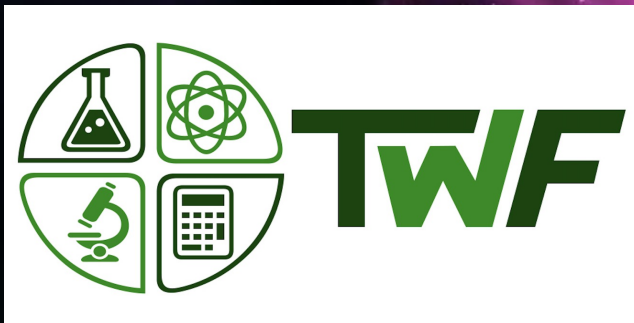


Asteroids, Comets, and Meteors

5E Lesson

The 5E model is a scientifically proven method to improve student engagement and learning in your classroom

- ✓ Engagement
- ✓ Exploration
- ✓ Explanation
- ✓ Elaborate
- ✓ Evaluate



Complete Teacher Instructions

Asteroids, Comets, and Meteors 5E Lesson

Grades 7-10	Asteroids, Comets, and Meteors	Ongoing Lesson
Lesson Objective: Students will learn about: - Asteroids - Comets - Meteoroids, meteors, and meteorites - Mining comets and asteroids for fuel - How the dinosaurs died - Impacts and craters		
Possible Student Misconceptions: - Earth won't be hit by meteors, asteroids, etc. - Anything that does hit Earth would cause global destruction - A spacecraft couldn't fly through the asteroid belt without getting destroyed - Shooting stars are really stars - Comets are not part of the solar system - All comets look the same - There is only empty space between the planets		
Materials: 1 device (smartphone, Chromebook, laptop, tablet, or computer) per 3 students - A means of projecting a PowerPoint presentation - Internet access - General classroom objects		
Teacher Notes: - All videos can be accessed directly from the PowerPoint. To retrieve them, click on the video icon while in slideshow mode and it will automatically open for you. If it doesn't, right-click on the image and click Edit Hyperlink or something similar. I've created a video walkthrough if needed. It can be accessed here - https://youtu.be/oCIKIP9SaDQ - I don't believe in long lessons. If you feel your students are losing their focus, stop the PowerPoint and give them a 5-minute break. If you'd like to see more of my video collection here - http://www.teachwithfergy.com are tons of brain-break videos to choose from all grouped by category		

Asteroids, Comets, and Meteors – 5E Lesson

Engagement Phase Your students will watch the video 'Less Than Five – What's the Difference Between Comets, Asteroids, Meteoroids, Meteors & Meteorites?' and complete the following. Watch the video and answer the questions.	
The video can be found here - https://www.youtube.com/watch?v=dvd47rMYia0	
Teacher Notes: - The video is about four minutes long - You may need to show the video more than once or pause when an answer is given to one of the questions.	
Exploration Phase Exploration – Lab Station Activity In groups of 2-3, have your students complete <i>Exploration – Lab Station Activity</i>. Once they're done, they will submit their passport to you.	
Teacher Notes: The complete instructions for my Lab Station activity can be found in the <i>START HERE – Instructions</i> file.	
Explanation Phase PowerPoint Lessons - The lesson is found in the folder – <i>Explanation – Asteroids, Comets, and Meteors Lesson</i> - This lesson is designed to be completed over one day - There are multiple embedded videos and plenty of opportunity to engage, interact and check for your students' understanding throughout the lesson - The lesson covers the following topics: - Asteroids - Meteors, Meteoroids, and Meteorites	

Comets Teacher Notes: - All videos can be accessed directly from the PowerPoint. To retrieve them, click on the video icon while in slideshow mode and it will automatically open for you. If they don't open, right-click the image and select Edit Hyperlink or something similar. - I've created a video walkthrough if needed. It can be accessed here - https://youtu.be/oCIKIP9SaDQ - I have also enclosed a .PDF version of both the teacher and student versions.	Goals - Students develop understanding of the content - Observations and experiences are discussed and critiqued - Students develop vocabulary - Students are able to connect the content presented to previous experiences
Elaborate Phase Elaborate – Reading Your students will complete – <i>Elaborate – How the Dinosaurs Died</i> . This reading will require your students to move beyond what was covered directly in the lesson and allow them to further develop their understanding.	Duration: 1 hour Teacher Role – Facilitate learning and keep students focused
Teacher Notes: - Students will work individually or in small groups - This reading contains 8 comprehension questions and 2 extension questions. It is fully editable so I encourage you to remove any question(s) in order to meet the needs of your students as well as your time frame.	Goal Students use their newly obtained knowledge to propose solutions and extend their learning to new situations
Evaluate Phase Quiz Have your students complete – <i>Evaluate – Asteroids, Comets, and Meteors Quiz</i>	Duration: 30 min Teacher Role – Distribute and collect evaluation
Teacher Notes: - It's sometimes best to have the students peer evaluate - Placing students in small groups and having them exchange papers to mark will accomplish two things 1) Provide immediate feedback on the questions they just completed 2) Significantly reduce your marking time - Peer evaluation is not needed, only suggested when appropriate	Goal Students are given the opportunity to demonstrate their understanding and evaluate their own progress

