Unit 2: Geologic Processes & History (Earth and Space Science)

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Belleville Public Schools

Curriculum Guide

Earth Science, Grade 7

Geologic Processes & History

Belleville Board of Education

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Unit Overview

The Dynamic Earth

- Structure of the Earth
- Rock Cycle
- Earth's Plates

Earth & Human Activities

- Humans & Earthquakes
- Humans & Volcanoes

Enduring Understanding

- Interactions between the layers of the Earth result in the movement of tectonic plates.
- Earth's materials cycle and energy flows to drive this process.
- Geologic events are the result of plate tectonics and impact the populations of regions where they occur.
- Plate movement in our lithospheric crust has caused and will continue to cause natural disasters and changes in our earth's topography (mountain building)
- Evidence shows that Geoscience processes have changed Earth's surface at varying time and spatial scales.
- Rock strata evidence supports earth's 4.6 billion-year-old history.

Essential Questions

- To what extent does the exchange of energy within the Earth drive geologic events on the surface?
- What natural disasters might one need to prepare for when living in a specific region?
- What evidence is there to support that Pangaea did exist?
- How did Marine fossils end up in the dessert?

Exit Skills

By the end of Module F students should be able to:

- Describe the hypothesis of continental drift
- Identify evidence of supporting continental drift
- Explain sea-floor spreading
- Recognize age and magnetic clues support sea-floor spreading
- Compare and contrast different types of plate boundaries
- Explain how heat inside Earth causes plate tectonics
- Recognize features caused by plate tectonics
- Explain how earthquakes result from the buildup of energy in rocks
- Describe how compression, tension, and shear forces make rocks move along faults
- Distinguish among normal, reverse, and strike-slip faults

New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

6-8.MS-ESS3-2.1.1	Graphs, charts, and images can be used to identify patterns in data.
6-8.MS-ESS3-5.1.1	Ask questions to identify and clarify evidence of an argument.
6-8.MS-ESS2-3.1.1	Patterns in rates of change and other numerical relationships can provide information about natural systems.
6-8.MS-ESS3-3.2.1	students classify relationships as causal or correlational, and recognize that correlation does not necessarily imply causation. They use cause and effect relationships to predict phenomena in natural or designed systems. They also understand that phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
6-8.MS-ESS2-1.2.1	Develop and use a model to describe phenomena.
6-8.MS-ESS2-2.3.1	students observe time, space, and energy phenomena at various scales using models to study systems that are too large or too small. They understand phenomena observed at one scale may not be observable at another scale, and the function of natural and designed systems may change with scale. They use proportional relationships (e.g., speed as the ratio of distance traveled to time taken) to gather information about the magnitude of properties and processes. They represent scientific relationships through the use of algebraic expressions and equations.
6-8.MS-ESS3-2.4.1	Analyze and interpret data to determine similarities and differences in findings.
6-8.MS-ESS2-3.4.1	Analyze and interpret data to provide evidence for phenomena.
6-8.MS-ESS2-2.6.1	Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future.
6-8.MS-ESS3-3.6.1	Apply scientific principles to design an object, tool, process or system.
6-8.MS-ESS2-1.7.1	Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale.
6-8.MS-ESS3-5.7.1	Stability might be disturbed either by sudden events or gradual changes that accumulate over time.
6-8.MS-ESS2-3.ESS1.C.1	Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches.
6-8.MS-ESS2-1.ESS2.A.1	All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's

	materials and living organisms.
6-8.MS-ESS2-2.ESS2.A.1	The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.
6-8.MS-ESS2-3.ESS2.B.1	Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.
6-8.MS-ESS2-2.ESS2.C.1	Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.
6-8.MS-ESS3-2.ESS3.B.1	Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.
6-8.MS-ESS3-3.ESS3.C.1	Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.
6-8.MS-ESS3-3.ESS3.C.2	Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.
6-8.MS-ESS3-5.ESS3.D.1	Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.
SCI.MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
SCI.MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
SCI.MS-ESS3-2	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
SCI.MS-ESS2-3	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
SCI.MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
SCI.MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

