Subject: Earth Science	Grade: 10	Unit #: 5	Title: Astronomy

UNIT OVERVIEW

STAGE ONE: Identify Desired Results

Established Goals/Standards

1.1a, 1.1b, 1.1c, 1.1d, 1.1e, 1.1f, 1.1g, 1.1h, 1.1i, 1.2a, 1.2b, 1.2c, 1.2d, 1.2e, 1.2f, 1.2g, 1.2h, 1.2i, 1.2j

Long-Term Transfer Goal

At the end of this unit, students will use what they have learned to independently…
Apply their understanding of astronomy to engage in argumentation using evidence as support to debate which celestial body is the most important

Meaning

Enduring Understandings

Students will understand that…

U1. Celestial phenomena are cyclic and predictable

U2. Gravity influences the creation and movement of celestial objects

U3. The universe is vast and is estimated to have formed 13-15 bya

U4. Scientific tools help us understand the universe.

Essential Questions

Students will consider such questions as…

1. How has Rochester changed throughout time and how do we know?
2. What is out there? How do we know?
3. How does the night and day sky change throughout the year in Rochester, NY?
4. How did we go from nothing to something?

Acquisition

What knowledge will students learn as part of this unit?

1. Most objects in the solar system are in regular and predictable motion.
   • These motions explain such phenomena as the day, the year, seasons, phases of the moon, eclipses, and tides.
   • Gravity influences the motions of celestial objects. The force of gravity between two objects in the universe depends on their masses and the distance between them.
2. Nine planets move around the Sun in nearly circular orbits.
   • The orbit of each planet is an ellipse with the Sun located at one of the foci.
   • Earth is orbited by one moon and many artificial satellites.

What skills will students learn as part of this unit?

1. Use models to represent and revise their thinking overtime.
2. Making qualitative and quantitative observations
3. Making predictions
4. Asking questions based on observation and data
5. Use and become proficient with certain tables and diagrams in the Earth Science Reference Tables.
6. How to construct and ellipse
7. How to use a spectrometer.

		3. Earth's coordinate system of latitude and longitude, with the equator and prime meridian as reference lines, is based upon Earth's rotation and our observation of the Sun and stars. 4. Earth rotates on an imaginary axis at a rate of 15 degrees per hour. To people on Earth, this turning of the planet makes it seem as though the Sun, the moon, and the stars are moving around Earth once a day. 5. Rotation provides a basis for our system of local time; meridians of longitude are the basis for time zones. 6. The Foucault pendulum and the Coriolis effect provide evidence of Earth's rotation. 7. Earth's changing position with regard to the Sun and the moon has noticeable effects. • Earth revolves around the Sun with its rotational axis tilted at 23.5 degrees to a line perpendicular to the plane of its orbit, with the North Pole aligned with Polaris. • During Earth's one-year period of revolution, the tilt of its axis results in changes in the angle of incidence of the Sun's rays at a given latitude; these changes cause variation in the heating of the surface. This produces seasonal variation in weather. 8. Seasonal changes in the apparent positions of constellations provide evidence of Earth's revolution. 9. The Sun's apparent path through the sky varies with latitude and season. 10. Approximately 70 percent of Earth's surface is covered by a relatively	

		thin layer of water, which responds to the gravitational attraction of the moon and the Sun with a daily cycle of high and low tides. 11. The universe is vast and estimated to be over ten billion years old. 12. The current theory is that the universe was created from an explosion called the Big Bang. Evidence for this theory includes: • cosmic background radiation • a red-shift (the Doppler effect) in the light from very distant galaxies. 13. Stars form when gravity causes clouds of molecules to contract until nuclear fusion of light elements into heavier ones occurs. Fusion releases great amounts of energy over millions of years. • The stars differ from each other in size, temperature, and age. • Our Sun is a medium-sized star within a spiral galaxy of stars known as the MilkyWay. Our galaxy contains billions of stars, and the universe contains billions of such galaxies. 14. Our solar system formed about five billion years ago from a giant cloud of gas anddebris. Gravity caused Earth and the other planets to become layered according to density differences in their materials. • The characteristics of the planets of the solar system are affected by each planet'slocation in relationship to the Sun. • The terrestrial planets are small, rocky, and dense. The Jovian planets are large, gaseous, and of low density. 15. Asteroids, comets, and meteors are components of our solar system. • Impact events have been correlated with mass extinction and global climatic change.	

		• Impact craters can be identified in Earth's crust. 16. Earth's oceans formed as a result of precipitation over millions of years. The presence of an early ocean is indicated by sedimentary rocks of marine origin, dating back about four billion years. .	

STAGE TWO: Determine Acceptable Evidence	
	Assessment Evidence
Criteria for/to assess understanding: *(This is used to build the scoring tool.)* 1. **Creation of effective science explanation** (Claim, Evidence, Analysis of Evidence**)** 2. **Effective communication** 3. **Understanding of the relationships and interactions between different celestial bodies** 4. **Understanding of different celestial bodies place in the universe and how they were created**	Performance Task focused on Transfer: For this performance task scholars will apply their understanding of astronomy to engage in argumentation using evidence as support to debate which celestial body is the most important.
	Other Assessment Evidence: • Daily bridge activities • Daily summary narratives (Claim/Evidence/Connections Sheet) • Ticket out the door, daily closure questions • Daily reflective tool • Two formal NYS style assessments • Bi-weekly NYS style quiz • Academic circles held in class (Think, Pair, Share) • Gallery Walks • BBKs

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T, M, A *(Code for Transfer, Meaning Making and Acquisition)*	**STAGE THREE: Plan Learning Experiences**	
	Learning Events:	Evidence of learning: *(formative assessment)*
M M M T	1. Intro to final project 2. Students "experience" astronomical and geologic time by "creating the universe" 3. Students investigate "what's out there and how do we know through a stationed activity that requires them to analyze diagrams and manipulate models 4. Students investigate the formation of the universe, our galaxy and the solar system and evidence for this. (Spectroscope lab/Doppler effect) 5. Life cycle of stars 6. Students uncover patterns about the structure of our solar system and generate theories about how the solar system is organized. 7. The difference in orbital speeds is analyzed through a lab. 8. Moon phases and tides lab 9. Lab on using models to predict the path of the sun across the sky throughout the year. 10. Rotation of Earth intro and time zone lab 11. Astrolab lab 12. Intro to near earth asteroids, reading and research Project: Debate/podcast construction and presentation	• Daily bridge activities • Daily summary narratives (Claim/Evidence/Connections Sheet) • Ticket out the door, daily closure questions • Two formal NYS style assessments. • Collaborative conversations held in class • Gallery Walks • Workshop activities • 5 week revisits of EQ • Labs • Student constructed models