Literacy Integration Unit

MS/HS Science

Unit based on ell.stanford.edu Understanding Language Unit 2

Kelly Clark-Literacy Consultant- Kentucky Department of Education

July 2013

Overview:

This unit prepares MS/HS students for the work of deep reading in science texts. The spiraling activities in the lessons bring the students back repeatedly to the text for understanding and meaning. This unit teaches students that dense text in any content must be examined multiple times for full understanding.

After interacting with the text in a comprehensive manner, students have the skills to complete the final activity, an argumentative science journal article with supporting evidence from the text.

Next Generation Science Standards

MIDDLE SCHOOL:

MS-LS2-1 Matter and energy in Organisms and Ecosystems: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS- LS2-4 Matter and energy in Organisms and Ecosystems: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-ESS1-4 History of the Earth: Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
MS-ESS2-3: A **History of the Earth**: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions.

HIGH SCHOOL:

HS-ESS1-6 History of Earth: Apply scientific reasoning and evidence from ancient earth materials, meteorites, and other planetary surfaces to construct an account of earth's formation and early history.

HS-ESS3-5 Weather and Climate: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and aassociated future impacts to Earth systems.

HS-ESS2-2 Earth's Systems: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

HS-ESS2-5 Earth's Systems: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

CCR Anchor Standards -Reading:

R1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

R5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

R7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

R9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

CCR Anchor Standards -Writing:

W1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content

W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

W5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

W7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
W8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

Speaking and Listening:

SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

Lesson: Life on Mars- Lessons for our planet

Audience: Middle/High school

Key Text:
"Mars' Reull Vallis: A River Ran Through It" (1520L)
"Mountains and Buried Ice on Mars"(1430L)
"Mars, Water and Life"(1460L)
"Glaciers" (1420L)
Robert Frost "Fire and Ice" (N/A)

Teacher Notes

A Base Group is a group of three or four students. This is considered students' "home base." Students move, when directed to do so, to an Expert Group, where they will complete a particular task. Each member of a Base Group participates in a different Expert Group. When alerted to do so, students return to their original Base Groups and share the information they gathered in their Expert Group. Thus, upon returning to their Base Groups, students receive two to three new pieces of information from their peers to help construct their understanding.

Instructional sequence

This unit was created as a model for integrating literacy and science to increase student motivation and comprehension of complex science texts. The activities are suggested progressions through the text, leading to the summative assessment, the written argument. You know your students best, some scaffolds have been built into the unit as a way of modeling differentiation but you may need to add supports or remove them for *your* students. With that said, remove too many activities and students will not have the experience of repeatedly looking back at text for deeper meaning, a core tenant of the new standards.

Because each school schedule is unique, course lengths differ and how we structure our time with students is dependent on *those* students, I have not estimated time for these activities.

The entire unit can be taught in six weeks or less with the writing component. Co-teaching the unit with an ELA teacher or using a rotation period is only one suggestion for how to "get it done." The writing piece can be handled one class period a week after the initial unit work is completed, while other content is being taught.

Preparing Leaners

- Building background
- Paired Photos activity
- Clarifying Bookmarks
- Base group share
- Wordle Partner Share

Introduction: The unit starts with the study of geography and land forms on earth and how they can be applied to infer what happened on distant planets. Scientists take what they know and study here on earth to make guesses about life on Mars. Mars has always captured the imagination of people on Earth and scientists. Beginning in the 1960's, scientists have sent unmanned spacecraft to study the planet and its atmosphere for signs of life. You will be reading informational articles about glaciation and how that affects our planet, articles about the exploration of Mars, and articles sharing results of scientific analysis about what they have found on the Red Planet. At the end of the unit you will be able to write an argumentative science journal article supported by textual evidence in answer to the question: "Should Mars be our next planet?"

Building Background

Three options are presented for this activity so that teachers may choose depending upon their students' needs.

- Option 1: Implementation of the task with minimal scaffolding
- Option 2: Implementation of the task moderate scaffolding
- Option 3: Implementation with maximal scaffolding.

Option 1: Implementation of the task with minimal scaffolding
Ask students to sit in heterogeneous groups of three. Distribute the envelope packet to each group (Handouts #1-3); ask students not to open the envelope until you alert them to do so.
Tell students that they are going to build their background knowledge about Mars and glaciation. To do so, they will first examine three documents, answering focus questions about each one. They will then examine a group of photos that provide additional information about these topics and pick one photograph to analyze further.
Distribute **Handout #5: Background Reading Focus Chart. (Handouts #4a-c are used in Option 2.)**
Ask one student at each table to open the envelope and pass out one handout to each person at the table. Tell students that they will each read their own handout, and respond in the corresponding quadrant. Give students about five-ten minutes only (dependent on reading level), and then ask them to pass the papers to their right. After three turns, each student will have read all three documents in the envelope.

Distribute one copy of **Handout #6: Paired Photos** to each group, and one copy of **Handout #7: Photograph Response**. Invite students to examine the photographs and, as a group, select one

pair to analyze further. Emphasize that each student should have a completed a Photograph Response sheet, and that the group need only write their caption on one strip of paper.

Option 2: Implementation of the task with moderate scaffolding
Tell students they are now sitting in Base Groups. Based on each student's English proficiency and reading level and your knowledge of the texts to be read, assign each student a number from 1 to 3. Subdivide expert groups, if needed, so that each group has no more than four students.

Tell students that they will now become experts in one area of information about the history of earth's formation, weather and climate. They will then return to their Base Groups and share their new knowledge with the other students in their group.

In students' expert groups, distribute a copy of the **Handout #4a: Clarifying Bookmark** and tell students that they are to begin their reading by using the Clarifying Bookmark to read their selection.

To work through the text, expert group members will take turns reading, in pairs, aloud the first two paragraphs of their assigned reading. Explain that each student will read a paragraph, stop, and use the Clarifying Bookmark to think aloud through the text. After each student is done with his or her part, their partner may add other ideas. Then the partner continues with the same process as he or she reads the second paragraph.

Explain that after each pair finishes the first two paragraphs, students read the rest of their text silently. As students read on their own, they should take notes on the focus area identified in **Handout #5: Background Reading Focus Chart.**

Round Robin
Ask students to share their responses. Remind students that only one person shares at a time, and that there will be no interruptions or comments until all four students have shared their responses.

If a student has the same information as another, invite him/her to respond using one of the following routine expressions:

I agree with so and so, I also noticed....
I also wrote that....

Tell students that if they like something that someone else shares, they can add it to their own chart.

Distribute one copy of Handout #6: Paired Photos to each group, and one copy of **Handout #7: Photograph Response**. Invite students to examine the photographs and, as a group, select one photograph to analyze further. Emphasize that each student should have a completed Photograph Response sheet, and that each student needs to write down the caption.

Base Group Share
Students return to their original base groups taking turns to share their responses to the text they read. They then share the photograph and caption.

Option 3: Implementation with maximal scaffolding
In this option, the teacher reads each text aloud, using the focus areas on **Handout #5: Background Reading Focus Chart** as a guide**.** The teacher stops at key points and asks students to talk to a partner about whether they can enter information into their chart and what information that might be. The teacher asks for student input and guides the group in their response. Collaboratively, the class works together to fill in the Chart, with the teacher modeling what should be written in each cell (either on poster paper or through a Document Camera).
Post a selected photo from **Handout #6: Paired Photos,** and distribute **Handout #7: Photograph Response**. As a group, complete Handout #7. Emphasize that each student should have a completed Photograph Response sheet. Ask partners to create captions and then post them on chart paper.

Wordle Partner Share
Distribute to each pair Handout #8: Wordle. The larger and bolder words in the Wordle are the ones that are repeated most often in one of the articles. This task is useful in not only highlighting certain words, but also in allowing students to consider what particular words mean to them, and how they resonate for them, based on past readings or experiences.
In pairs, ask students to discuss the following two prompts:

- Which words (pick two or three) jump out at you?
- When you think of those words, what images or ideas come to mind?

Round Robin
Tell each partner to share at least one word and their images/ideas associated with it with the other two partners in their small group.

Invite several groups to share their ideas with the class, noting similarities and/or differences in their choices and responses.

Interacting with Texts

- Close Reading
- Literary Devices Dyad
- Author's Tone
- Wordle Part II
- Interpretation Circles

Close Reading

Students sit in groups of four. Distribute **Handout #9: "Mars'Reull Vallis: A River Ran Through it".** Tell students that you are going to read the article aloud.

Tell students that you will read the text twice. First, you will read it aloud and they will listen without interruption or comment, in order to reinforce fluency. Then, you will read it a second time, guiding their understanding by using the Questions to Guide the Classroom Discussion located in the side bar. You may use some or none of these questions, they are a starting point for discussion. Let your students dictate what needs to be clarified. Some questions may require further research- assign students to research the answers and bring them back to class, or if you have BYOD, let students search for answers at their desks.

Tell students that because the text is difficult, you will stop and guide them through parts of the text. As you read aloud to students, you may want to stop and alert students to some of the language and details of the text and text features. You may need to explain to students that the photo was taken of the surface of Mars from space. (Note: students may need to be told that the caption under the photo, while part of the text, is not the first paragraph.)

