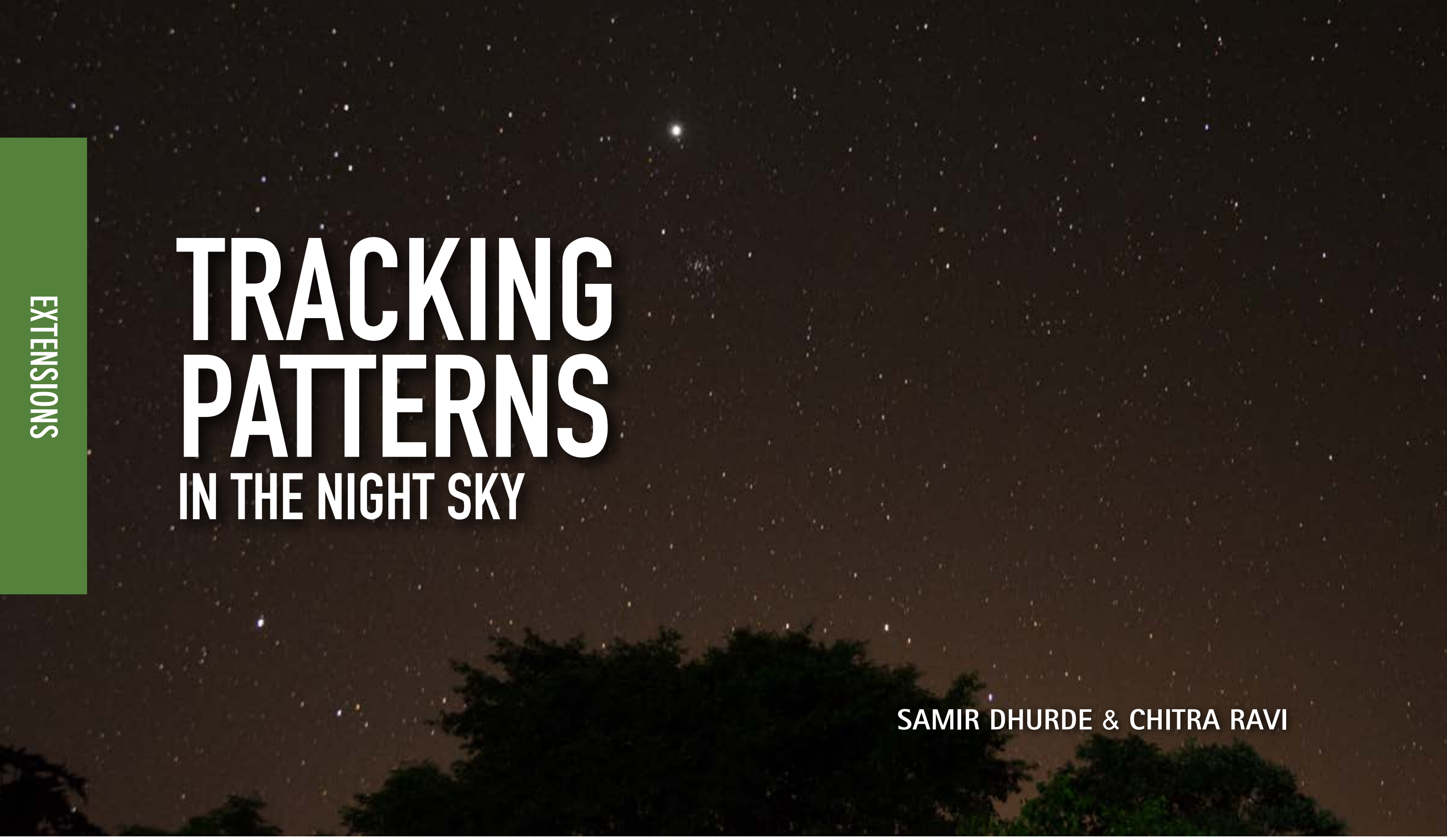
EXTENSIONS



TRACKING PATTERNS IN THE NIGHT SKY

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The Grade VI science textbook suggests an observation-based approach to introduce students to a range of celestial objects in the night sky. What patterns can students observe when they move from one-time tasks to regular observation?

Chapter 12 ('Beyond Earth') of the Grade VI science textbook (NCERT, Reprint 2026-27) introduces students to many celestial objects: stars, planets, satellites, asteroids, comets, and galaxies.[1] It also includes ideas for four activities (12.1-12.4) that encourage students to observe these objects for themselves in the night sky.[1]

These activities recognise the night sky as a natural classroom filled with wandering planets and bright stars. More importantly, they remind us that students can see and study many of these objects, and the patterns they form in the sky, without any special equipment (see the **Field Guide**). They also suggest how students' curiosity about celestial objects can be deepened through observations that allow a clear progression in learning. For example, the first activity invites students to draw any patterns they observe in the sky and make stories around them. The next three activities encourage them to locate specific constellations (like Orion), specific stars (like Pole Star), and a specific planet (Venus) in the night sky.[1]

