Dynamic Geosphere Storyline – Volcanoes – Chapter 1

Big Idea:

5. The dynamic geosphere includes a rocky exterior upon which ecosystems and human communities developed and a partially molten interior with convection circulation that generates the magnetosphere and drives plate tectonics. It contains resources that sustain life, causes natural hazards that may threaten life, and affects all of Earth's other geospheres.
9. Natural hazards associated with Earth processes and events include drought, floods, storms, volcanic activity, earthquakes and climate change. They pose risks to humans, their property and communities. Earth science is used to study, predict, and mitigate natural hazards so that we can assess risks, plan wisely, and acclimate to the effects of natural hazards.

	Activity 1 – Where are the Volcanoes?	**Activity 2 – Volcanic Landforms**	**Activity 3 – Volcanic Hazards: Flows**	**Activity 4 – Volcanic Hazards: Airborne Debris**	**Activity 5 – Volcanoes and the Atmosphere**	**Activity 6 – Volcanic History of Your Community**	**Activity 7 – Monitoring Active Volcanoes**
Key Evidence Learned **Connection to:**	- how maps are made & projected - closest volcanoes to us - patterns of volcanoes on Earth - most volcanoes are in the ocean	- how topo maps are made and read - where would lava flow on a volcano - relationships between magma composition and type of volcanoe formed	- how lava flows, pyroclastic flows and lahars are affected by volume, temp, slope and channels - predict movement of lahars using topo maps - hazards from each type of flow - evacuation planning and decision making	- why ash covers a much larger area - tephra and associated hazards - scale of eruptions from the past - ash movement is controlled by wind	- gases that come from a volcano - impact of volcanoes on global climate - hazards of volcanic gases	- how to read and interpret a geologic map - examine and identify igneous rocks in CO - closest volcanic rocks to Littleton	- volcanic monitoring - what signs may signal an upcoming eruption
Big Idea	- location of volcanoes and closeness to community	- lava flow path in relation to communities	- hazards from lava & pyroclastic flows, lahars and impact on humans	- potential hazard of ash to our community and how it would get here	- hazards from gases and how they impact life directly or indirectly	- using past evidence to predict future events	- how to mitigate damage - how to plan for evacuations and protect lives and property
Real Life and Chapter Challenge	- closest volcano to CO - logical location choice for story	- how landforms in CO are interpreted on topo map - description of volcano's appearance	- how volcanic flows can affect communities - understanding hazards of flows and what can/cannot happen	- ash layers in CO	- hazards from gases during and after an eruption	- volcanoes in CO	- evacuation orders - monitoring efforts on volcano before eruption
Geosphere	- pattern of volcanism	- how topo maps give us a picture of the world - how lava flows make types of volcanoes	- how volcanic flows weather and erode - how volcanic flows can add layers	- ash layers in different areas - connection of ash layers to ancient eruptions		- rock history of CO and other locations - how to interpret rock history	- past evidence of eruptions
Hydrosphere	- most volcanoes are in the ocean	- what would happen if lava flowed into the ocean	- how lahars are formed	- what happens when ash combines with water in the ocean and air	- how gases can combine with water to create acid rain - theory of ocean origin		- acidity levels
Atmosphere		- how magma composition creates explosive eruptions	- how pyroclastic flows impact and interact with the air	- how ash travels in the atmosphere			- gases from volcanoes
Cryosphere		- location of glaciers near tops of volcanoes	- how lahars are formed	- how ash deposits are recorded in ice			- melting of glaciers/snow before eruptions
Biosphere	- knowing locations impacts where we choose to live	- location of forests on volcanoes	- how volcanic flows impact life on and around a volcano	- impact of ash on plants and animals	- hazards of gases on life	- how life has changed due to volcanoes	-changes in animal patterns - dead plants/animals from gases, acidity and heat
State Stand.	4.1.b					4.1.b, 4.1.d	4.1.d
Jeffco Stand.	4.1.b	4.1.d				4.1.b	
CSAP Frame	4.1.2.a	4.1.4.a					4.1.4.b
Jeffco PE	G 1d	G 1d, 1h	G 1h	G 1h	G 1h	G 1d, 1h	G 1d

Dynamic Geosphere Storyline – Plate Tectonics – Chapter 2

Big Idea:

5. Natural hazards associated with Earth processes and events include drought, floods, storms, volcanic activity, earthquakes and climate change. They pose risks to humans, their property and communities. Earth science is used to study, predict, and mitigate natural hazards so that we can assess risks, plan wisely, and acclimate to the effects of natural hazards.
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	Activity 1 – Taking a Ride on a Lithospheric Plate	**Activity 2 – Plate Boundaries and Plate Interactions**	**Activity 3 – What Drives the Plates?**	**Activity 4 – Effects of Plate Tectonics**	**Activity 5 – The Changing Geography of Your Community**
Key Evidence Learned	- which direction and how fast North America is moving - how GPS works - how we know the plates are moving (sea floor spreading, magnetic stripes, mountains)	- types of plate boundaries (divergent, convergent, transform) - how to identify which boundary is between two plates - our community's nearest plate boundary	- density of liquids and rocks - how density impact Earth layers and structure - how temp effects density - causes of plate motion - structure of Earth - convection cells in the mantle	- how earthquake and volcano location relate to plate boundaries - volcanic arcs – types and formation - hot spots - how continents grow - landforms at plate boundaries - how boundaries can affect the interior of a continent	- Pangea formation and break up using evidence to support - prediction of where the continents will be in 250 million years - why Wegener was criticized - evidence we use today that Wegener didn't have
Connection to:					
Big Idea	- Earth is made of plates that move	- plate have different boundaries that create different effects	- Earth's interior is based on density - causes of plate motion	- how boundaries create different landforms	- how the Earth has changed over time - development of plate tectonic theory
Real Life and Chapter Challenge	- how North America is moving - where North America will end up - evidence for movement	- different types of boundaries - nearest boundary to our community	- how we know what the layers of the Earth are - how the plates move	- types of boundaries explain where EQ and volcanoes are located - how CO has been affected by plate tectonics - Yellowstone	- how the theory was developed - evidence we use to support theory - where the continents may end up in the future
Geosphere	- movement of plates - how we know the plates are moving	- plate boundaries and identification	- density of rocks determine the type of boundary - causes of plate motion - structure of Earth	- EQ and volcano patterns - how volcanic areca are formed - where hot spots are - how continents grow - different landforms at boundaries	- how the Earth has changed over time - formation of plate tectonic theory
Hydrosphere		- boundaries in the ocean - ocean floor features - evidence from the ocean floor		- EQ and volcanoes in the ocean - volcanic island arcs - Hawaii - trenches	- how ocean basins open and close over geologic time
Atmosphere					- climatology evidence
Cryosphere					- glacial evidence
Biosphere					- fossil evidence
State Standard		4.1.b	4.1.a		4.1.b, 4.1.c
Jeffco Standard		2.3.a, 4.1.b, 4.1.d	2.2.a, 2.3.a, 4.1.a		4.1.b, 4.1.c
CSAP Frame		4.1.1.c, 4.1.2.a, 4.1.2.b, 4.1.2.e	4.1.1.a, 4.1.1.b, 4.1.2.e	4.1.1.c, 4.1.2.b, 4.1.2.e	4.1.2.a, 4.1.2.d
Jeffco PE	G 1b, 1i	G 1e, 1f, 1h	G 1g, 1i, 1j	G 1e, 1f, 1h	G 1a, 1b, 1i, 1j

Dynamic Geosphere Storyline – Earthquakes – Chapter 3

Big Idea:

5. The dynamic geosphere includes a rocky exterior upon which ecosystems and human communities developed and a partially molten interior with convection circulation that generates the magnetosphere and drives plate tectonics. It contains resources that sustain life, causes natural hazards that may threaten life, and affects all of Earth's other geospheres.
9. Natural hazards associated with Earth processes and events include drought, floods, storms, volcanic activity, earthquakes and climate change. They pose risks to humans, their property and communities. Earth science is used to study, predict, and mitigate natural hazards so that we can assess risks, plan wisely, and acclimate to the effects of natural hazards.

	Activity 1 – An Earthquake in Your Community	**Activity 2 – Detecting Earthquake Waves**	**Activity 3 – How Big Was It?**	**Activity 4 – Earthquake History of Your Community**	**Activity 5 – Lessening Earthquake Damage**	**Activity 6 – Designing "Earthquake-Proof" Structures**
Key Evidence Learned **Connection to:**	- P and S and surface waves and their characteristics - epicenter and focus	- how seismometers work - how to read a seismometer - how to interpret a travel-time graph	- develop an intensity scale - map intensity of an EQ - magnitude - epicenter location - amplification & liquefaction - comparison of magnitude and intensity	- global EQ distribution patterns - correlations between faults and EQ locations - risk areas in the US	- direct and indirect hazards - personal safety during and after an EQ	- safe building construction - resonance - how to mitigate damage
Big Idea	- how the movement of P, S and surface waves affect the Earth's surface and cause damage	- how to determine the distance to the EQ	- understand intensity vs. magnitude - how liquefaction and amplification can cause damage	- where EQ occur on Earth - high risk areas of the US	- how to mitigate damage - safety before, during and after and EQ	- how to mitigate damage from EQ - how to build safer buildings
Real Life and Chapter Challenge	- how seismic waves affect people and buildings	- how to know how far away an EQ was	- difference between intensity and magnitude - how liquefaction and amplification affect people and buildings	- closest EQ and faults to CO - our risk rating for CO	-what to expect during and after an EQ - personal safety during and after an EQ	- how to mitigate damage - building codes
Geosphere	- seismic waves and their interaction with the surface - faults	- how waves travel through the Earth	- measurement of magnitude - location of epicenter - amplification and liquefaction	- patterns of EQ in relation to plate boundaries - where faults occur	- hazards from EQ – how they are caused	- resonance - damage mitigation through surface construction
Hydrosphere	- how seismic waves affect water - tsunamis	- how waves change when they move through water	- tsunamis	- where earthquakes occur in the ocean	- tsunamis	- how to mitigate damage near lakes and the ocean
Atmosphere						
Cryosphere	- what could happen to a glacier from a seismic wave		- how ice reacts	- EQ near glaciated areas		
Biosphere	- affect of seismic waves on trees and people		- difference between intensity and magnitude	- risk ratings	- personal safety - how hazards affect humans	- damage mitigation
State Standard				4.1.b		4.1.d
Jeffco Standard	2.2.1, 2.3.c	2.2.b		4.1.b		
CSAP Frame				4.1.2.a, 4.1.4.a	4.1.4.b	4.1.4.b
Jeffco PE	G 1c	G 1b, 1c	G 1c, 1h	G 1d, 1h	G 1h	G 1h