Questions to Guide the Classroom Discussion

Close Reading Activity

- ***The structure "is believed to have formed when running water flowed in the distant Martian past." Believed by whom? What planet's past is being discussed?***
- ***The distances are in kilometers and meters. Can we translate these into miles? What on earth would be this size?***
- ***What is a parallel and longitudinal feature? For ELL students and lower readers, you may need to instruct how to use a thesaurus and have them model or draw the images for understanding***
- ***What does" in the wider context image" mean in paragraph 6?***
- ***What does the word morphology mean in paragraphs 9 and 10?***
- ***What is an analogy? What do you think- in your own words- is being compared in this article?***
- ***After reading this article, what do you think a planetary scientist does?***

Author's Tone

The use of persuasion, connotative word or phrase choice and author's tone are meant to push the reader toward a certain conclusion. Author's use these literary elements in fiction, speeches, poetry and in non-fiction. Articles are written by people who have strong beliefs about the subject matter. An author's tone is described by using descriptive and emotional adverbs and adjectives such as friendly, angry and defensive. Tone is discovered by a pulling apart of the author's choice of certain words and phrases which may reflect an emotion or attitude. The choice of words, the use of literary devices like alliteration or repetition is all evidence of the author's tone or attitude toward a subject.

Use Handout #10, Author's Tone. Each student needs their own copy so that they can actively dig into the two pieces of text. Have students read Passage 1 and highlight, circle or underline words or phrases they think may be clues to the author's tone. In their Base groups, then have students share what they annotated and why. The table should come to a consensus of a descriptive emotional word to describe the tone and be ready to share why they felt that way.

Repeat with Passage 2. As a whole class, discuss the differences in the tone in both passages and have students summarize the discussion by answering the question below Passage 2. An extension is provided for students who wish to take the discussion further.

Literacy Devices Dyad

Remind students that literary devices do not just appear in fiction writing. Although it is not a poem, the article utilizes a number of poetic, or literary elements. While students often associate literary devices with fiction or poetry, in fact, literary devices are used across genres and are often an important element in nonfiction writing like articles. Some examples of literary devices that students may be very familiar with are metaphors, similes and alliteration. Alliteration is the repetition of initial, internal or the ending sounds of words.

Tell students that for this article, they will focus on only one literary device, in this case, Alliteration.

For students who need less scaffolding, this task can be duplicated to include other literary devices, such as simile, rich descriptive language, metaphor, and so on.

Distribute **Handout #11: Literary Device Matrix.**

Ask each pair to work collaboratively in examining the text, with each student filling in his or her own matrix. Pairs will work together, discuss, and reach a consensus before they complete their own matrix.

Once pairs have found several examples, alert students that they will now share the information with the other partners in their small group. Remind students that they must be able to explain why their answer is an example of the literary device.

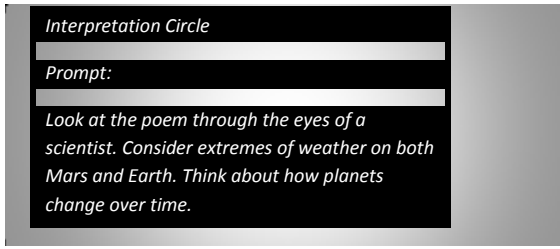
Wordle, Part II

Refer students to the **Wordle, Handout #8**. Ask students to again consider which words jump out at them. Tell students to examine the Wordle closely and consider if variations of the same word are apparent. Ask students to share with a partner any words they find that appear more than once, in a different form (mountains, channel, craters, structures, morphology).

As students why the article uses words and phrases like "striking resemblance" and "tantalizing glimpse" to make an analogy with earth? What is the author's purpose for sharing this information using these adjectives rather than "close copy" or "interesting look"?

- Does word choice matter in articles? Why or why not?
- What conclusion does the author want us, as readers, to come to about water on Mars and water on Earth?
- How does the author's tone and word choice help us come to that conclusion?

Interpretation Circles (adapted from ArtsLit, The Arts Literacy Project at Brown University*)



This strategy requires students to stand and move in concentric circles, choose a space they can work in, in hallways, gyms, cafeterias or outside.

Each student gets **#12 Interpretation Circles Handout.**

Follow the procedure outlined in the Handout.
Keep student moving quickly through the activity. The power is in the repetition of ideas and building on thoughts of others as they move. The reflection piece is where students pull back to connect the poem with the science material. Do not frontload this by explaining either the poem or preconceptions for the students, let them uncover the meaning.

*For more information about this strategy – refer to the ARTSLIT lesson on the resource page

Extending Understanding

- **Handout #13 Vocabulary Review Jigsaw**
- **In our own words, Argumentative Article**

Vocabulary Review Jigsaw-Handout #13

Students sit in groups of four. Distribute **Handout #13** four prepared vocabulary jigsaw cards (A, B, C, D) face down, one to each person in a group. You will retain a fifth card for each group — the answer key. Give students directions:

1. Each group member makes a clue sheet, numbering from 1 to 12 down the left hand side of a piece of paper.
2. In each group, the student holding card A will choose any number from 1-12 to begin the activity. Group members circle it on their clue sheets, and they then share their clues for that number in A, B, C, D order. All students in the team make notes of the clues and when clue D is read, all students guess at the term and write down the group's consensus answer. An important rule is that no student can say the answer until all four clues have been read.
3. After the student holding card A has selected three random numbers for the group, students rotate the cards. The new student A selects the next three numbers, in any order, from those numbers remaining and students guess at the terms.
4. Students rotate the cards two more times so that each group member holds each clue card once.
5. When a group finishes, a member of the team requests an answer key from the teacher and the group checks its answers.

In Our Own Words- Argumentative Article

The writing is accomplished through the scaffolded structure of a Literacy Design Collaborative (LDC) module. The module walks students through the process of writing and supports them all areas of writing instruction; including gathering data, comprehending text, organizing thoughts, editing and writing.

The LDC module is time consuming, however – it supports all students in thinking critically as a scientist in order to communicate effectively as a scientist. Once one module has been taught and students are more comfortable with accomplishing some tasks independently, there is less front loading of processes and skills. By assigning writing without the instructional supports in place, many students will not gain the necessary skills to be a proficient writer about science. Teaching writing in your subject area is your job and literacy is an essential component of science. The skill building components of the LDC modules move students to being College and Career Ready.

The LDC module, "Should Mars Be Our Next Home?" is attached.

Handout #1

BACKGROUND ARTICLE ONE (1460L)

Why Explore Mars?

After Earth, Mars is the planet with the most hospitable climate in the solar system. So hospitable that it may once have harbored primitive, bacteria-like life. Outflow channels and other geologic features provide ample evidence that billions of years ago liquid water flowed on the surface of Mars. Although liquid water may still exist deep below the surface of Mars, currently the temperature is too low and the atmosphere too thin for liquid water to exist at the surface.

What caused the change in Mars' climate? Were the conditions necessary for life to originate ever present on Mars? Could there be bacteria in the subsurface alive today? These are the questions that lead us to explore Mars. The climate of Mars has obviously cooled dramatically. By studying the reasons for climate change on Mars, which lacks the complications of oceans, a biosphere, and industrial contaminants, we may begin to understand the forces driving climate change on Earth. As we begin to explore the universe and search for planets in other solar systems, we must first ask the question 'Did life occur on another planet in our own solar system?' and 'What are the minimal conditions necessary for the formation of life?'

What Are We Looking For?

The planet Mars landed in the middle of immense public attention on July 4, 1997, when Mars Pathfinder touched down on a windswept, rock-laden ancient flood plain. Two months later, Mars Global Surveyor went into orbit, sending back pictures of towering volcanoes and gaping chasms at resolutions never before seen.

In December 1998 and January 1999, another orbiter and lander were launched to Mars. And every 26 months over the next decade, when the alignment of Earth and Mars are suitable for launches, still more robotic spacecraft will join them at the red planet.

These spacecraft carry varied payloads, ranging from cameras and other sensors to rovers and robotic arms. Some of them have their roots in different NASA programs of science or technology development. But they all have the goal of understanding Mars better, primarily by delving into its geology, climate and history.

With the announcement in 1996 by a team of scientists that a meteorite believed to have come from Mars contained what might be the residue of ancient microbes, public interest became regalvanized by the possibility of past or present life there. The key to understanding whether life could have evolved on Mars, many scientists believe, is understanding the history of water on the planet.

http://mars.jpl.nasa.gov/msp98/why.html

Handout #2

BACKGROUND ARTICLE TWO (1420L)

An Overview of Glaciers

From Colin Stief, Geography Intern

Glaciers are a hot topic these days and are a frequent subject of debate when discussing global climate change or the fate of polar bears. Do you ever find yourself asking what glaciers have to do with global warming? Have you ever wondered what exactly your friend meant when she told you that you moved at a glacial pace? Either way, read on, and learn all about these frozen landforms.

Glacier Basics

A glacier is essentially a huge mass of ice resting on land or floating in the sea next to land. Moving extremely slowly, a glacier acts similarly to an immense river of ice, often merging with other glaciers in a stream-like manner.

