

Unit 1.7: Earth and Space Science – The Structure of the Cosmos

Weekly Focus: Finding Evidence to Support a Claim or Theory

Weekly Skill: Summarizing a Reading Passage

Lesson Summary: This week students will search for evidence provided in passages that lend support about the structure and organization of the Cosmos. Then students will summarize a passage.

Materials Needed:

- Reading on “Cosmic Mysteries” [Unit 1.7 Handout 1](#) (Spectrum Science, Gr. 6, pages 84-85)
- Video [Unit 1.7 What is Evidence for Big Bang Theory? \(Time 5:27min.\)](#)
- Reading on “What is the Evidence for the Big Bang?” [Unit 1.7 Handout 2](#)

Objectives: Students will be able to...

- Summarize key concepts and evidence of the Big Bang theory

College and Career Readiness Standards: RI, RST, WHST

ACES Skills Addressed: DFP, LS, AL, CT, SM

Notes: Explain to students the importance searching for evidence to support a theory or claim that is presented in a reading passage. It is a skill they will certainly use on any of the GED test modules as well as a college task. Some of the information in this lesson may be new and take some time to fully comprehend. The reading passages can be dense with new vocabulary and ideas. Please let students know you are there to support them. They should feel free to ask questions along the way and you will do your best to answer and assist. Remind students that they do not have to be an expert on the information, but should understand the idea of the Big Bang theory and its part in the Cosmos for the GED Science Module.

While there are many theories to explain how the Universe was created, the work today is not to debate such theories, but rather to look for evidence that supports a major scientific theory of the Big Bang. Please review the [Classroom Routines 5: Handling Controversial Topics](#) if you feel students may be uncomfortable with the reading passages and possible follow-up discussions. Depending on the class and the student make up of your particular section, as well as your comfort level with the material, you may wish to leave time at the end of the lesson for students to discuss other theories or ideas. Again, the information presented is related to GED Science Module and does not mean someone has to agree or disagree with it. The lesson is to give students background knowledge prior to taking a test or entering college.

Also, please note that [Routine 4](#) is referenced in this lesson.

GED 2014 Science Test Overview – For Teachers and Students

The GED Science Test will be 90 minutes long and include approximately 34 questions with a total score value of 40. The questions will have focus on three content areas: life science (~40%), physical science (~40%), and Earth and space science (~20%). Students may be asked to read, analyze, understand, and extract information from a scientific reading, a news brief, a diagram, graph, table, or other material with scientific data and concepts or ideas.

The online test may consist of multiple choice, drop down menu, and fill-in-the-blank questions. There will also be a short answer portion (suggested 10 minutes) where students may have to summarize, find evidence (supporting details), and reason or make a conclusion from the information (data) presented.

The work students are doing in class will help them with the GED Science Test. They are also learning skills that will help in many other areas of their lives.

Activities:

Warm-Up: The Big Bang Theory – (science not TV show!) Time: 10 minutes

- As students enter the class, have the following written on the board or overhead **“Most astronomers believe the Universe began in a Big Bang about 14 billion years ago. This is referred to as the Big Bang Theory.”** Have students create a “KWL” chart on a piece of notebook paper (below). This helps to activate students’ prior knowledge by asking them what they already **K**now (column 1); students (collaborating as a classroom unit or within small groups) set goals specifying what they **W**ant to learn (column 2); and after reading students discuss what they have **L**earned (column 3).
- Students apply higher-order thinking strategies which help them construct meaning from what they read and help them monitor their progress toward their goals.

KWL Chart:

K - What (else) do I KNOW?	W - What do I WANT to know?	L - What did I LEARN?

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Activity 1: Reading for Comprehension (Unit 1.7 Handout 1)

Time: 20 minutes

1) Hand out (**Unit 1.7 Handout 1**) to students. **2)** Discuss with students that when reading, they should look for evidence to support a theory or claim, while reading students should determine what is the evidence provided in the passage **3)** Ask students to read the passage and answer the questions that follow. Circulate the class while students are working independently to help as needed. Remind students to review the guide words in bold on the left to help with new vocabulary. **4)** When students are finished, review answers as a whole class. **5)** Ask for students to share their answers if they would like. If there is time, you may have students practice reading for fluency and read the passage to each other in pairs.

Activity 2: Finding Supporting Evidence (Unit 1.7 Handout 2 and Video: GED Science Unit 1.7 "What is Evidence for Big Bang Theory?")

Time: 20 - 30 minutes

1) Hand out (**Unit 1.7 Handout 2**) to students. **2)** Discuss with students that when reading, they should look for evidence to support a theory or claim, while reading students should determine what is the evidence provided in the passage **3)** View the video "GED Science Unit 1.7 "What is Evidence for Big Bang Theory?" while students watch and read along with the handout. The handout is what is stated and presented in the video. **4)** After viewing the video, ask students work independently to reread the passage and underline the evidence presented **5)** Circulate class while they are reading to make sure they understand the information presented and see if there are any questions **6)** Review answers as a whole class. Note: some answers *may* vary, but if they have different evidence, ask them to support their answers. Ask students with different answers to discuss theirs with the class. **7)** Have students fill in the final column of their K-W-L chart from today's warm-up activity.

