The Sun Spins

Our star has slightly cooler regions called sunspots which rotate with the rest of the star. From the patterns, the rotation rate of the Sun can be determined.

Solar viewing can be very dangerous. Sunglasses (even many in a row) and exposed camera film do **NOT** make it safe to watch. There are basically 3 methods to safely observe the Sun:

1. Project the image from a pinhole or single binocular to a screen as shown in this 2006 Sky and Telescope article: https://skyandtelescope.org/observing/observing-the-sun/

2. Put filter on the front of a telescope making sure it is tight so it does not fall off. (By the way, some manufacturers used to supply solar filters which screw into an eyepiece. It is recommended to discard them and never use them.)

3. Buy a specific telescope for solar observing as described in the following 2022 article from Astronomy magazine.

https://astronomy.com/magazine/news/2022/01/solar-filters-for-observing-the-sun

The specific solar telescopes might be expensive, but are quite safe and can be used during the day. Many also block all colours but hydrogen alpha a red colour given off by hot hydrogen atoms. This reveals interesting patterns, especially prominences which are like tongues of flame coming from the limb of the Sun. Complex magnetic fields push them out shown in this NASA photo of a large one.

There are other brands than shown. If you are going to buy a solar telescope for student use, get it from an established astronomy store, rather than an unknown online discount provider. You can get advice about these telescopes from people in your local RASC centre.

Before this activity, it's useful if students have actually looked at the Sun over a few days and perhaps practiced sketching sunspots. If the Sun is observed near noon (1 PM if daylight time), the solar north pole is approximately up. However, sometimes during solar minimums, there are no sunspots for weeks at a time. https://spaceweather.com/ give the latest patterns. It might be worthwhile only doing this activity when there are sunspots.

http://solar-center.stanford.edu/spin-sun/spin-sun.html has an activity where students look at printed images of the Sun (or student sketches) over various weeks and observe the pattern of how the sunspots move.

It suggests you get images from the SOHO satellite which was launched in 1995. and since then other missions to observe the sun have been

launched such as the Solar Dynamic Observatory launched in 2010. A useful image for sunspots with north up is:

https://sdo.gsfc.nasa.gov/assets/img/latest/latest_2048_HMIIC.jpg

The date and universal time (ie London England standard time) are given at the bottom. Each camera on the spacecraft records at a variety of different wavelengths corresponding to specific energy levels of atoms on the Sun. Each large enough sunspot is given a number. When it rotates around from the other side it keeps the same number.

This link has a presentation students might enjoy:

https://pdfs.semanticscholar.org/fb72/ebf3b2083a06f0117865631d8d734ac67fbb.pdf