Regions with continuous snowfall and constant freezing temperatures foster the development of these frozen rivers. It is so cold in these regions that when a snowflake hits the ground it does not melt, but instead combines with other snowflakes to form larger grains of ice. As more and more snow accumulates, mounting weight and pressure squeeze these grains of ice together to form a glacier.

A glacier cannot form unless is it above the snowline, the lowest elevation at which snow can survive year round. Most glaciers form in high mountain regions such as the Himalayas of Southern Asia or the Alps of Western Europe where regular snow and extremely cold temperatures are present. Glaciers are also found in Antarctica, Greenland, Iceland, Canada, Alaska, and even South America (the Andes), California (the Sierra Nevada), and Mount Kilimanjaro in Tanzania.

As tiny air bubbles are eventually forced out by the increasing pressure the glacier appears blue, a sign of highly dense, airless ice.

Glaciers may be retreating worldwide due to global warming, but they still cover about 10% of earth's land and hold about 77% of earth's freshwater (29,180,000 cubic kilometers).

Types of Glaciers

Glaciers can be characterized in two ways based on their formation: alpine and continental.

Alpine Glacier - Most glaciers that form in a mountain are known as alpine glaciers. There are several subtypes of alpine glaciers:

- Cirque: a cirque is a bowl shaped hollow at the head of a valley. Within a cirque lies a snowfield, the place where snow accumulates to form a cirque glacier.
- Valley: any glacier that resides in an area eroded by stream action is called a valley glacier. These types of glaciers tend to be very long and often times pass below the snowline.
- Piedmont: when multiple valley glaciers come together as one at a large stretch of flat line, the resulting mass is a piedmont glacier.
- Tidewater: a glacier that meets the sea is known as a tidewater glacier. Usually a process called calving occurs, when a piece of the glacier breaks off in to the sea, forming a large mass of floating ice known as an iceberg.

Continental Glacier – An expansive, continuous mass of ice considerably bigger than an alpine glacier is known as a continental glacier. There are three primary subtypes:

- Ice Sheet: the largest of any glacier type, extending over 50,000 square kilometers. The only places on earth that have these frozen monsters are Antarctica and Greenland. Antarctica alone is home to 92% of all glacial ice worldwide. Ice sheets are so massive and heavy that they literally bend the continental crust on which they sit, a phenomena known as isostatic depression.
- Ice Cap: similar to an ice sheet, though smaller and forming a roughly circular, dome-like structure that completely blankets the landscape underneath.
- Ice Field: a smaller version on an ice cap that fails to cover the land and is elongated relative to the underlying topography.

Glacial Movement

There are two types of glacial movement: sliders and creepers. Sliders travel along a thin film of water located on the bottom of the glacier. Creepers, on the other hand, form internal layers of ice crystals that move past one another based on the surrounding conditions (e.g. weight, pressure, temperature). The top and middle layers of a glacier tend to move faster than the rest. Most glaciers are both creepers and sliders, plodding along in both fashions.

Glacier speed can vary from virtually at rest to a kilometer or more per year. On average, though, glaciers move at the laggardly pace of a couple hundred feet per year. In general, a heavier glacier moves quicker than a lighter one, a steep glacier quicker than a less steep one, a warmer glacier quicker than a cooler one.

Glaciers Shaping the Land

Because glaciers are so massive, the land they dominate is carved and shaped in significant and long lasting ways through glacial erosion. As a glacier moves it grinds, crushes, and envelopes rocks of all shapes and sizes, wielding the ability to alter any landform in its path, a process known as abrasion.

A simple analogy when thinking about how glaciers shape the land is to envision the large rocks it carries as chisels, gashing and scraping out new formations in the ground below.

Typical formations that result from the passing of a glacier include U-shape valleys (sometimes forming fjords when the sea fills them), long oval hills called drumlins, narrow ridges of sand and gravel called eskers, and hanging waterfalls, among many others.

The most common landform left by a glacier is known as a moraine. There are a variety of these depositional hills, but all are characterized by unstratified (a fancy word for unorganized) material including boulders, gravel, sand, and clay.

Why are Glaciers Important?

Glaciers have shaped much of the earth as we know it through the processes described above and are just as intimately connected with the earth's current condition.

The common fear is that with temperatures rising worldwide, glaciers will begin to melt, releasing some or all of the huge amounts of water held inside. As a result, the oceanic processes and structures we have adapted to will abruptly change, with unknown consequences.

To find out more, scientists are turning to paleoclimatology, a field of study that uses glacial deposits, fossils, and sediments to determine the history of earth's climate. Ice cores from Greenland and Antarctica are currently being used to this end.

Handout #3

BACKGROUND ARTICLE THREE (1460L)

Mars and Water

Other developments that shaped scientists' thinking included new research on how and where life thrives on Earth. The fundamental requirements for life as we know it are liquid water, organic compounds and an energy source for synthesizing complex organic molecules. Beyond these basics, we do not yet understand the environmental and chemical evolution that leads to the origin of life. But in recent years it has become increasingly clear that life can thrive in settings much different from the long held notion of a tropical soup rich in organic nutrients.

In the 1980s and 1990s, biologists found that microbial life has an amazing flexibility for surviving in extreme environments - niches that by turn are extraordinarily hot, or cold, or dry, or under immense pressures - that would be completely inhospitable to humans or complex animals. Some scientists even concluded that life may have begun on Earth in heat vents far under the ocean's surface.

This in turn had its effect on how scientists thought about Mars. Life might not be so widespread that it would be found at the foot of a lander spacecraft, but it may have thrived billions of years ago in an underground thermal spring. Or it might still exist in some form in niches below the frigid, dry, windswept surface wherever there might be liquid water.

NASA scientists also began to rethink how to look for signs of past or current life on Mars. In this new view, the markers of life may well be so subtle that the range of test equipment required to detect it would be far too complicated to package onto a spacecraft. It made more sense to collect samples of Martian rock, soil and air to bring back to Earth, where they could be subjected to much more extensive laboratory testing with state-of-the-art equipment.

Mars and Water Mars today is too cold, with an atmosphere that is too thin, to support liquid water on its surface. Yet scientists who studied images from the Viking orbiters kept encountering features that appeared to be formed by flowing water - among them deep channels and canyons, and even features that appeared to be ancient lake shorelines. Added to this were more recent observations by Mars Pathfinder and Mars Global Surveyor which suggested widespread flowing water in the planet's past. Some scientists identified features which they believe appear to be carved by torrents of water with the force of 10,000 Mississippi Rivers.

There is no general agreement, however, on what form water took on the early Mars. Two competing views are currently popular in the science community. According to one theory, Mars was once much warmer and wetter, with a thicker atmosphere; it may well have boasted lakes or oceans, rivers and rain. According to the other theory, Mars was always cold, but water trapped as underground ice was periodically released when heating caused ice to melt and gush forth onto the surface.

In either case, the question of what happened to the water remains a mystery. Most scientists do not feel that Mars' climate change was necessarily caused by a cataclysmic event such as an asteroid impact that, perhaps, disturbed the planet's polar orientation or orbit. Many believe that the demise of flowing water on the surface could have resulted from gradual climate change over many millennia as the planet lost its atmosphere.

Under either the warmer-and-wetter or the always-cold scenario, Mars must have had a thicker atmosphere in order to support water that flowed on the surface even only occasionally. If the planet's atmosphere became thinner, liquid water would rapidly evaporate. Over time, carbon dioxide gas reacts with elements in rocks and becomes locked up as a kind of compound called a carbonate. What's left of Mars' atmosphere today is overwhelmingly carbon dioxide.

On Earth, shifting tectonic plates are continually plowing carbonates and other minerals under the surface; heated by magmas, carbon dioxide is released and spews forth in volcanic eruptions, replenishing the carbon dioxide in the atmosphere. Although Mars has no known active volcanoes and there are no signs of fresh lava flows, it had abundant volcanic activity in its past. However, Mars appears to have no tectonic plates, so a critical link in the process that leads to carbon dioxide replenishment in Earth's atmosphere is missing. In short, Mars' atmosphere could have been thinned out over many eons by entrapment of carbon dioxide in rocks across its surface.

That scenario, however, is just a theory. Regardless of the history and fate of the atmosphere, scientists also do not understand what happened to Mars' water. Some undoubtedly must have been lost to space. Water ice has been detected in the permanent cap at Mars' north pole, and may exist in the cap at the south pole. But much water is probably trapped under the surface - either as ice or, if near a heat source, possibly in liquid form well below the surface.

http://mars.jpl.nasa.gov/msp98/why.html

Handout # 5

BACKGROUND READING FOCUS CHART

Read the articles and jot down a few notes as you read and discuss

#1 Why Explore Mars?	Words I don't know
Why reasons do scientists give for thinking there was water on Mars? Why would we study Mars? What is the goal of the recent spacecraft that went to Mars?	
#2 Glaciation	**Words I don't know**
How much of the earth's fresh water is in glacier form? How fast, on average, does a glacier move? Why are glaciers important?	
#3 Mars and Water	**Words I don't know**
What features on Mars do scientists feel were caused by water flow? What theories do scientists have about the loss of water on Mars?	

