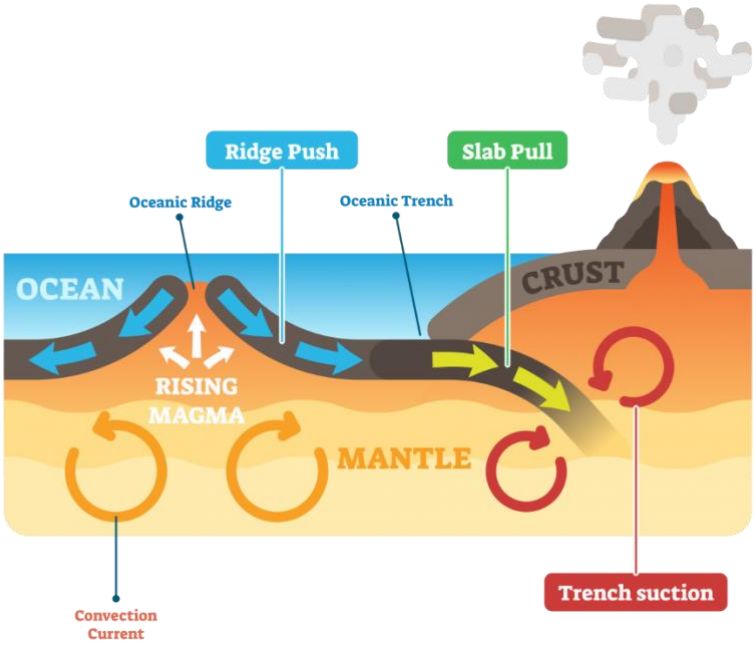
Pilgrim Federation

Key Stage 2

Learning Theme:



Earthquakes, Volcanoes & Mountains

Links to Other Learning Themes:
This Learning Theme links to: Ancient Greeks Africa Forces Asia The Americas Europe Explorers

KEY STAGE 2

By the end of the piece of learning about **'Earthquakes, Volcanoes & Mountains'** Key Stage 2 pupils will be able to answer the following questions. These questions cover the essential geological processes, locations, impacts, and safety measures related to these fascinating natural phenomena. They provide a solid foundation for further learning in later key stages:

1. **What are the main causes of earthquakes?** (This gets to the heart of tectonic plates and their movement, which is a fundamental concept.)

2. **How are volcanoes formed, and what are some of the things that can erupt from them?** (This explores the process of magma rising and the diverse materials ejected during an eruption.)

3. **What are the different ways mountains can be formed?** (This introduces the idea that mountains aren't all made the same way, touching on folding, faulting, and volcanic activity.)

4. **Where in the world are earthquakes and volcanoes most likely to occur, and why?** (This encourages them to see patterns and connect the locations to plate boundaries.)

5. **What are some of the immediate dangers and long-term impacts of earthquakes and volcanic eruptions on people and the environment?** (This fosters an understanding of the human and environmental consequences of these natural hazards.)

6. **How can people prepare for and try to stay safe during an earthquake?** (This introduces the crucial aspect of safety and preparedness in earthquake-prone areas.)

Other questions to consider:
Can you name a famous mountain range in the United Kingdom?
What are some of the dangers associated with volcanic eruptions?
Explain the difference between the epicentre and the focus of an earthquake.
What is the name of highest mountain in the world? Where in the world is it?
Can you explain what the 'Ring of Fire' is?

EXPLORING EARTHQUAKES, VOLCANOES, & MOUNTAINS: A KS2 ADVENTURE!

1. WHAT CAUSES EARTHQUAKES?

TECTONIC PLATE MOVEMENT



THE EARTH'S CRUST IS BROKEN INTO TECTONIC PLATES.

THEY CAN MOVE OR GRIND, CAUSING SUDDEN SNAP AND RELEASING ENERGY.