Each phase is clearly described

A Complete Lesson

Asteroids

- Size ranges from 6 meters to 933 km
- Dinosaur killer ~ 10 km across
- Landed in the Gulf of Mexico



Asteroid Impact –
Dinosaur Killer

Make sure your students are on track

Student copies with blanks
Videos embedded right into
your slideshow

Meteorite

- A meteorite is a meteoroid or asteroid that _____.
- Most are small
- Size: pebble to boulder (up to 100 kg, 220 lbs)
 - Smaller than 2mm: micrometeorite
- 3 types
 - Stony: mostly silicate minerals (rock)
 - Iron: mostly metallic iron-nickel
 - Stony-iron: both rocky and metallic



February 2013 Meteor Explosion over Russia

- The meteor had an initial mass of about 12,000–13,000 metric tonnes (heavier than the Eiffel Tower), and measured between 17 and 20 meters in size (55-65 feet).
- It was moving at approximately 18.6 km/s (over 41,000 mph or 66,960 km/h), almost 60 times the speed of sound.
- It exploded 23.3 km above the ground, releasing the energy equivalent of 500 kilotons of TNT, 20–30 times more energy than was released from the atomic bomb detonated at Hiroshima (but without the radiation).
- The explosion created a shockwave, shattering windows, toppling smaller structures, and injuring thousands.



Play Video

Interactive and Engaging Activities

How the Dinosaurs Died

Scientific Reading Comprehension Article and Extension Activity

How the Dinosaurs Died

What Were Dinosaurs?

Dinosaurs were reptiles that emerged during the Triassic Period, which lasted from 252.17 to 201.3 million years ago. However, at the end of the Cretaceous Period, around 65 million years ago, most dinosaurs had died out.

Despite their seemingly complete disappearance, their descendants live among us today. Birds evolved from a specific clade of dinosaurs, the *maniraptorans*, that lived during the Mesozoic Era, which included the Triassic, Jurassic, and Cretaceous Periods. Perhaps the most famous maniraptoran is the Velociraptor, although it looked quite different in real life than it does in the Jurassic Park movies. It was small, perhaps the size of a turkey, and covered in feathers.

So, how did most dinosaurs go extinct? There are two theories, and they're not necessarily mutually exclusive. Here, we will address both theories and some of the controversy surrounding the dinosaur extinction.

How Dinosaurs Went Extinct

The end of the Cretaceous Period was marked by an extreme extinction event, called the Cretaceous-Tertiary, or Cretaceous-Paleogene Extinction, abbreviated K-T. Over half of the world's species died out. This included the non-avian (non-bird-like) dinosaurs, including the marine dinosaurs and the pterosaurs (flying dinosaurs, such as the pterodactyl). In the marine realm, many species of sharks, sponges, brachiopods (non-molluscan shelled invertebrates), and placinates disappeared. So too did the last of the ammonites, squid-like invertebrates with coiled shells that emerged during the Triassic Period, around 260 million years ago. Many plant species were similarly wiped out. Some reptiles (including crocodiles and turtles), amphibians, mammals (perhaps only 7%), birds, and invertebrates (such as snails, sea stars, mollusks, and sea urchins), however, managed to survive.