Handout # 6

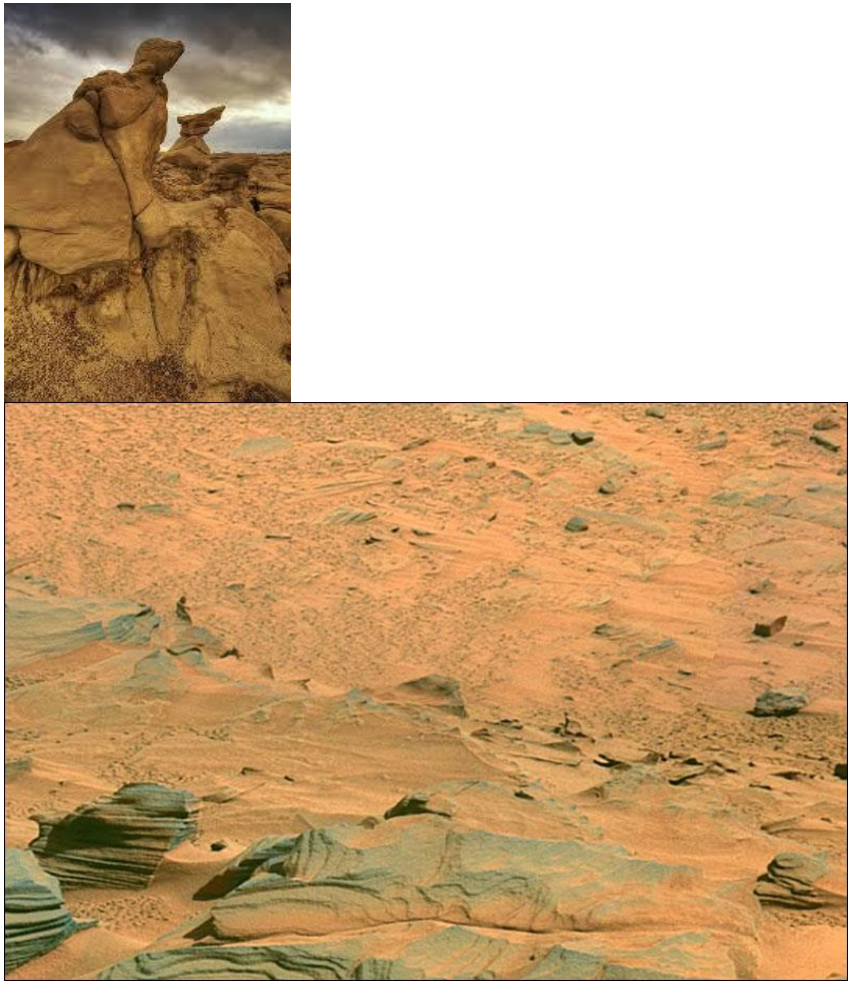
PAIRED PHOTO #1

Handout # 6

PAIRED PHOTO #2

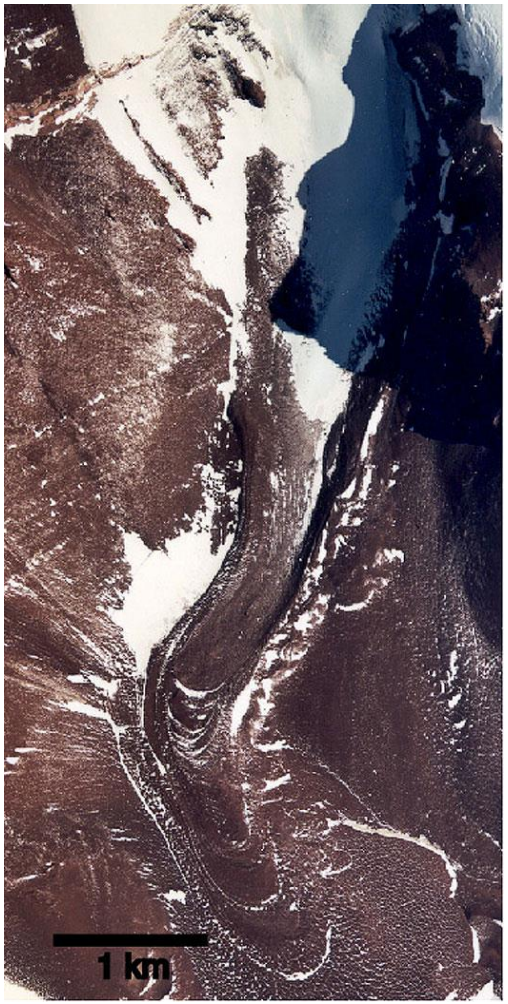
Handout # 6

PAIRED PHOTO #3



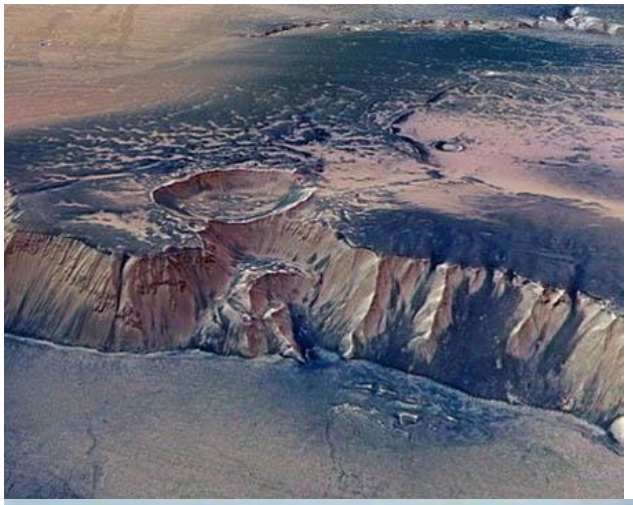
Handout # 6

PAIRED PHOTO #4



Handout # 6

PAIRED PHOTO #5



Handout #7

PAIRED PHOTO RESPONSE

Select one photograph that stands out to your group to analyze further. Complete the questions below to fully develop your thinking about the photograph and what it might represent. After your group has finished, collectively write a caption and post the captions below the photo on the wall.

You are making educated guesses about these photos. Remember the unit introduction when responding. This is not fiction but science.

General description (be specific about describing what you see- use your adjectives and descriptive language)

This is a picture of:

Describe how you think this formation occurred:

This looks this way because:

What is the setting of this picture?

This is located (place) because of these reasons:

Any other details:

WRITING A CAPTION

A caption is a short description of explanation of a photograph or picture. It often includes information about what is happening in the picture, where and when the picture was taken and the purpose of the picture. Write a caption for ONE photograph on a strip of paper and post it below the picture on the wall.

Handout #8

WORDLE

With a partner, discuss which words jump out at you (pick two or three). Once you have selected your two or three words, share with your partner what images or ideas come to mind when you think of those particular words.

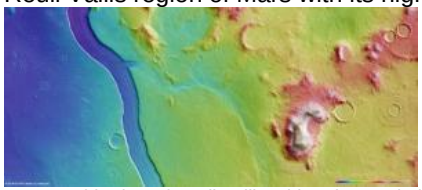
.

Handout #9

Science Daily

Mars' Reull Vallis: A River Ran Through It

Jan. 22, 2013 — ESA's Mars Express imaged the striking upper part of the Reull Vallis region of Mars with its high-resolution stereo camera last year.



Topographic view of Reull Vallis: This colour-coded overhead view is based on an ESA Mars Express HRSC digital terrain model of the Reull Vallis region, from which the topography of the landscape can be derived. The colour coding shows the depth of the main channel, coloured in blue, which contrasts clearly against the Promethei Terra Highlands and their smooth, soft and rounded mountain tops. Centred at around 41°S and 107°E, the image has a ground resolution of about 16 m per pixel. The image was taken during revolution 10657 on 14 May 2012. (Credit: ESA/DLR/FU Berlin (G. Neukum))

Reull Vallis, the river-like structure in these images, is believed to have formed when running water flowed in the distant Martian past, cutting a steep-sided channel through the Promethei Terra Highlands before running on towards the floor of the vast Hellas basin.

This sinuous structure, which stretches for almost 1500 km across the Martian landscape, is flanked by numerous tributaries, one of which can be clearly seen cutting in to the main valley towards the upper (north) side.

The new Mars Express images show a region of Reull Vallis at a point where the channel is almost 7 km wide and 300 m deep.

The sides of Reull Vallis are particularly sharp and steep in these images, with parallel longitudinal features covering the floor of the channel itself. These structures are believed to be caused by the passage of loose debris and ice during the 'Amazonian' period (which continues to this day) due to glacial flow along the channel.

The structures were formed long after it was originally carved by liquid water during the Hesperian period, which is believed to have ended between 3.5 billion and 1.8 billion years ago. Similar lineated structures, believed to be rich in ice, can also be found in many of the surrounding craters.

In the wider context image, the tributary intersecting the main channel appears to be part of a forking of the main valley into two distinct branches further upstream before merging back into a single main valley.

The right (northern) part of the main image is dominated by the Promethei Terra Highlands with their high and soft-rounded mountains shown in these images, rising around 2500 m above the surrounding flat plains.