Rather than seeing these activities as one-time tasks, teachers can adapt them to encourage

Box 1. Extending textbook activities to encourage regular observations:

Chapter 12 of the Grade VI science textbook (NCERT, Reprint 2026-27) provides some instructions—such as choosing a dark location and allowing eyes to adjust to the dark—to help students make one-time observations of the night sky. These can be easily extended to regular observations. Here are a few other simple practices that can help students build this habit:

- Help them learn to identify the four cardinal directions (North, South, East, and West) even without a compass. Observing where the Sun sets can help students establish direction.
- Organise periodic observation sessions—either in school or as guided home activities. Emphasise the usefulness of observing the night sky regularly over several days or weeks to notice changes in the positions or patterns of celestial objects.
- Encourage students to focus on a few easily identifiable patterns in the sky, rather than trying to locate many objects at once. If students struggle with night observation, suggest that they use a flashlight (with its face covered with red cellophane to reduce glare).
- Encourage students to maintain records of their observations. They can sketch and/or describe what they observe each day. Invite students to share observations of patterns during class discussions. You can also connect their observations with stories from Indian astronomy and cultural traditions to broaden student engagement.

students to track and record structured observations of the night sky over longer periods (see **Box 1**). What scientific concepts and thinking skills can students develop from this extension?

Linking observations with textbook ideas

Regular observations of the night sky can be used to strengthen students' understanding of a variety of concepts and ideas introduced in the middle-stage science curriculum:

(a) **Observing constellations:** At first, the night sky may appear to students as a random collection of objects, with no clear pattern. This can be addressed by asking them to identify constellations. At this stage, the focus needs to be less on getting students to memorise the pattern of stars that form each constellation, and more on learning to make systematic observations of the night sky. Looking at the same constellation at different times over a single night, or over a period of weeks or months, may allow students to notice how its position in the sky changes over time. For example, they may observe that Orion appears to rise in the east, move across the sky, and set in the west. They may also notice a westward shift in its position relative to buildings, trees, or the horizon even within a period of 1–2 hours. Teachers can use these observations to point out that the apparent movement of constellations across the sky over a single night is due to the Earth's rotation. Similarly, students may notice that in certain months of the year (for example, from about November to February in India), Orion is visible in the evening sky. But in other months, it appears later at night or before sunrise. Teachers can explain such observations by pointing to the fact that the Earth revolves around our Sun—this movement changes which part of the sky is visible to us at the same hour across different times of the year.

(b) **Observing stars:** Observing the night sky allows students to pay closer attention to stars other than our Sun. Learning to locate constellations provides a way to organise this practice. For example, students can easily identify Orion by first locating the three bright stars that form its belt (see **Fig. 1**). These can be used to identify the other stars in this constellation. By drawing an imaginary line through the belt toward the southeast, students will hit an incredibly bright, twinkling star. This is Sirius. Locating this star makes it easier for students to trace the rest of Canis major. If students follow the line from the belt in the opposite direction (northwest), it will lead them to a reddish star. This is Aldebaran, the eye of Taurus the Bull. If they go a bit further in that same direction (northwest), they will run into a tiny, fuzzy cluster of stars that looks like a 'mini' Big Dipper. This is the Pleiades (the Seven Sisters). Students can also connect Sirius to Betelgeuse (the slightly reddish looking

Fig. 1. The stars that form the Orion constellation. The three bright stars forming Orion's belt are the most prominent and easiest to locate. Once these are identified, the other stars that outline the hunter become easier to recognise. Students may also observe that Betelgeuse appears reddish, while Rigel appears bluish-white.

star that forms Orion's shoulder) and Procyon (a star from Canis minor) that appears to rise shortly before Sirius in the Northern Hemisphere) to form the 'Winter Triangle'. This seasonal pattern with the shape of a nearly perfect equilateral triangle is often easy to spot, even from cities with light pollution. In this way, students can start building mental maps of the night sky from their location. As students practise locating these constellations regularly, they may begin asking questions about the differences they observe between stars within a constellation. For example, students may wonder why some stars appear brighter than others.

Teachers can explain that stars like Sirius appear brighter to us because it is one of our closest neighbors (only 8.6 light-years away) and emits about 25 times more light than our Sun. They can also contrast this with a star like Rigel (the brightest star in Orion) that emits 120,000 times more light than our Sun, but does not appear to be as bright as Sirius because it is much further (about 860 light-years) away. Comparisons like this can help students see that the sky has depth. Similarly, students may ask why stars appear to have different colours. Teachers can explain that some differences in colour are because of differences in surface temperature—bluish stars like Rigel are extremely hot, while reddish stars like Betelgeuse are cooler. They can also share how a star's colour often tells us where it is in its 'life cycle'. Young, energetic stars are often blue in colour; middle-aged stars (like our Sun) are often yellow; and stars like Betelgeuse, which are nearing the end of their lives, often turn red. Learning that Betelgeuse is expected to explode (as a supernova) 'soon' in cosmic time can make the sky feel more active and dynamic to students. Finally, by drawing attention to how Sirius often appears to flicker in multiple colours (red, blue, and white), teachers can explain that this effect is due to Earth's atmosphere. Because Sirius often appears low on the horizon, its light travels through a thicker layer of turbulent air before reaching our eyes. This air can split the light into different colours—we notice this effect so clearly because Sirius is so bright. Such contrasts help students appreciate how similar observations (differences in star colour) may not always have the same explanation.