But why did so many organisms disappear? Scientists have a couple of ideas. The most well-known theory of dinosaur extinction is that an asteroid struck Earth at the end of the Cretaceous Period, generating mass destruction and death followed by clouds of dust and ash that blocked the sun. The intense shaking led to declining temperatures and prevented plants from photosynthesizing. Many animals and plants were unable to adapt to the darkness and cold, and

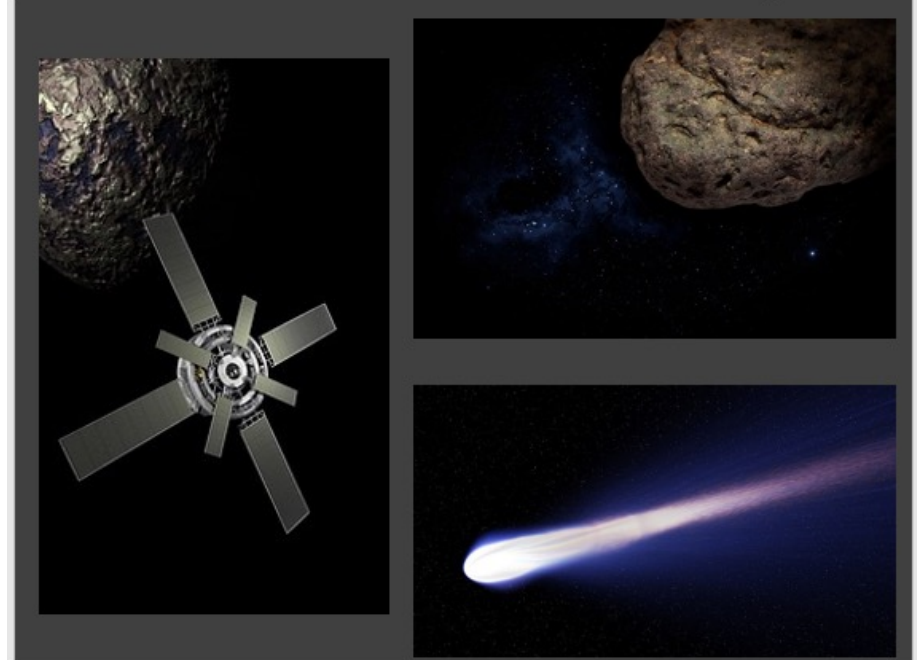
Controversy

Although the two theories are not mutually exclusive, fossil records have been too sparse to confirm either theory. The asteroid impact theory is the most widely accepted, but some scientists still argue that the dinosaurs went extinct due to a volcanic eruption.



Improve your students' **Literacy** and **Analysis Skills**, use as an **Emergency Substitute Plan**, or create **Applicability** in your classroom

Asteroids, Comets, and Meteors Lab Station Activity

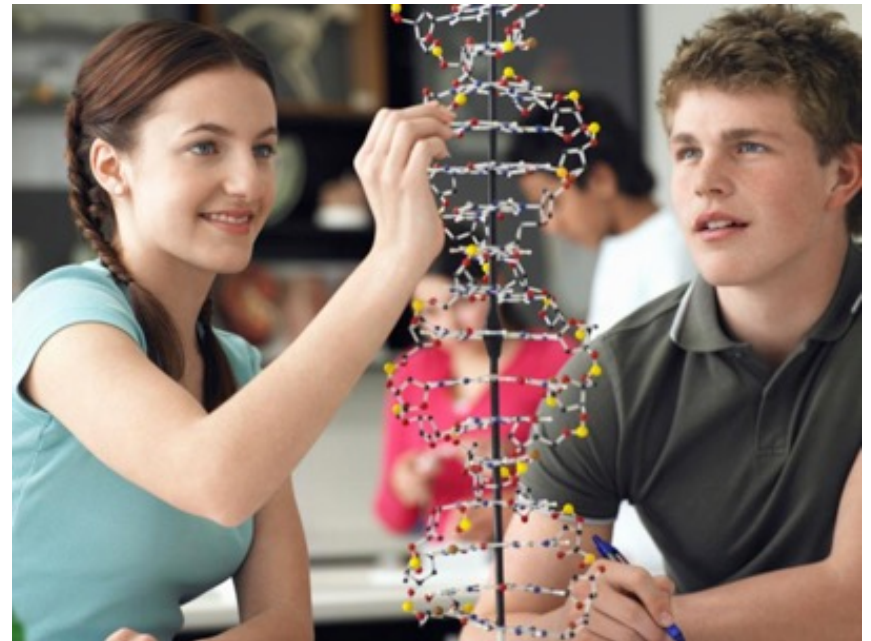


7 Lab Station Activities to get your kids out of their seats and engaged in their learning

Get away from tired practices and unengaged students



Provide a Scientifically-Proven means of instruction



Incorporate Technology and Increase Collaboration