The perspective view below shows one of these mountains with nearby sediment-filled impact craters.

This region shows a striking resemblance to the morphology found in regions on Earth affected by glaciation. For example, we can see circular step-like structures on the inner walls of the sediment-filled crater in the foreground of the second perspective view. Planetary scientists think that these may represent former high water or glacial levels, before ice and water sublimated or evaporated away in stages at various times.

The morphology of Reull Vallis suggests it has experienced a diverse and complex history, with analogies seen in glacial activity on Earth. These analogies are giving planetary geologists tantalising glimpses of a past on the Red Planet not too dissimilar to events on our own world today.

Story Source:
The above story is reprinted from materials provided by **European Space Agency**.
Note: Materials may be edited for content and length. For further information, please contact the source cited above

Handout #11

Literary Devices Matrix: "Mars' Reull Vallis"

Rich descriptive language- The primary purpose of descriptive writing is to describe a person, place or thing in such a way that a picture is formed in the reader's mind. Capturing an event through descriptive writing involves paying close attention to the details by using all of your five senses.

Exciting Adjectives- Careful word choice includes adjectives that help build mental pictures in the reader's mind. Good writers conscientiously choose words that have a connotations (meaning beyond the straight forward definition.)

Similes – making comparisons using "like" or "as" –another way writers build in mental images with their words.

Alliteration- Repetition in letter sounds to add a rhythmical element to writing.

Author's attitude (Tone) - Tone is expressed through the words and details the author selects. To determine the author's tone, you must notice how these words and details are used within the writing. The author's tone can change a reader's feelings or attitude about a subject through careful use of loaded words or phrases.

Look at the following phrases in the Matrix, identify which literacy device the author is using and describe the intended effect. For connotations you look up the words or state the image that comes to mind from those words

Phrase	Literacy Device	Connotation/Visualization	Effect on Reader
river-like			
cutting a steep-sided channel			
this sinuous structure			
high and soft-rounded mountains			
striking resemblance			
experienced a diverse and complex history			
tantalizing glimpse			

Conclude: How does word choice support the author's tone, description or message?

Handout #10

Author's Tone:
Compare the two passages below and try to identify the tone (Tone words are emotional adjectives i.e.: excited, cautious, defensive.)

1. What is the author's tone in Passage 1? Which words or phrases make you think that?

Passage 1- Mars' Reull Vallis (Handout #)

This region shows a striking resemblance to the morphology found in regions on Earth affected by glaciation. For example, we can see circular step-like structures on the inner walls of the sediment-filled crater in the foreground of the second perspective view. Planetary scientists think that these may represent former high water or glacial levels, before ice and water sublimated or evaporated away in stages at various times.

The morphology of Reull Vallis suggests it has experienced a diverse and complex history, with analogies seen in glacial activity on Earth. These analogies are giving planetary geologists tantalising glimpses of a past on the Red Planet not too dissimilar to events on our own world today.

2. What is the author's tone in Passage 2? Which words and phrases make you think that?

Passage 2- Mountains and Buried Ice (Handout#)

The mountains themselves are probably not volcanic in origin, but have been raised by ancient tectonic forces that squeezed different regions of the surface together.

New images from the high-resolution stereo camera on ESA's Mars Express orbiter allow a closer inspection and show that almost every mountain is surrounded by 'lobate debris aprons' – curved features typically observed around plateaus and mountains at these latitudes.

Previous studies have shown that this material appears to have moved down the mountain slopes over time, and looks similar to the debris found covering glaciers here on Earth.

The suggestion then is that there may be glaciers buried just below the surface in this region.

3. After determining tone and comparing the passages, which author feels more emotionally attached to the subject? Use the text can to support your idea.

EXTENSION:
The source for both these articles is the European Space Agency (ESA) why would the same source material be treated so differently in articles? Notice the articles are separated by two years, what could have happened in two years to change emotions or feelings about the possibility of water on Mars?

The response can be demonstrated through writing, digital presentation, art form or music.

Handout #13

Science demonstration Unit- Mars

Vocabulary Jigsaw

CARD A

1. The word starts with the letter **a**

2. The word starts with the letter **t**

3. The word starts with the letter **s**

4. The word starts with the letter **l**

5. The word starts with the letter **m**

6. The word starts with the letter **M**

7. This phrase has two words
   The first word starts with the letter **p**
   The second word starts with the letter **l**

8. The word starts with the letter **s**

9. The word starts with the letter **d**

10. The word starts with the letter **f**

11. This phrase has two words
    The first word starts with the letter **s**
    The second word starts with the letter **f**

12. The word starts with the letter **g**

Science

Science demonstration Unit- Mars

Vocabulary Jigsaw

CARD B

1. This word has <u>four</u> syllables

2. This word has <u>four</u> syllables

3. This word has <u>three</u> syllables

4. This word has <u>four</u> syllables

5. This word has <u>four</u> syllables

6. This word has <u>two</u> syllables

7. The first word of this phrase has <u>three</u> syllables
   The second word in the phrase has <u>five</u> syllables

8. This word has <u>four</u> syllables

9. This word has <u>four</u> syllables

10. This word has <u>one</u> syllable

11. The first word of this phrase has <u>three</u> syllables

    The second word in the phrase has <u>one</u> syllable

12. This word has <u>four</u> syllables

Science

Science demonstration Unit- Mars

Vocabulary Jigsaw

CARD C

1. The last letter in this word is **s**
2. The last letter in this word is **y**
3. The last letter in this word is **s**
4. The last letter in this word is **d**
5. The last letter in this word is **y**
6. The last letter in this word is **n**
7. The last letter of the second word is **l**
8. The last letter in this word is **d**
9. The last letter in this word is **r**
10. The last letter in this word is **d**
11. The last letter of the second word is
12. The last letter in this word is **n**

Science

Science demonstration Unit- Mars

Vocabulary Jigsaw

CARD D

1. It means "a similarity between like features of two things"
2. It means "a stream that flows to a larger stream or other body of water"
3. It means "having many curves, bends, or turns; winding"
4. It means "marked with lines, especially parallel lengthwise lines; striped"
5. It means "the form or structure of anything"
6. It means "of, occurring on, or relating to the planet Mars"
7. It means "extending in the same direction and running lengthwise"
8. It means "evaporate or extract"
9. It means "unlike, not similar"
10. It means "the side of anything"
11. It means "filled with mineral or organic matter deposited by water, air, or ice"
12. It means "the results of movement of ice or glaciers"

Science

Science demonstration Unit- Mars

Vocabulary Jigsaw

Answer Key

1. analogies

2. tributary

3. sinuous

4. lineated

5. morphology

6. Martian

7. parallel longitudinal

8. sublimated

9. dissimilar

10. flanked

11. sediment-filled

12. glaciation

Directions for Vocabulary Review Jigsaw

This activity was taken from ell.standford.edu (Lesson #2)

The definitions are from dictionary.com and modified for content

Vocabulary Review Jigsaw

Students sit in groups of four. Distribute four prepared vocabulary jigsaw cards
(A, B, C, D) face down, one to each person in a group. You will retain a fifth card
for each group — the answer key. Give students directions:

1. Each group member makes a clue sheet, numbering from 1 to 12 down the left hand side of a piece of paper.

2. In each group, the student holding card A will choose any number from 1-12 to begin the activity. Group members circle it on their clue sheets, and they then share their clues for that number in A, B, C, D order. All students in the team make notes of the clues and when clue D is read; all students guess at the term and write down the groups consensus answer. An important rule is that no student can say the answer until all four clues have been read.

3. After the student holding card A has selected three random numbers for the group, students rotate the cards. The new student A selects the next three numbers, in any order, from those numbers remaining and students guess at the terms.

4. Students rotate the cards two more times so that each group member holds each clue card once.

5. When a group finishes, a member of the team requests an answer key from the teacher and the group checks its answers.

Overview

Overview | Should Mars be our next home?

Should Mars be our next home?

by Kelly Clark

This science module explores the geologic similarities and lessons learned from the study of the Mars landscape. From a variety of scientific texts, students gain knowledge of and can apply reasoning and evidence of possible water sources, issues of global change and the construction of earth's formation and possible future.
Please find in resource section, "Read This First"
for information and additional resources

Grades: *8 9 10 11 12*

Discipline: *Science*

Teaching Task: *Task Template 2 (Argumentation and Analysis)*

Author Information:
Kelly Clark (Kentucky)

Section 1: What Task?

TEACHING TASK

Task Template 2 — [3 Levels] *Argumentation & Analysis*

L1: Should Mars be our next home? After reading 4-6 informational texts write a science journal article that addresses the question and support your position with evidence from the text(s).

L2: Be sure to acknowledge competing views.

STUDENT BACKGROUND

The unit starts with the study of geography and land forms on earth and how they can be applied to infer what happened on distant planets. Scientists take what they know and study here on earth to make guesses about life on Mars. Mars has always captured the imagination of people on Earth and scientists. Beginning in the 1960's, scientists have sent unmanned spacecraft to study the planet and its atmosphere for signs of life. You will be reading informational articles about glaciation and how that affects our planet, articles about the exploration of Mars, and articles sharing results of scientific analysis about what they have found on the Red Planet. At the end of the unit you will be able to write an argumentative science journal article supported by textual evidence in answer to the question: "Should Mars be our next home?"

