Unit 2: Geologic Processes and History (Module F) - Earth and Space Science

Content Area: **Science**
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Status: **Published**

Title Section

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Earth Science Honors, Grade 7

HMH Geologic Processes and History (Module F)

Belleville Board of Education

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Unit Overview

The Dynamic Earth

- The Rock Cycle
- Earth's Plates
- Structure of Earth Interior

ESS1.C: The History of Planet Earth

- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE) (secondary to MS-ESS2-3)

ESS2.A: Earth's Materials and Systems

- 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. (MS-ESS2-1)
- 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. (MS-ESS2-2)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- 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. (MS-ESS2-3)

Earth and Human Activity

- Earthquakes and Humans
- Volcanoes and Humans

ESS3.B: Natural Hazards

- 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. (MSESS3-2)

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.
- Students will understand how a volcano is "born" and the impact volcanoes have on people and the environment.
- Volcanoes are due to lithospheric plates moving on Earth's surface and are in turn evidence for the theory of plate tectonics.
- Rocks and minerals, which undergo constant and continual geological change, are essential to sustaining life.
- The unique physical and chemical properties of rocks and minerals make them useful.
- Rocks and minerals are limited resources

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?
- How do the collisions of plates contribute to the formation of volcanoes?
- How do humans use rocks as a resource to construct buildings?
- How are minerals used as a resource?

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
- Describe the Rock Cycle
- Identify and classify various minerals and sedimentary, igneous, and metamorphic rocks

New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

6-8.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.
6-8.MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
6-8.MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
6-8.MS-ESS2-3.1	Patterns.
6-8.MS-ESS3-1.2	Cause and effect: Mechanism and explanation.
6-8.MS-ESS2-1.2	Developing and Using Models
6-8.MS-ESS3-1.2.1	Cause and effect relationships may be used to predict phenomena in natural or designed systems.
6-8.MS-ESS2-1.2.1	Develop and use a model to describe phenomena.
6-8.MS-ESS1-4.3	Scale, Proportion, and Quantity
6-8.MS-ESS1-4.3.1	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-ESS2-3.4	Analyzing and Interpreting Data
6-8.MS-ESS3-2.4.1	Analyze and interpret data to determine similarities and differences in findings.
6-8.MS-ESS2-2.6	Constructing Explanations and Designing Solutions
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-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-ESS1-4.ESS1.C	The History of Planet Earth
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-ESS1-4.ESS1.C.1	The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.
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	Plate Tectonics and Large-Scale System Interactions
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-ESS3-2.ESS3.B	Natural Hazards
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.

Interdisciplinary Connections

LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
MA.7.7.2	Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.
MA.7.7.3	Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in Grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.
MA.7.7.4	Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the

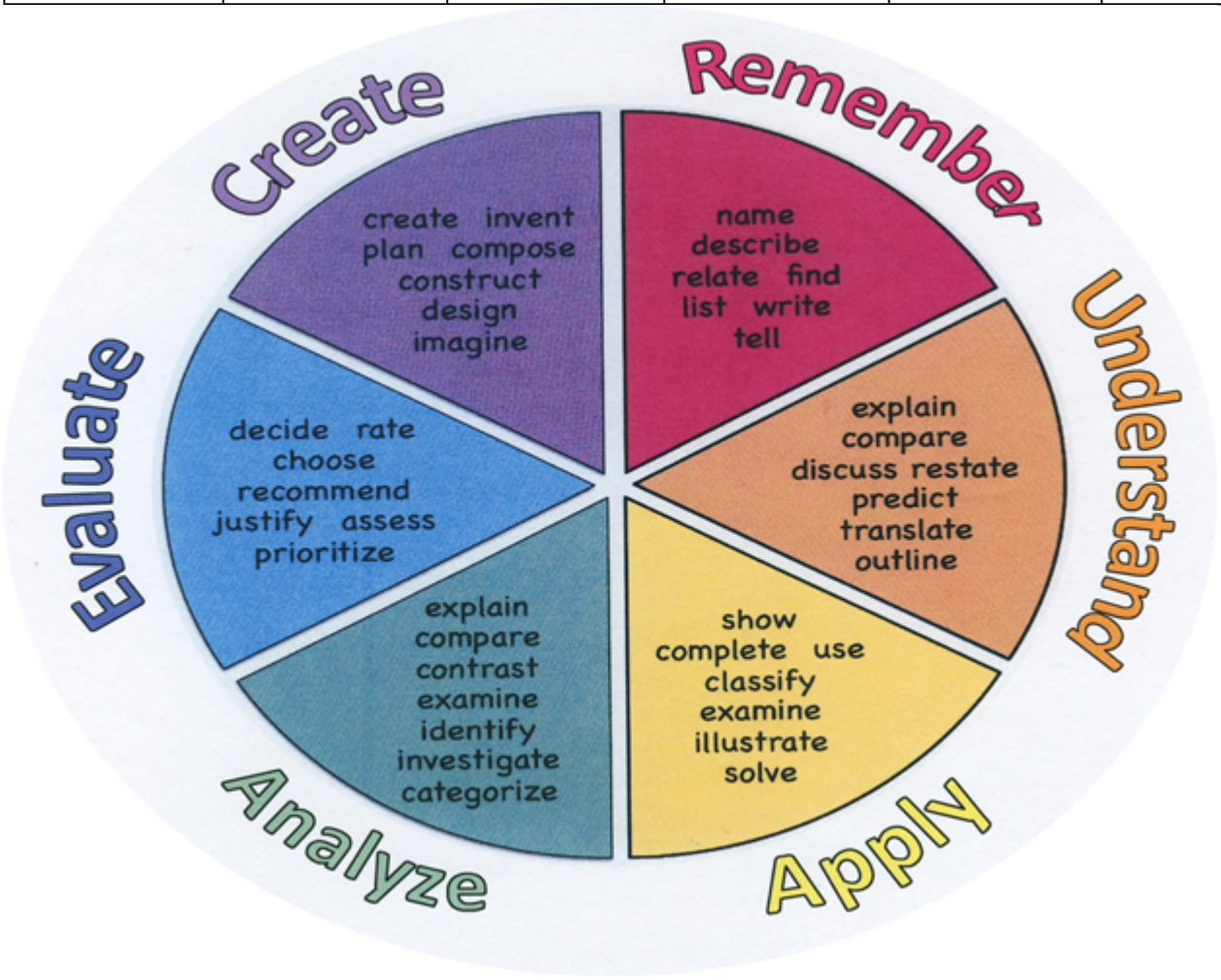
	importance of representative samples for drawing inferences.
SOC.6.1.8.B	Geography, People, and the Environment
SOC.6.3.8	Active Citizenship in the 21st Century: All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.