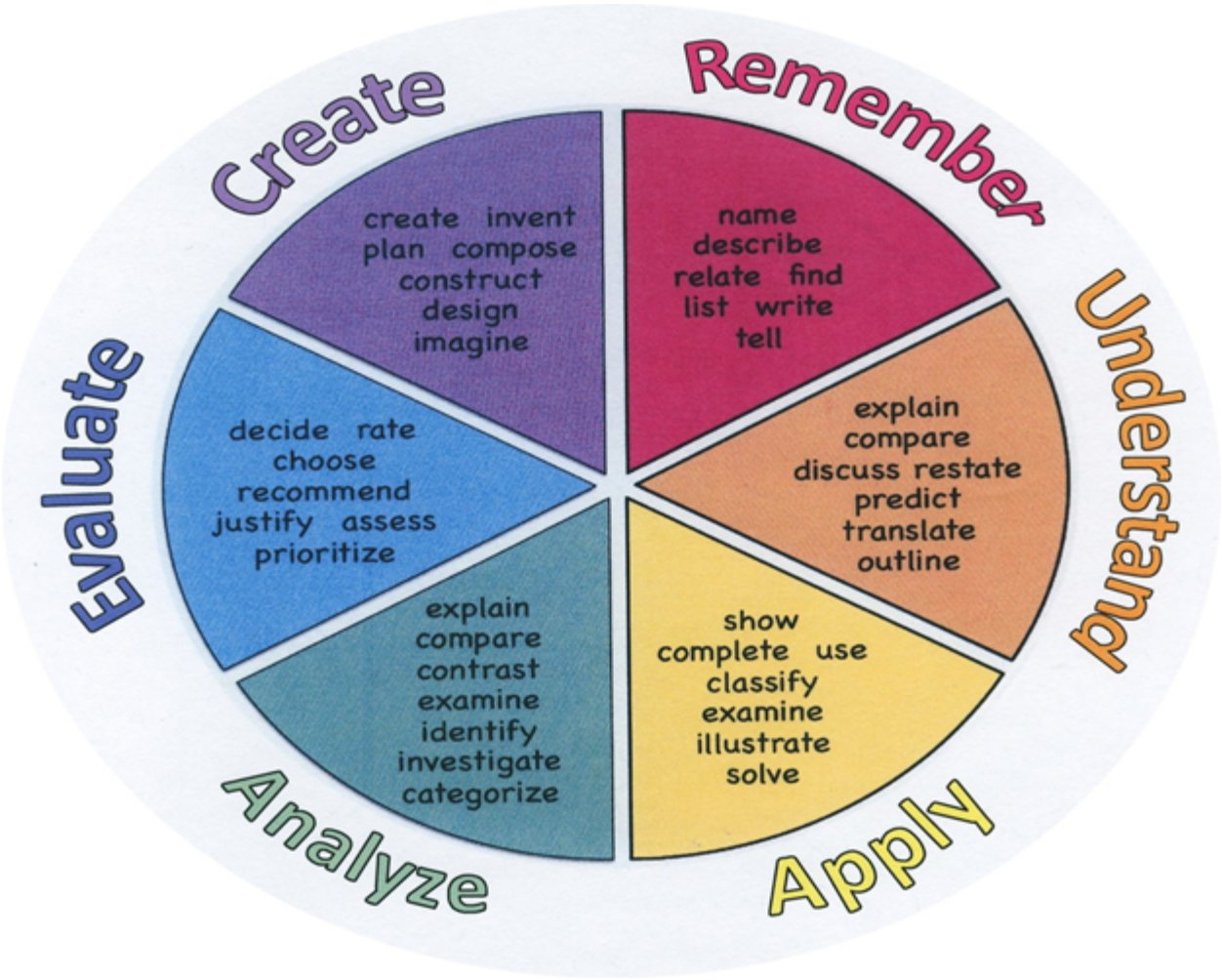
Interdisciplinary Connections

LA.RL.7.1	Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RL.7.4	Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of rhymes and other repetitions of sounds (e.g., alliteration) on a specific verse or stanza of a poem or section of a story or drama.
LA.W.7.1	Write arguments to support claims with clear reasons and relevant evidence.
MA.7.G.A.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Learning Objectives

- Students will be able to use their learning of geology to explain how rock formations and other matter on Earth's surface have changed over time through chemical and physical processes. Students will also model the effects of erosion and deposition by water and wind.
- Students will be able to use their learning of geology to infer that earthquakes are the sudden release of strain energy, usually along faults, but also associated with volcanism and mineral transformations.
- Students will be able to use their learning of geology to determine the ages of rocks and fossils using relative and absolute dating methods and analyze evidence used to organize Earth's long history.
- Students will be able to use their learning of geological processes, rocks, and fossils to construct explanations for how Earth's history is organized into the geological time scale.

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate
Recall	Select	Complete	Outline		Prescribe
Recognize	Show	Compute	Point out		Propose
Repeat	Summarize	Discover	Separate		Reconstruct
Reproduce	Tell	Divide			Revise
	Translate	Examine			Rewrite
	Associate	Graph			Transform
	Compute	Interpolate			
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			
	Extrapolate	Subtract			
	Generalize				
	Predict				



Suggested Activities & Best Practices

Utilization of various **DefinedStem.com** projects which recognizes the different learning styles of the students. DefinedStem is both problem and project-based learning. Content specific project:

- Volcanology Mt. St. Helens

Utilization of **NEWSELA.com** that can be used for different leveled readers.