EXTENSION

Cross curricular (ELA and Social Studies): Students create a multi-media presentation to persuade people to settle on Mars. Students research primary source documents that persuaded Europeans to move to America as colonists as a basis for their persuasive arguments. Students will research and apply and cite evidence that their settlement type, transportation to and desciption of their settlement is a possibility. (This is science, not science fiction).

Rubric

Scoring Elements	Not Yet		Approaches Expectations		Meets Expectations		Advanced
1	1.5	2	2.5	3	3.5	4	
Focus	Attempts to address prompt, but lacks focus or is off-task.		Addresses prompt appropriately and establishes a position, but focus is uneven.		Addresses prompt appropriately and maintains a clear, steady focus. Provides a generally convincing position.		Addresses all aspects of prompt appropriately with a consistently strong focus and convincing position.
Controlling Idea	Attempts to establish a claim, but lacks a clear purpose. (L2) Makes no mention of counter claims.		Establishes a claim. (L2) Makes note of counter claims.		Establishes a credible claim. (L2) Develops claim and counter claims fairly.		Establishes and maintains a substantive and credible claim or proposal. (L2) Develops claims and counter claims fairly and thoroughly.
Reading/Research	Attempts to reference reading materials to develop response, but lacks connections or relevance to the purpose of the prompt.		Presents information from reading materials relevant to the purpose of the prompt with minor lapses in accuracy or completeness.		Accurately presents details from reading materials relevant to the purpose of the prompt to develop argument or claim.		Accurately and effectively presents important details from reading materials to develop argument or claim.
Development	Attempts to provide details in response to the prompt, but lacks sufficient development or relevance to the purpose of the prompt. (L3) Makes no connections or a connection that is irrelevant to argument or claim.		Presents appropriate details to support and develop the focus, controlling idea, or claim, with minor lapses in the reasoning, examples, or explanations. (L3) Makes a connection with a weak or unclear relationship to argument or claim.		Presents appropriate and sufficient details to support and develop the focus, controlling idea, or claim. (L3) Makes a relevant connection to clarify argument or claim.		Presents thorough and detailed information to effectively support and develop the focus, controlling idea, or claim. (L3) Makes a clarifying connection(s) that illuminates argument and adds depth to reasoning.
Organization	Attempts to organize ideas, but lacks control of structure.		Uses an appropriate organizational structure for development of reasoning and logic, with minor lapses in structure and/or coherence.		Maintains an appropriate organizational structure to address specific requirements of the prompt. Structure reveals the reasoning and logic of the argument.		Maintains an organizational structure that intentionally and effectively enhances the presentation of information as required by the specific prompt. Structure enhances development of the reasoning and logic of the argument.
Conventions	Attempts to demonstrate standard English conventions, but lacks cohesion and control of grammar, usage, and mechanics. Sources are used without citation.		Demonstrates an uneven command of standard English conventions and cohesion. Uses language and tone with some inaccurate, inappropriate, or uneven features. Inconsistently cites sources.		Demonstrates a command of standard English conventions and cohesion, with few errors. Response includes language and tone appropriate to the audience, purpose, and specific requirements of the prompt. Cites sources using appropriate format with only minor errors.		Demonstrates and maintains a well-developed command of standard English conventions and cohesion, with few errors. Response includes language and tone consistently appropriate to the audience, purpose, and specific requirements of the prompt. Consistently cites sources using appropriate format.
Content Understanding	Attempts to include disciplinary content in argument, but understanding of content is weak; content is irrelevant, inappropriate, or inaccurate.		Briefly notes disciplinary content relevant to the prompt; shows basic or uneven understanding of content; minor errors in explanation.		Accurately presents disciplinary content relevant to the prompt with sufficient explanations that demonstrate understanding.		Integrates relevant and accurate disciplinary content with thorough explanations that demonstrate in-depth understanding.

STANDARDS

Common Core Anchor Standards — Reading

R.CCR.1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

R.CCR.2: Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

R.CCR.4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

R.CCR.10: Read and comprehend complex literary and informational texts independently and proficiently.

Common Core Anchor Standards — Writing

W.CCR.1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

W.CCR.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

W.CCR.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

W.CCR.9: Draw evidence from literary or informational texts to support analysis, reflection, and research.

W.CCR.10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Common Core Anchor Standards — Language

L.CCR.1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

L.CCR.2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

L.CCR.3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Common Core Anchor Standards — Speaking and Listening

SL.CCR.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

SL.CCR.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

SL.CCR.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

Custom Standards

SCIENCE MS MATTER AND ENERGY IN ORGANISMS AND ECOSYSTEMS: MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

SCIENCE MS MATTER AND ENERGY IN ORGANISMS AND ECOSYSTEMS: MS- LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

SCIENCE MS HISTORY OF EARTH: MS-ESS1-4 Construct a scientific explanantion based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

SCIENCE MS HISTORY OF EARTH: MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions.

Section 2: What Skills?

Selected Skills

Preparing for the Task

TASK ENGAGEMENT: Ability to connect the task and new content to existing knowledge, skills, experiences, interests, and concerns (Atlantic interview)

TASK ANALYSIS: Ability to understand and explain the task's prompt and rubric. Describe and model science article format through RATA.

RATA (READING ALOUD/THINKING ALOUD): Through the process of modeling how to think aloud, teachers demonstrate the ways proficient readers take when approaching and responding to unfamiliar text. RATA lesson plan from Scijourn attached.

Reading Process

ACTIVE READING: Ability to identify the central point and main supporting elements of a text.

RATA (READ ALOUD/THINK ALOUD): Through the process of modeling how to think aloud, teachers demonstrate the ways proficient readers take when approaching and responding to unfamiliar text. RATA lesson plan from Scijourn attached.

NOTE-TAKING: Ability to read purposefully and select relevant information; to summarize and/or paraphrase. Use template for recording information. Note taking format used should be common to school or district (ex: Cornell Notes.) Students may need lesson and modeling on taking thorough notes. Support level will vary according to student need.

ACADEMIC INTEGRITY: Ability to use and credit sources appropriately. Demonstrate ways of embedding citation in writing (Attribution lesson from Scijourn).

ESSENTIAL VOCABULARY: Ability to apply strategies for developing an understanding of text(s) by locating words and phrases that identify key concepts and facts, or information. Vocabulary Review Jigsaw attached. (If LDC module used with model science unit- essential vocabulary has already addressed through Vocabulary Review Jigsaw).

Transition to Writing

ACTIVE READING: Ability to identify the central point and main supporting elements of a text.

RATA (READ ALOUD/THINK ALOUD): Through the process of modeling how to think aloud, teachers demonstrate the ways proficient readers take when approaching and responding to unfamiliar text. RATA lesson plan from Scijourn attached.

BRIDGING: Ability to begin linking reading results to writing task. Use organizing template - Inverted Triangle from Scijourn.

Writing Process

CONTROLLING IDEA: Ability to establish a controlling idea and consolidate information relevant to task. Through the warm-up pitch (description attached), students define and refine compelling question from their research. Students draft possible ledes for article.

RATA (READ ALOUD/THINK ALOUD): Through the process of modeling how to think aloud, teachers demonstrate the ways proficient readers take when approaching and responding to unfamiliar text. RATA lesson plan from Scijourn attached.

DEVELOPMENT: Ability to construct an initial draft with an emerging line of thought and structure.

REVISION: Ability to refine text, including line of thought, language usage, and tone as appropriate to audience and purpose. Use peer editing with SAFI Tool.

EDITING: Ability to proofread and format a piece to make it more effective. Editing can be done in small groups or by the teacher. The rubric can be modified to use as an editing tool.

COMPLETION: Ability to submit final piece that meets expectations.

Section 3: What Instruction?

MiniTasks

Preparing for the Task

TASK ENGAGEMENT: Ability to connect the task and new content to existing knowledge, skills, experiences, interests, and concerns (Atlantic interview)

LIST **45 minutes**

Either in groups of four, pairs or individually read the interview from Atlantic Magazine. While reading make notes of questions you generate while reading. Share out questions in whole group. Make connections to writing prompt

Scoring Guide (Work Meets Expectations If):
Students make notes while reading and share or listen while others' speak.

Instructional Strategies:
•Paired reading
• Make intentional connections of questions to prompt
•Group discussion after reading, confirms or adds to individual thinking on subject.

Accomodations and Interventions:
add supports if needed- teacher may have two strong readers to read article for class as "readers theater".

TASK ANALYSIS: Ability to understand and explain the task's prompt and rubric. Describe and model science article format through RATA.

LIST **45 minutes**

In your own words, what are the important features of a good response to this prompt?

Scoring Guide (Work Meets Expectations If):
Students respond by making list and sharing in group discussion - students should be able to articulate assignment.