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 be able to use their learning of geology to 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.
- Students will be able to use their learning of geology to analyze the natural processes of the Earth as well as plate tectonics to demonstrate how they have or can change the topography of the area in which they live.
- Students will be able to use their learning of minerals to recognize and describe different types of Earth materials
- Students will be able to use their learning of rocks to explain how rocks and are used to understand the history of the Earth

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:

- Geology: Volcanology and Mount St. Helens
- Industrial Development Geologist: Rivers and Sediments
- Paleontology

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

Utilization of **Google Applications**:

- Create line, bar, and/or circle graphs representing mineral and rock data on Earth

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)

- 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
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- 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, etc.

Ancillary Resources

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

Technology Infusion

- Smart TV
- DefinedStem.com
- 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



Alignment to 21st Century Skills & Technology

Mastery of key subjects and 21st century themes is essential for all students in the 21st century. Key subjects include:

- English Language Arts
- Reading
- World Languages
- Arts
- Mathematics
- Economics
- Science
- Geography
- History
- Government and Civics
- 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.7	Evaluate the impact of online activities and social media on employer decisions.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.8.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.2.8.A.CS1	The characteristics and scope of technology.
TECH.8.2.8.A.CS2	The core concepts of technology.
TECH.8.2.8.A.CS3	The relationships among technologies and the connections between technology and other

fields of study.

21st Century Skills/Interdisciplinary Themes

- 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

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

Differentiation

HMH Module F - "Take It Further" informational text readings:

1. Exploring the Ash Fall Fossil Beds
2. Yellow is Changing
3. Careers in Science
4. Gold Rush
5. Coal Mining
6. People in Science

Hands-on Activities:

- 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 (fossils, rocks, matching mountains)
- 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
- Have students create a graphic organizer classifying volcanoes by: eruptive force, type of volcano, viscosity, and related plate boundary

- Have students construct an interactive notebook activity classifying the formations of rocks by: cool solutions, hot solutions, and from magma

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning

- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

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

- 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)

- 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

- 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)

- 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:

Via DefinedStem.com, SWBAT create an interactive visitor experience at the foot of Mount St. Helens that will explain the various characteristics of volcanoes and a timeline of events that led to the Eruption of Mount St Helens and the catastrophe that followed

Anticipatory Set/Do Now:

View the career video on volcanologist & respond to the guided questions via Google Docs

Learning Activity:

Student groups will brainstorm ideas and further analyze and decide which one of five products they will complete:

- *Newscast,*
- *Research Report*
- *Scientific Drawing*
- *Webpage*
- *3-D Visual*

Student Assessment/CFU's: *Completed product*

Materials:

- *1:1 Chromebooks*
- *Google Applications: docs, slides, sites*
- *Access to DefineStem website*

21st Century Themes and Skills: See Link

Differentiation/Modifications:

- *Small group instruction*
- *Repeat directions*
- *Highlighted text*
- *Students work with assigned partner*
- *Visual presentation*
- *View Spanish version*

Integration of Technology:

- *Smart TV*
- *Chromebooks*

- *Access to assigned website*

Full Task Plan: *https://images.definedstem.com/PDF/performance-task-guide.pdf*