

## CAPSTONE PROJECT

Lesson Name	Constellation
Stem Challenge	Constellation sewing cards and Constellation Viewer
Level / Grade	Grade 7
Overview	In this STEM lesson, the students understand the life process of stars and determine the various constellations.
Problem Statement	Sharanya, a science student is fascinated about the stars. Though she knew the properties of stars, she wants to spot the various groups of stars.
Learning objectives	<ul style="list-style-type: none"><li>• Identify the stars and the constellations formed</li><li>• Describe the life process of stars</li></ul>
Materials	3 Black chart, 5 colors of woolen thread, Plastic Needle, Craft Scissors, White Pen or Marker, Ruler, Pencil, Eraser, Single Paper Punch, Board Pins, Paper Cups, Torch Light
Background Information	<ul style="list-style-type: none"><li>• The stars that you see are objects that shine because of the heat and light that they generate in their interiors. They are made up mostly of hydrogen gas and their</li></ul>

radiant energy is due to the conversion of hydrogen to helium in their cores. On any clear night, if you look for a sufficiently long time, in any direction of the sky, you are likely to see a moving point of light with a short – lived trail; these are shooting stars or meteors. Shooting stars are really not stars at all; they are just grains of dust or rocks from outer space which burn up and shine when they enter Earth’s atmosphere. Among the stars that you see, you often find star like objects which, however, do not twinkle; these are the planets, comparatively cold objects, which move around the Sun and which shine only because of the sunlight that they reflect. They do not make any light of their own. Many of the planets have moons or satellites; these are also cold objects which can only reflect the Sun’s light. Our Sun is a star and our Earth is a planet which moves about the Sun once every 365.14 days. The Moon is a natural satellite of Earth.

- Many stars are often born together, live and move together in groups called star clusters. There are two types of clusters – Open clusters, in which the stars somewhat loosely packed with no special shape to the

cluster and Globular clusters, in which the stars are rather closely packed in distinctly spherical groupings. Some clusters can be seen with the naked eye or just binoculars.

- Stars are born from huge clouds of gas and dust and when they die they leave behind such clouds. These great clouds, which only reflect or scatter starlight are called nebulae. Though one needs some optical aid to see these, a few of them are visible to the naked eye on clear dark nights.
- Our Sun belongs to a very large collection of stars (about a hundred thousand million of them) called the Milky Way galaxy. A galaxy is a very large collection of stars that are held together by the force of gravity; note that every galaxy contains many thousands of star clusters. Our galaxy, the Milky Way, is just one among the billions of galaxies that make up the Universe. While many external galaxies can be seen with even a small telescope, the only one that can be seen with naked eye, as a faint patch is the Andromeda Galaxy.
- Just as we need maps to locate countries on the globe, cities in countries and localities in cities, we need sky

maps to locate the stars and other objects in the skies. Fortunately, for all practical purposes the stars occupy fixed positions in the sky and so their positions can be marked on sky maps. In addition, certain groups of stars appear to be together and form apparent patterns in the skies; these star groupings are called constellations. Many of the constellations were known to and imaginatively named by the ancients. Leo, Ursa Major, Canis Major. Today, the constellations are used to map the whole sky into 88 distinct regions.

- Though the stars are in almost fixed positions in relation to one another, the night sky appears to change throughout the night and more slowly from season to season throughout the year. These changes are due to the rotation of Earth on its own axis once every day and the revolution of Earth about the Sun once every year. Just as the Sun and Moon appear to rise in the east and set in the west because of the rotation of Earth, so do the stars. The stars and constellations appear to rise in the east and set in the west; thus, the stars and constellations that you see overhead at 9pm on some night will appear to set by 3 am and a new set of stars will be seen overhead. The

	<p>whole sky appears to rotate about us once every 24 hours. The axis of time, about which it rotates passes through the well known star, the Pole star or Polaris, and as a consequence the Pole Star or Polaris, and as a consequence the Pole Star remains fixed in the northern sky even though all the other stars appear to move through the night. In addition to this rapid nightly motion there is a slow change due to the motion of Earth about the Sun. Each day the stars appear to rise 4 minutes earlier than the previous day.</p> <ul style="list-style-type: none"> <li>• One can observe the stars at any time on any clear night of the year. But the best observations can be made on moonless nights, does to new moon or before the moon has risen or after it has set; bright moon light makes the stars appear faint.</li> </ul>
<p>Procedure</p>	
<p>Pre session</p>	<p><b>Constellation Sewing Chart</b></p> <ul style="list-style-type: none"> <li>• Cut the black chart into A5 size (21 × 15 cm).</li> <li>• Draw the constellations on each card with pencil and highlight with the white pen or marker</li> <li>• Mark the dots for the stars in the constellation.</li> </ul>

	<ul style="list-style-type: none"> <li>• Use the single paper punch to poke holes on the star dots.</li> <li>• With the needle and woolen thread, stitch the shapes in the constellation.</li> </ul> <p><b>Constellation Viewer</b></p> <ul style="list-style-type: none"> <li>• Draw the constellation on the bottom of the paper cup</li> <li>• Mark clear dots for the stars in the constellation.</li> <li>• Use a push pin to poke holes into the star dots.</li> </ul> <p>The constellation viewer works best in a dark room. Shine the constellation onto any flat, dark surface. Hold the flashlight at an angle, instead of straight at the bottom of the cup, so the light diffuses neatly through the holes.</p>
<p>Process with time allocation</p>	<ul style="list-style-type: none"> <li>• 20 minutes – Concept explanation</li> <li>• 30 minutes – STEM Challenge</li> </ul>
<p>STEM connect</p>	<ul style="list-style-type: none"> <li>• Science – Stars</li> <li>• Technology – Sky Map App</li> <li>• Engineering – Telescope making</li> <li>• Math – Measurements, Shapes.</li> </ul>
<p>Assessment</p>	<p>Identify the constellations with sewing cards and viewer and spotting the constellation in the star gazing tour.</p>