Instructional Strategies:
• Share examples of type of text students will produce (either from past students or from professional writers).
Find examples of student written science journal articles at Scijourner.org. Use RATA method (see next Mini-Task).
• Identify or invite students to identify key features of examples.
• Pair students to share and improve their individual bullets.
• Create a classroom list: Choose one student to share a few ideas on the board, and ask other to add to it.

Notes:
Post both prompt and key elements in room during assignment. Draw students attention frequently to reason for activities (provide THE WHY)

Accomodations and Interventions:
Have students summarize the assignment verbally or as a bell ringer - check for misconceptions and address in mini lesson before undertaking assignment

RATA (READING ALOUD/THINKING ALOUD): Through the process of modeling how to think aloud, teachers demonstrate the ways proficient readers take when approaching and responding to unfamiliar text. RATA lesson plan from Scijourn attached.

NOTES **5-45 minutes**

Follow the Scijourn lesson for Read Aloud/Think Aloud

Scoring Guide (Work Meets Expectations If):
Students listen and ask questions- answers can be written or discussed as a group.

Instructional Strategies:
•Read Aloud and Think Aloud
•Give students copies of aticles to look at and choose which one interests them.
•You do not need to read the entire article each RATA. Only focus on section or highlight area that will help students have a model for what you want them to accomplish.
•Draw attention to format of science articles, similarities and differences with essays or their textbook.
• Share variety of science publications that exist and the purposes for reading them.
•Post shared articles as ongoing reference for students.

Notes:
Students most understand the product you want them to produce. RATA provides a model for writing AND by reading aloud and stopping to think aloud for students, you are modeling the types of questions, inferences and conclusions scientists have wnen reading.

Reading Process

ACTIVE READING: Ability to identify the central point and main supporting elements of a text.

SHORT CONSTRUCTED RESPONSE **2-5 class periods**

•Read five articles attached
"Mars' Reull Vallis: A River Ran Through It"
"Mountains and Buried Ice on Mars"
"Mars, Water and Life"
"Water on Mars:Exploration and Evidence"
For each article have students answer the questions below
What is the author trying to accomplish? Which parts of the text show you that?
• L2 What competing arguments have you encountered or can you think of?

Scoring Guide (Work Meets Expectations If):
• Answers questions with credible response.

Instructional Strategies:
• Decide and intentionally teach a method of notetaking. Demonstrate using RATA article as a mentor text.
• Invite students to brainstorm ways to figure out any author's intent.
• Invite students to share and discuss their answers for each text.
• After the discussion, allow them to add to their entries.

Notes:
If science model unit has been taught, students will have read most of these articles. Have students review articles and make notes for this prompt.

Accomodations and Interventions:
Paired or group reading of articles, teacher may need to assist some students in comprehension. Summaries might be shared by students at the end of each article.

RATA (READ ALOUD/THINK ALOUD): Through the process of modeling how to think aloud, teachers demonstrate the ways proficient readers take when approaching and responding to unfamiliar text. RATA lesson plan from Scijourn attached.

NOTES **5-45 minutes**

Follow instructions from Preparing for the Task section.
Choose article which demontrates several attribution types.

Scoring Guide (Work Meets Expectations If):
Students engage through active listening and questioning.

Instructional Strategies:
• Draw student attention to how facts and information are attributed in the article.
•Emphasize the central argument and counterclaims in the RATA article.
•Post article for reference.

Notes:
This RATA works well when students have a visual through overhead, smartboard or individual copies with varoius attributions highlighted.

NOTE-TAKING: Ability to read purposefully and select relevant information; to summarize and/or paraphrase. Use template for recording information. Note taking format used should be common to school or district (ex: Cornell Notes.) Students may need lesson and modeling on taking thorough notes. Support level will vary according to student need.

NOTES **2-5 class periods**

From each text, make a list of the elements that look most important for answering the prompt. Do what you need to do to avoid plagiarism.
• L2(b): What implications can you draw?
• L3 Why is it important in the process of inquiry to "identify gaps" or "unanswered questions" about the topic?

Scoring Guide (Work Meets Expectations If):
• Identifies relevant elements.
• Includes information to support accurate citation and attribution(for example, page numbers for a long text, clear indication when quoting directly.

Instructional Strategies:
• Teach a model format for note taking.
• Have sample notes posted with earlier RATA articles.
•Draw student attention to prompt and what information would best answer question.
• Check that early student work is in the assigned format

Notes:
Students can work in groups to complete each article and come to a consensus on information.
Note taking information can be shared in class- allow students to correct and amend notes.

ACADEMIC INTEGRITY: Ability to use and credit sources appropriately. Demonstrate ways of embedding citation in writing (Attribution lesson from Scijourn).

SHORT CONSTRUCTED RESPONSE **40-50 minutes**

Define attribution and compare to plagarism.

Scoring Guide (Work Meets Expectations If):
• can provide an accurate definition
• can identify different forms of attribution in a sample article.

Instructional Strategies:
•Use Scijourn lesson "who Says? - Using Attribution."
Discuss respect for others' work to assemble evidence and create texts.
• Discuss academic penalties for stealing others thoughts and words.
• Discuss that an article can not move forward if a draft contains unattributed or incorrect factual evidence.

Notes:
Share copy of student guide to attribution.
Scijourn lesson "Who Says? - Using Attribution." attached

ESSENTIAL VOCABULARY: Ability to apply strategies for developing an understanding of text(s) by locating words and phrases that identify key concepts and facts, or information. Vocabulary Review Jigsaw attached. (If LDC module used with model science unit- essential vocabulary has already addressed through Vocabulary Review Jigsaw).

LIST **5-45 minutes**

Follow lesson plan for Vocabulary Review Jigsaw activity (attached).
Groups of four

Scoring Guide (Work Meets Expectations If):
Completes Jigsaw Review activity

Instructional Strategies:
• After scoring, ask some students to share definitions of terms that others overlooked or misunderstood.
• After scoring, be willing to provide direct instruction or guide a close reading if needed to work through a key phrase most students missed.

Notes:
The provided Vocabulary Review activity is an example using vocabulary from "Mars Reull Vallis"
You may need to create vocabulary jigsaws or other vocabulary activities to intentionally teach the science vocabulary for each of the articles.

Transition to Writing

ACTIVE READING: Ability to identify the central point and main supporting elements of a text.

SHORT CONSTRUCTED RESPONSE **45 minutes**

Read the excerpted pages from Chapter 2 of Front Page Science. These pages breakdown and discuss the format of an article (The inverted triangle).

Scoring Guide (Work Meets Expectations If):
Students can identify the parts of a science article.

Instructional Strategies:
• Article will be used to with the RATA to identify particular parts of a science article.

RATA (READ ALOUD/THINK ALOUD): Through the process of modeling how to think aloud, teachers demonstrate the ways proficient readers take when approaching and responding to unfamiliar text. RATA lesson plan from Scijourn attached.

SHORT CONSTRUCTED RESPONSE **1-2 class periods**

Follow along as the teacher Reads/thinks aloud. Pay attention to the parts of the article (the inverted triangle).

Scoring Guide (Work Meets Expectations If):
Student annotates own article and identifies the parts correctly.
Students share in whole group discussion about location of pieces in article.

Instructional Strategies:
•Identify the various parts on your article
•Students may work collaboratively
•Students apply what they learned from reading
•Another (cold read) science article may be given as a formative assessment to identify parts. To ensure assessment is on correctly identifying parts, make sure article is same reading level as the one modeled and list of parts given to students (otherwise it is about memorization of the parts - not identifying).

Notes:
Students have a copy of the article to annotate and mark as the teacher does the RATA activity.

Students may also have the Chapter 2 excerpt as a guide to identifying the parts of an article.

BRIDGING: Ability to begin linking reading results to writing task. Use organizing template - Inverted Triangle from Scijourn.

OUTLINE **1-2 class periods**

Using the Inverted Triangle Outline (attached), review your notes and fill in the graphic organizer.

Scoring Guide (Work Meets Expectations If):
Outlined completed using notes from active reading.

Instructional Strategies:
•Synthesizing information
•Some students may require teacher help to gather and place thoughts in graphic.
• Templates must be reviewed to catch misconceptions before drafts are written.

Notes:
This can be done as a whole class activity, in groups and then shared, in pairs or individually depending on the level of support needed.

Writing Process

CONTROLLING IDEA: Ability to establish a controlling idea and consolidate information relevant to task. Through the warm-up pitch (description attached), students define and refine compelling question from their research. Students draft possible ledes for article.

SHORT CONSTRUCTED RESPONSE **45 minutes**

Write an opening paragraph that includes a lede. Students may write three ledes from which to choose.

Scoring Guide (Work Meets Expectations If):
• Writes a concise draft opening.
• Provides one to three ledes.
• Establishes a controlling idea.
• Participates in warm-up pitch

Instructional Strategies:
• Offer several examples of opening paragraphs (refer back to your previously read RATA articles).
THE WARM-UP PITCH
• Students pair up and sit facing each other. One student has 2 minutes to "pitch" their opening and possible lede. The student listening must listen for and comment on student's opening.
• Review of constructive criticism may be necessary, you may provide a list of acceptable questions a science editor would ask a writer.
1) What is the topic/ angle of your story?
2) How is this interesting for readers? Why are you interested in this story?
3) Where is the science? What sources will you use? Are your sources reliable?
4) Are your arguments and counter arguments strong?
• Students switch roles

Notes:
Students should commit spoken ideas to paper soon after pitch - another "quality check" pitch may be needed to make sure that the changes were recorded accurately and reflect the revisions from the warm-up pitch.