Break: 10 minutes

Activity 3: Summarizing Passage (Unit 1.7 Handout 2)

Time: 50 minutes

1) Students will continue to use **Unit 1.7 Handout 2** for this activity. **2)** Explain to students they will now summarize the passage they have read. They can use the back of the handout or write on a separate piece of paper. (Refer to **Classroom Routine 4: Summarizing** to assist with this activity.) **3)** Explain to students that summarizing is how we take larger selections of text and reduce them to their bare essentials: the gist, the key ideas, the main points that are worth noting and remembering. **4)** Describe the main steps in writing a summary: 1. Keep the most important ideas 2. Remove ideas or details that are not very important 3. Use own words to write the summary. **5)** Encourage students to work individually. They should think about their summary, write it, and then share it with a partner. **6)** Circulate the class while students are working on their summaries. Assist students who seem to be stuck on where to begin. Remind them to think of the key "wh" questions used for a summary "who" or "what"; "where" or "when"; and "why" "how" is it important. **7)** Ask volunteers to write their

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summaries on the board and review as a class the possible summaries on the board or overhead. If there is time, as a class, work on rewriting, editing, or adding to the summaries. Remind students that editing and rewriting is not admission that their first draft was wrong or bad, it is just part of the writing process and a strategy that all writers use.

Wrap-Up: Summarize Orally **Time: 5 - 10 minutes**

Have students turn to a partner (or write in their journals) about what they have learned today about the reading passage on the Big Bang theory or Cosmic Mysteries. Another option for lesson summary is to have students come up with one question or wondering they still have about the subject that they could research and report back to the class.

*Note: Use **Classroom Routine 4 Handout: Summarizing***

Extra Work/Homework: The End of the World? (Unit 1.7 Handout 3) **Time: 20 - 30 minutes outside of class**

Students can read and answer questions using Unit 1.7 Handout 3 "The End of the World?" This is an excellent opportunity for students to look at new material in an independent manner.

Differentiated Instruction/ELL Accommodation Suggestions	Activity
<p>If some student groups finish early, they can use the time to practice summarizing a multi-paragraph reading. They can turn their paper over and begin to write up a 3-5 sentence summary of the passage. This is a great way to practice a skill they will need to use on GED modules.</p>	<p>Unit 1.7 Handout 1</p>
<p>Writing a summary can be a difficult task for anyone, especially new students. Refer to the <u>Classroom Routine 4: Summarizing Techniques</u> to review ways to handle this. Remind students to look for the <u>most</u> important information and leave out the details.</p> <p>If some students finish their summary early, have the made revisions to their summary using academic vocabulary. It is a strategy they could use when writing on the GED tests.</p>	<p>Unit 1.7 Handout 2</p>

Online Resources:

<http://www.universetoday.com/106498/what-is-the-evidence-for-the-big-bang/>

Suggested Teacher Readings:

- GED Testing Service – GED Science Item Sample (to get an idea of what the test may be like)

<http://www.gedtestingservice.com/itemsamplerscience/>

- Assessment Guide for Educators: A guide to the 2014 assessment content from GED Testing Service:

<http://www.riaepdc.org/Documents/ALALBAASSESSMENT%20GUIDE%20CHAPTER%203.pdf>

- Minnesota is getting ready for the 2014 GED test! – website with updated information on the professional development in Minnesota regarding the 2014 GED.

http://abe.mpls.k12.mn.us/ged_2014_2

Unit 1.7 Handout 2 (2 pages)

Read the following passage on the evidence to support the Big Bang theory. Underline the evidence presented in the passage. When finished, you will write a brief summary.

What is the Evidence for the Big Bang?

Almost all astronomers agree on the theory of the Big Bang, that the entire Universe is spreading apart, with distant galaxies speeding away from us in all directions. Run the clock backwards to 13.8 billion years ago, and everything in the Cosmos started out as a single point in space. In an instant, everything expanded outward from that location, forming the energy, atoms and eventually the stars and galaxies we see today. But to call this concept merely a theory is to misjudge the overwhelming amount of evidence.

There are separate lines of evidence, each of which independently points towards this as the origin story for our Universe. The first came with the amazing discovery that almost all galaxies are moving away from us.

In 1912, Vesto Slipher calculated the speed and direction of "spiral nebulae" by measuring the change in the wavelengths of light coming from them. He realized that most of them were moving away from us. We now know these objects are galaxies, but a century ago astronomers thought these vast collections of stars might actually be within the Milky Way.

In 1924, Edwin Hubble figured out that these galaxies are actually outside the Milky Way. He observed a special type of variable star that has a direct relationship between its energy output and the time it takes to pulse in brightness. By finding these variable stars in other galaxies, he was able to calculate how far away they were. Hubble discovered that all these galaxies are outside our own Milky Way, millions of light-years away.

So, if these galaxies are far, far away, and moving quickly away from us, this suggests that the entire Universe must have been located in a single point billions of years ago. The second line of evidence came from the abundance of elements we see around us.