- Assign weekly informational text articles directly related to the lesson
- Complete reading comprehension activities on the assigned articles: quiz, power words, write

Problem and project-based learning. Content specific project:

- Pangaea map construction project
- Graphing of Seismic Waves
- Locating Earthquake Epicenter

Assessment Evidence - Checking for Understanding (CFU)

Summative Module F Chapter Tests given in Google Classroom (Summative)

Periodic Vocabulary Quizzes (Summative)

Lab activities and Accompanying worksheets (Summative)

Defined Stem project (Alternate)

Why It Matters charts (KWL) (Formative)

Graphic Organizer (Formative)

BrainPop quizzes on videos covering Module F (Summative)

Newsela Article/Quiz covering Module F (Summative)

HMH Workbook Highlights & Questions (Formative)

Notebook Entries & Diagrams (Alternate)

Oncourse Assessment Tools (Formative)

"Do Now/Exit Ticket" Activity (Formative)

- Activities
- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's

- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Google Forms
- Illustration
- Journals
- Kahoot
- KWL Chart
- Learning Center
- Multimedia Reports
- Newspaper Headline
- Outline
- Plickers
- Question Stems
- Quickwrite
- Quizlet
- Quizzes Unit
- Red Light, Green Light
- review/Test prep
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

- HMH workbook series: F and G and supplementary materials (lab kits)
- Internet resources
- 1:1 Google classroom platform: Docs, Sheet, Forms, Slides, Sites

