplinary lessons and connect to multiple content areas:

<b>Content Area</b>	<b>Lesson/Activities</b>	<b>Expected Outcome</b>
<i>Science</i>	<p>The data on solar cycles and sunspots can promote 3D learning.</p> <p><u>DCIs</u>: The data will provide a "real-world relevance" by establishing a direct connection between the natural phenomena and our daily lives.</p> <p><u>SEPs</u>: Data analysis will engage students in scientific practices such as interpretation of data and analyzing relationship between solar activity and data.</p> <p><u>CCCs</u>: Data analysis will be applied to crosscutting concepts, such as patterns, cause and effect, and systems models.</p>	Through the study of this data, students will be able to establish solid understanding of solar activity and its influence on Earth's climate, space weather and the electromagnetic disturbance.
<i>Mathematics</i>	Actively working with solar cycle and sunspot numbers data will engage students in "mathematical modeling" practice. They can create a graph and infer functions like a quadratic equation and gain a clear understanding of the relationship between solar cycles, sunspot numbers and other possible variables.	This process of data analysis will enhance students' mathematical skills such as statistics and graphing. This process of data analysis will enhance students' mathematical skills such as statistics and graphing.
<i>History</i>	To spark students' curiosity, I will introduce intriguing historical events related to solar storms, such as the Carrington Event in 1859 and the 1989 Solar Storm in Quebec, Canada. Students will examine their historical significance of those events on society and communication technology infrastructure.	After examining historic data, students will be able to understand that the next solar storm could cause devastating damage to our highly interconnected modern society, which heavily relies on advanced technology infrastructure.
<i>Engineering</i>	Examining historic solar activity's impact on society will inspire engineering projects to mitigate solar storms' effects on Earth. We will discuss NASA's AI-generated solar storm warning for 2025, and students will review ongoing engineering efforts to prepare for the storm.	The lesson will enhance students' understanding on how solar radiation impacts technology and communication. They can then design a mitigation system, such as a heat shield, to lessen the effects of the solar storm. (6).

I expect students to develop a clear understanding of the dynamics of solar activity by integrating solar cycle and sunspot data across multiple interdisciplinary subjects, including science, math, history, and engineering. This approach will not only enhance their understanding but also improve their skills in various content areas.

## References:

1. [https://www.washingtonpost.com/technology/2023/06/28/solar-storm-internet-apocalypse/?utm\\_medium=social&utm\\_campaign=wp\\_main&utm\\_source=twitter](https://www.washingtonpost.com/technology/2023/06/28/solar-storm-internet-apocalypse/?utm_medium=social&utm_campaign=wp_main&utm_source=twitter), accessed June 29, 2023
2. <https://www.nasa.gov/feature/goddard/2023/sun/nasa-enabled-ai-predictions-may-give-time-to-prepare-for-solar-storms>, accessed June 27, 2023
3. <https://www.history.com/news/a-perfect-solar-superstorm-the-1859-carrington-event>, accessed June 30, 2023
4. [https://www.nasa.gov/topics/earth/features/sun\\_darkness.html](https://www.nasa.gov/topics/earth/features/sun_darkness.html), accessed June 30, 2023
5. <https://spacemath.gsfc.nasa.gov/NASADocs/nasa5.pdf>, accessed July 1, 2023
6. <https://www.nasa.gov/stem-ed-resources/activity-four-build-a-heat-shield.html>, accessed on July 2, 2023.