In the earliest moments after the Big Bang, there was nothing more than hydrogen compressed into a tiny volume, with crazy high heat and pressure. The entire Universe was acting like the core of a star, fusing hydrogen into helium and other elements.

This is known as Big Bang Nucleosynthesis. As astronomers look out into the Universe and measure the ratios of hydrogen, helium and other trace elements, they exactly match what you would expect to find if the entire Universe was once a really big star.

Line of evidence number 3: cosmic microwave background radiation. In the 1960s, Arno Penzias and Robert Wilson were experimenting with a 6-meter radio telescope, and discovered a background radio emission that was coming from every direction in the sky – day or night. From what they could tell, the entire sky measured a few degrees above absolute zero.

Theories predicted that after a Big Bang, there would have been a tremendous release of radiation. And now, billions of years later, this radiation would be moving so fast away from us that the wavelength of this radiation would have been shifted from visible light to the microwave background radiation we see today.

The final line of evidence is the formation of galaxies and the large-scale structure of the cosmos. About 10,000 years after the Big Bang, the Universe cooled to the point that the gravitational attraction of matter was the dominant form of energy density in the Universe. This mass was able to collect together into the first stars, galaxies and eventually the large-scale structures we see across the Universe today.

These are known as the 4 pillars of the Big Bang Theory, the four independent lines of evidence that build up one of the most influential and well-supported theories in all of cosmology. But there are more lines of evidence. There are fluctuations in the cosmic microwave background radiation, we don't see any stars older than 13.8 billion years, the discoveries of dark matter and dark energy, along with how the light curves from distant supernovae.

So, even though it's a theory, we should regard it the same way that we regard gravity, evolution and general relativity. We have a pretty good idea of what's going on, and we've come up with a good way to understand and explain it. As time progresses we'll come up with more inventive experiments to throw at. We'll refine our understanding and the theory that goes along with it.

Most importantly, we can have confidence when talking about what we know about the early stages of our magnificent Universe and why we understand it to be true.

Source www.universetoday.com

Read more: <http://www.universetoday.com/106498/what-is-the-evidence-for-the-big-bang/#ixzz2peOWj8xV>

ANSWER KEY (possible answers, students' answers may vary)

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Possible summary: *There are at least four main concepts that give evidence to support the theory of the Big Bang created the Cosmos over 13.8 billion years ago. Some of the evidence is that galaxies are moving away from us; there is an abundance of elements around us; there is microwave radiation in the background; and the formation of galaxies and the Cosmos.*

Unit 1.7 Handout 3

Name: _____

Sequence **WEEK 25**
DAY 4

READ THE PASSAGE Pay attention to the sequence of events described in the passage.

The End of the World?

Asteroids—small bodies in space—have collided with Earth many times. The best-known strike occurred about 65 million years ago and created a huge crater in the Gulf of Mexico. After striking Earth, the asteroid likely caused huge tsunamis, or waves thousands of feet high. Dust particles probably filled the air. Scientists believe this dust blocked sunlight, eventually causing the planet to cool. Lack of sunlight may also have affected plant life, which is possibly what killed most dinosaurs.

A more recent large asteroid impact happened in 1908 in Siberia, Russia. As the asteroid exploded, it scorched and leveled trees for miles around. For several months afterward, astronomers reported increased dust in Earth's atmosphere.

Today, several scientists around the world track asteroid movement. When astronomers discover a new asteroid, they photograph it over several days. Then they use the pictures to create computer models of its possible orbits. Next they compare those orbits to Earth's orbit. Based on the comparisons, they try to determine how close to Earth the asteroid might pass.

Scientists have created the Torino Scale to measure how likely it is that an asteroid will collide with Earth in the next 100 years. The scale goes from "0" (no probability) to "10" (definite impact). In 2004, astronomers observed an asteroid that they named 2004 MN4. They predicted it would pass near Earth in 2029 and gave it a rating of "4" on the Torino Scale. However, after studying it for several months, they decided that the asteroid will not strike Earth and changed its rating to "0."

SKILL PRACTICE Read each question. Fill in the bubble next to the correct answer.

- Which of these do scientists think happened last after the asteroid fell in the Gulf of Mexico?
 (A) Trees were scorched.
 (B) The planet cooled.
 (C) Giant tsunamis formed.
 (D) The air filled with dust.
- When astronomers discover a new asteroid, they first _____.
 (A) take pictures of it
 (B) calculate its score on the Torino Scale
 (C) create computer models
 (D) compare its orbit to Earth's
- After astronomers create computer models of an asteroid's orbit, they _____.
 (A) predict the size of the asteroid
 (B) estimate where it will strike Earth
 (C) take pictures of it
 (D) compare its orbit to Earth's orbit
- When astronomers discovered 2004 MN4, which of these happened first?
 (A) They predicted it would pass near Earth.
 (B) They studied it for months.
 (C) They gave it a "0" on the Torino Scale.
 (D) They decided it would not hit Earth.

STRATEGY PRACTICE List the verbs and nouns in the passage that helped you visualize the passage.

Unit 1.7 Handout 3

ANSWER KEY

1. B
2. A
3. D
4. A

Sample answer: collided, huge crater, waves, thousands of feet high, scorched and leveled