- Video streaming: YouTube, BrainPOP

Ancillary Resources

- Outdoor area of school
- Chromebook/ 1:1 Google classroom platform

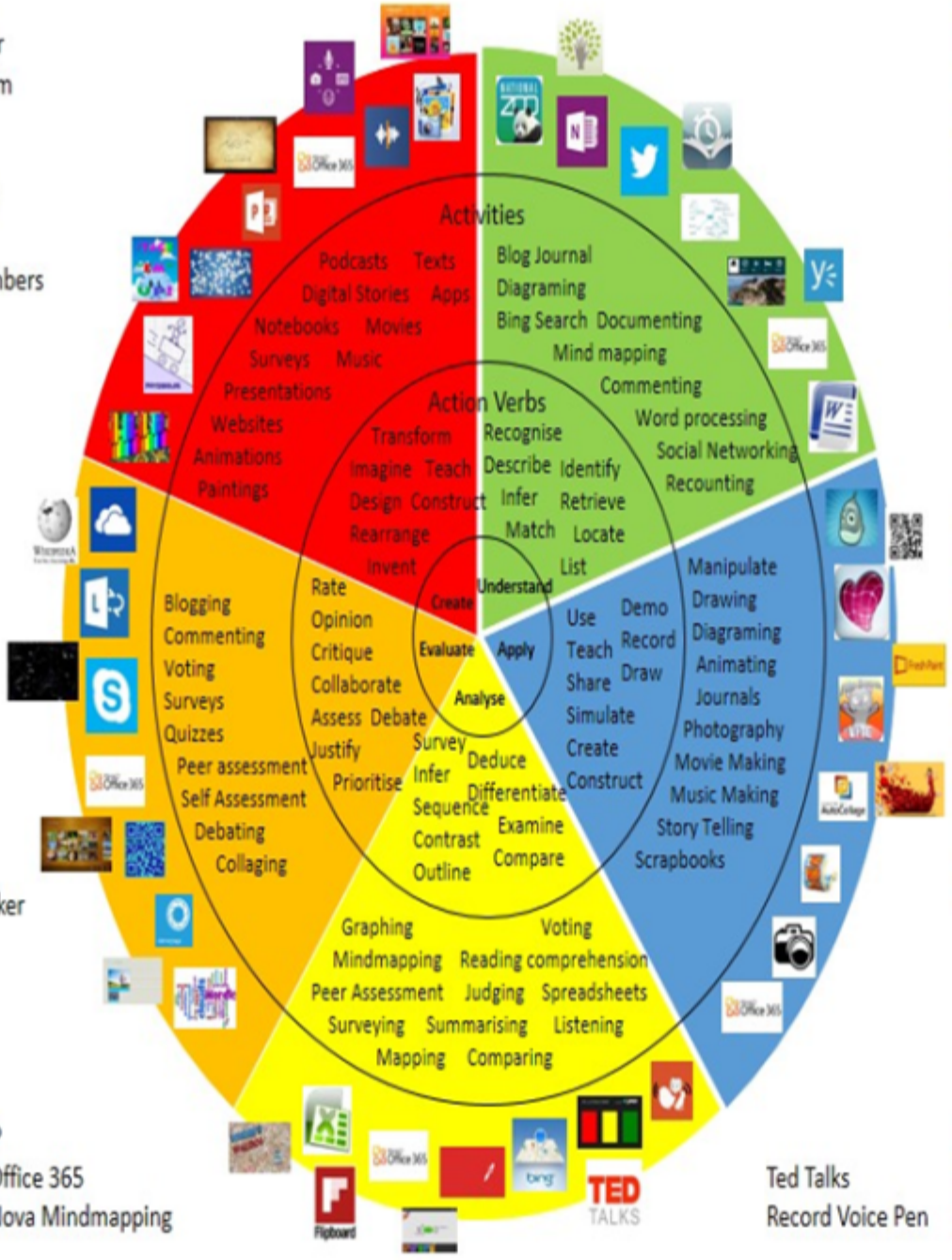
Technology Infusion

- Smart TV
- DefinedStem.com
- Document Camera
- Pod-casts video streams
- Discovery Education video streams
- YouTube video streams
- BrainPOP video streams
- Chromebooks
- Khan Academy
- Power Point presentation
- Flipgrid
- MS Word
- Google Applications: Classroom, Docs, Sheets, Slides, Forms, Sites

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CAEP.9.2.8.B.4	Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.
CAEP.9.2.8.B.6	Demonstrate understanding of the necessary preparation and legal requirements to enter the workforce.
CAEP.9.2.8.B.7	Evaluate the impact of online activities and social media on employer decisions.
TECH.8.1.8.A.2	Create a document (e.g., newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
TECH.8.1.8.A.4	Graph and calculate data within a spreadsheet and present a summary of the results.
TECH.8.1.8.B.1	Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.8.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.8.C.CS4	Contribute to project teams to produce original works or solve problems.

21st Century Skills/Interdisciplinary Themes

21st Century/Interdisciplinary Themes that will be incorporated into this unit.

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

21st Century Skills that will be incorporated into this unit.

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

- Have students construct an informational poster representing their own version of Pangaea and what it will become today. They must include evidence discovered by Alfred Wegener.
- Have students construct an interactive notebook activity that will represent sea-floor spreading and the evidence that supports it.
- Have students design a graphic organizer where they will be able to differentiate the differences between: plate boundaries, plate motion, and what results due to their interactions

Differentiations:

- Small group instruction
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Study guides
- Teacher reads assessments allowed
- Rephrase written directions
- Multisensory approaches
- Additional time
- Highlight text

Lo-Prep Differentiations

- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Games and tournaments
- Group investigations
- Guided Reading

- Independent research and projects
- Interest groups
- Multiple texts
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products

Special Education Learning (IEP's & 504's)

Special Education Learning adaptations that will be employed in the unit, using the ones identified below.

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments

- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

English Language Learning adaptations that will be employed in the unit, using the ones identified below.

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

Intervention Strategies that will be employed in the unit, using the ones identified below.

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.

- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

Talented and Gifted adaptations that will be employed in the unit, using the ones identified below.

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

Sample Lesson

Unit Name: Earth's Plates

NJSLS: See Link

Interdisciplinary Connection: See Link

Statement of Objective: SWBAT generate a poster or animated visual representing continental drift which lead to Plate Tectonics

Anticipatory Set/Do Now: Describe the ways in which plate tectonics have affected the geography of our world today?

Learning Activity:
1- As a class we will Review do now responses

2- In predetermined pairs, students will create a poster with a map of Pangaea by meshing a three letter word or initials

3- Lower on the poster, they will then create another map of what their continents look like today creating breaking points.
4- Lastly include a key of either walking dinosaurs or plants of that time period that inhabited the Pangaea land mass and the continents as they slowly broke and drifted apart over time.

5- Exit Card: how can fossils of the mesosaurus be found on multiple separated continents? If yes, how is this helpful in supporting the theory of the continental drift?

Student Assessment/CFU's: Computer or internet review using Brain Pop or Google Classroom Who is Alfred Wegener?

Can the Appalachian mountains be found on several continents?

Materials: 1. Handout Guide
2. Laptops
3. Letter Stencils

21st Century Themes and Skills: See Link

Differentiation: See Link (Heterogeneous student groupings based on current marking period grade
-Instruction is by learning style: visual, verbal, tactile/kinesthetic)

Integration of Technology: Smart TV

SCI.MS-ESS1-4	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.
SCI.MS-ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
SCI.MS-ESS2-3	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
SCI.MS-ESS3-2	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
SCI.MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
SCI.MS-ESS3-1	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
SCI.MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
SCI.MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.