(c) **Observing planets:** One of the most teachable observational cycles in the night sky relates to the changing position of Venus. Teachers can extend the one-time task in the textbook by asking students to locate Venus once a week over several weeks. As suggested in the textbook, students can do this either shortly after sunset or just before sunrise, depending on when the planet is visible from their location. During each observation, students can note the position of Venus relative to the horizon, the sunset/sunrise point, and fixed landmarks like trees

Box 2. Curricular connections:

Planning classroom instruction around such explorations and discussions can help meet the following:

A) Curricular goals for middle-stage science:

- CG-2: [The student] explores the physical world in scientific and mathematical terms. Specifically, it can help students develop the competency (C-2.5) to: "*Observe and identify celestial objects (stars, planets... constellations...) in the night sky using a simple telescope and images/ photographs, and explain their role in navigation, calendars, and other phenomena...*"
- CG-6: [The student] explores the nature and processes of science through engaging with the evolution of scientific knowledge and conducting scientific inquiry. Specifically, it can help students develop the competency (C-6.2) to: *"Formulate questions using scientific terminology (to identify possible causes for an event, patterns, or behaviour of objects) and collect data as evidence (through observation of the natural environment, design of simple experiments, or use of simple scientific instruments)."*[2]

B) Learning objectives for middle-stage students:

- The learner distinguishes between stars, planets, and satellites e.g., Sun, Earth, and Moon.[3]
- List commonly seen objects in the sky as celestial objects.[4]
- Categorise... commonly known groups of stars in order to explain that constellations are groups of stars with recognisable shapes.[4]

or buildings. They can record whether it appears higher or lower in the sky than in the previous week, and how long it remains visible. These observations can be recorded as brief, dated sketches or notes and compared over time. What pattern are students likely to notice through these weekly observations? If they first spot Venus after sunset in the western sky, it will initially appear close to the horizon. Over several months (about 8-9), it will appear brighter as it climbs higher each week and moves further away from our Sun's position in the sky. Eventually, it 'drops' back toward the Sun, becoming harder to see, and disappears for about 1-3 weeks. It reappears in the eastern sky before sunrise, as the 'morning star'. From this point onward, it quickly reaches its highest point before slowly sinking lower over several months (about 8-9). Its visibility decreases each week as it moves closer to the rising Sun. It then disappears again for a longer period (about 2-3 months) before reappearing as the 'evening star.' Through this exercise, students will observe firsthand that planets do not stay in fixed positions relative to the horizon or stars. Teachers can also point out that Venus never appears high overhead at midnight. They can explain that because Venus orbits closer to our Sun than Earth, it always appears to us as being tethered to our Sun. This also means that if a student sees a bright object with a steady light directly overhead at midnight, they can be certain it is not Venus. Instead, it is likely a planet that orbits outside Earth's path, such as Jupiter or Mars. Over time, this exercise can strengthen students' understanding that Earth and Venus are continuously revolving around our Sun at different speeds.

Parting thoughts

Chapter 12 of the Grade VI science textbook (NCERT, Reprint 2026–2027) encourages teachers to introduce students to the night sky without specialised equipment.[1] Extending the focus of the activities shared in this chapter from one-time identification to regular observation has the potential to spark a lifetime of curiosity in celestial objects among students. Teachers can support this shift by guiding students on what to observe, encouraging them to record their findings through simple sketches and notes, and providing opportunities to compare and discuss their observations across weeks. In doing so, teachers can draw attention to patterns that emerge over time and use them to strengthen students' understanding of ideas such as motion, light, and scale. Such an approach allows students to move beyond memorising celestial names and definitions to begin thinking like astronomers (see **Box 2**). They begin to engage with the night sky not as a fixed image, but as a changing system that they can continually observe, question, and learn from.

Key takeaways

- Textbook activities in the Grade VI science curriculum can be treated as opportunities for regular and structured observation, rather than one-time tasks, to help students notice patterns and changes in the night sky over time.
- Identifiable constellations, prominent stars, and visible planets can be used as reference points to help students organise their observations and build mental maps of the night sky.
- Teachers can support students in connecting observations to concepts (such as motion, apparent size, and distance) by guiding what they notice, record, and discuss.

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Notes:

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(b) This article includes one classroom resource: **Field Guide: A Beginner's Map to the Night Sky**.

(c) The order of authors' names and bios in this article reflects the sequence in which contributions were made. The author who made the first concrete contribution is listed first, and the author who contributed most recently is listed last. Unlike in academic publications, this order does not indicate the relative extent or importance of each author's contribution.

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