RATA (READ ALOUD/THINK ALOUD): Through the process of modeling how to think aloud, teachers demonstrate the ways proficient readers take when approaching and responding to unfamiliar text. RATA lesson plan from Scijourn attached.

NOTES **5-45 minutes**

Students are to pay attention to the opening paragraph and lede. Students should also attend to how the article unfolds after the opening as a guide to writing their own articles.

Scoring Guide (Work Meets Expectations If):
Students can identify the lede and the opening paragraph while listening.

Instructional Strategies:
• Students can follow the reading with their own copies and highlight the lede and other elements of the article.

Notes:
Posting copies of your RATA articles for students to refer to helps guide them in the process of writing.

DEVELOPMENT: Ability to construct an initial draft with an emerging line of thought and structure.

LONG CONSTRUCTED RESPONSE **1-3 class periods**

Write an initial draft complete with opening, development, and closing; insert and attribute textual evidence.

Scoring Guide (Work Meets Expectations If):
• Provides complete draft with all parts.
• Supports the opening in the later sections with evidence and attributions.

Instructional Strategies:
• Encourage students to re-read prompt partway through writing, to check that they are on track.
• Have students read and peer edit each other's work. Some students may need a checklist or class anchor chart for guidance.

REVISION: Ability to refine text, including line of thought, language usage, and tone as appropriate to audience and purpose. Use peer editing with SAFI Tool.

LONG CONSTRUCTED RESPONSE **1-2 class periods**

Refine composition's analysis, logic, and organization of ideas/points. Use textual evidence carefully, with accurate citations. Decide what to include and what not to include. Use SAFI tool attached or modify.

Scoring Guide (Work Meets Expectations If):
• Provides complete draft with all parts.
• Supports the opening in the later sections with evidence and citations.
• Improves earlier edition.

Instructional Strategies:
• Sample useful feedback that balances support for strengths and clarity about weaknesses.
• Assign students to provide each other with feedback on those issues.
• Use attached SAFI tool or modify.

Notes:
Emphasis should be on development of ideas, clarity of thinking and use of evidence. You are an editor, and as such, concerned with substance over style at this point. * I am not saying spelling and sentence structure is not important - but that can be fixed later during targeted editing.

EDITING: Ability to proofread and format a piece to make it more effective. Editing can be done in small groups or by the teacher. The rubric can be modified to use as an editing tool.

LONG CONSTRUCTED RESPONSE **1-2 class periods**

Revise draft to have sound spelling, capitalization, punctuation, and grammar. Adjust formatting as needed to provide clear, appealing text.

Scoring Guide (Work Meets Expectations If):
• Provides draft free from distracting surface errors.
• Uses format that supports purpose.

Instructional Strategies:
• Briefly review selected skills that many students need to improve.
• Assign students to proofread each other's texts a second time.

Notes:
Students should know that an article or paper is never "done." Each draft should show changes. Unedited or unchanged drafts demonstrate the thought process has stopped and the assignment is not complete. Make sure to give the student time to make changes and turn in multiple drafts.
Targeted feedback helps students understand the nature of changes, vague comments will not yield shifts in thinking.

COMPLETION: Ability to submit final piece that meets expectations.

LONG CONSTRUCTED RESPONSE

Turn in your complete set of drafts, plus the final version of your piece

Scoring Guide (Work Meets Expectations If):
• Fits the "Meets Expectations" category in the rubric for the teaching task.

Instructional Strategies:

Resources

Uploaded Files

C:UserskclarkDesktopScience unit- MarsThe Atlantic.docx
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/1821286730_Jul_18_2013_121618913.docx)

The Coming Age of Space Exploration

C:UserskclarkDesktopArticles for Sc and SS for vocabularyMars Reull Vallis word version.docx
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/339320145_Jul_18_2013_121907187.docx)

Mars Ruell Vallis: A River Ran Through It

C:UserskclarkDesktopArticles for Sc and SS for vocabularymountains and Buried Ice on Mars- ESA.docx
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/401875220_Jul_18_2013_122035886.docx)

Mountains and Buried Ice On Mars

C:UserskclarkDesktopArticles for Sc and SS for vocabularySpace.docx
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/640140801_Jul_18_2013_12222396.docx)

Water on Mars: Exploration and Evidence

C:UserskclarkDesktopArticles for Sc and SS for vocabularyMars Water and Life.docx
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/916037202_Jul_18_2013_122732408.docx)

Mars, Water and Life

C:UserskclarkDesktoplesson-Read-Aloud-Think-Aloud.pdf
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/970239483_Jul_18_2013_132728935.pdf)

Scijourn Read Aloud/Think Aloud lesson plan

C:UserskclarkDesktopScience unit- MarsMars- Vocabulary Jigsaw.docx
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/891350664_Jul_18_2013_141315746.docx)

Vocabulary Review Jigsaw - based on ell.stanford.edu activity.

C:UserskclarkDesktoplesson-Who-Says-Using-Attributions.pdf
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/210625223_Jul_18_2013_142041110.pdf)

Scijourn lesson "Who Says - using Attributions"

C:UserskclarkDesktopStudent-Guide-Attributions.pdf
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/351944992_Jul_18_2013_142206712.pdf)

Scijourn Student guide to Attribution

C:UserskclarkDesktopSAFI.pdf
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/1632694586_Jul_18_2013_16093464.pdf)

Science Article Filtering Instrument (SAFI) from Front Page Science

---

C:UserskclarkDesktopChp 2 excerpt Inverted Triangle.pdf
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/80783440_Jul_18_2013_161044827.pdf)

Excerpt from Front Page Science Chp 2 Inverted Triangle.

C:UserskclarkDesktopInverted Triangle Outline.docx
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/2090749154_Jul_22_2013_111348569.docx)

Inverted Triangle Outline

C:UserskclarkDesktopREAD THIS FIRST BEFORE TEACHING MODULE.docx
(http://literacybytechnology.s3.amazonaws.com/teacherresourceuploads/23836/1952446685_Jul_22_2013_114007896.docx)

Read this First Guide to module with essential information and further resources

---

Keywords

*Links**

Scijourner - Teens engaging science through journalism (N/A)
(http://scijourner.org/)
Online published articles by teens. Scijourner is the result of the National Science Foundation grant funded project - the text containing more support and infomration is "Front-Page Science: Engaging Teens in Science Literacy."

Teach4Scijourn (790L)

(http://teach4scijourn.org/)
Support site for teachers implementing the Scijourn process - has guidance and lesson plans.

* These Lexile measures were computed automatically and did not undergo human review. They are not certified measures and should not be published or recorded in any way.

Other Resources

The Coming Age of Space Colonization
Interview from "The Atlantic Magazine" with Eric C. Anderson, chairman and founder of Space Adventures.

Mars' Reull Vallis: A River Ran Through It
Lexile Approx. 1520 Complex science article from European Space Agency detailing river-like structures seen from a Mars Express image of the Reull Vallis region on Mars.

Mountains and Buried Ice On Mars
Lexile Approx. 1430 Complex article discussing early images from Mars Express and possible conclusions.

Water on Mars: Exploration and Evidence
Lexile Approx 1450 Comprehensive article from Space.com that discusses possibility of water on Mars.

Mars, Water and Life
Lexile Approx. 1460 NASA overview of the Mars Polar Lander mission in 1998. Contains basic information about the reason behind the mission and goals of the mission.

Section 4: What Results?

Classroom Assessment Rubric

Not Yet	
Focus	Attempts to address prompt but lacks focus or is off-task.
Reading/Research	Demonstrates weak use of reading material to develop argument.
Controlling Idea	Establishes a claim and attempts to support an argument but is not convincing; (L2) Attempts to acknowledge competing arguments.
Development	Reasoning is not clear; examples or explanations are weak or irrelevant. (L3) Connection is weak or not relevant.
Organization	Provides an ineffective structure; composition does not address requirements of the prompt.
Conventions	Demonstrates a weak command of standard English conventions; lacks cohesion; language and tone are not appropriate to audience and purpose.
Meets Expectations	
Focus	Addresses the prompt and stays on task; provides a generally convincing response.
Reading/Research	Demonstrates generally effective use of reading material to develop an argument.
Controlling Idea	Establishes a credible claim and supports an argument that is logical and generally convincing. (L2) Acknowledges competing arguments while defending the claim.
Development	Develops reasoning to support claim; provides evidence from text(s) in the form of examples or explanations relevant to the argument (L3) Makes a relevant connection(s) that supports argument.
Organization	Applies an appropriate text structure to address specific requirements of the prompt.
Conventions	Demonstrates a command of standard English conventions and cohesion; employs language and tone appropriate to audience and purpose.

Classroom Assessment Task

Optional

Exemplar Work

Uploaded Files

Comments

Author Notes

Other Comments