2. HOW ARE VOLCANOES FORMED & WHAT ERUPTS?

MAGMA & MATERIALS



3. HOW ARE MOUNTAINS MADE?

THREE MAIN WAYS



A. FOLDING: Plates push together, crumpling the land.

B. FAULTING: Plates move or slide, creating high and low blocks.

C. VOLCANIC ACTION: Layers of lava and ash build a peak.

4. WHERE & WHY DO THEY HAPPEN?

PLATE BOUNDARIES & GLOBAL LOCATIONS



5. WHAT ARE THE DANGERS & IMPACTS?

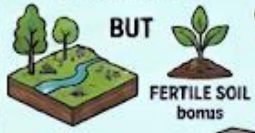
HUMAN & ENVIRONMENTAL CONSEQUENCES

SHORT-TERM:



LONG-TERM: habitat loss, landscape change

BUT



6. HOW TO PREPARE & STAY SAFE?

EARTHQUAKE SAFETY GUIDE



PREPARE: Emergency Kit (Water, Food, Flashlight, First Aid).

DURING: DROP, COVER, HOLD ON! (Under a sturdy table).

AFTER: Be aware of aftershocks, move outside safely.

READY TO ANSWER KEY QUESTIONS ABOUT OUR PLANET!

Key Vocabulary

Key vocabulary for Key Stage 2 related to the learning theme **'Earthquakes, Volcanoes & Mountains'** categorised for clarity:

I. Earthquakes

Earthquake: A sudden violent shaking of the ground, typically resulting from the movement of the Earth's crustal plates.
Tremor: A slight earthquake; a shaking or trembling movement.
Seismograph: An instrument used to detect and record earthquakes.
Richter Scale: A scale used to measure the strength or magnitude of an earthquake.
Epicentre: The point on the Earth's surface directly above the focus of an earthquake.
Focus (or Hypocentre): The point within the Earth where an earthquake rupture starts.
Fault Line: A crack in the Earth's crust where movement has occurred.
Tectonic Plates: Large pieces of the Earth's crust that are constantly moving.
Seismic Waves: Waves of energy that travel through the Earth's layers, caused by earthquakes.
Aftershock: A smaller earthquake that occurs after a larger earthquake in the same area.
Tsunami: A very large ocean wave caused by an underwater earthquake or volcanic eruption.

II. Volcanoes

Volcano: A mountain or hill, typically conical, having a crater or vent through which lava, rock fragments, hot vapour, and gas are ejected from the Earth's crust.
Crater: A large bowl-shaped hollow, typically one formed by the impact of a meteorite or the explosive eruption of a volcano.
Lava: Molten rock that flows from a volcano during an eruption.
Magma: Molten rock found beneath the Earth's surface.
Eruption: A sudden outpouring of something, especially lava or gas, from a volcano.
Vent: An opening in the Earth's surface through which volcanic materials erupt.
Ash (Volcanic Ash): Fine particles of rock, mineral, and volcanic glass ejected from a volcano.
Pyroclastic Flow: A fast-moving current of hot gas and volcanic debris.
Active Volcano: A volcano that has erupted in historical times or is expected to erupt in the future.
Dormant Volcano: A volcano that has not erupted for a long time but may erupt again.
Extinct Volcano: A volcano that is no longer active and is not expected to erupt again.
Cone: The conical shape of a volcano, built up by successive eruptions of lava and ash.
Magma Chamber: A large underground pool of molten rock (magma) beneath the surface of the Earth.

III. Mountains

Mountain: A large natural elevation of the Earth's surface rising abruptly from the surrounding level; a large steep hill.
Peak/Summit: The pointed top of a mountain.
Range (Mountain Range): A line of mountains connected by high ground.
Fold Mountains: Mountains formed when two tectonic plates collide, causing the Earth's crust to fold upwards.
Fault-Block Mountains: Mountains formed when faults in the Earth's crust cause large blocks of rock to be uplifted.
Volcanic Mountains: Mountains formed from the accumulation of volcanic material after eruptions.
Erosion: The process of wearing away the Earth's surface by natural forces like wind, water, and ice.
Weathering: The breaking down of rocks and minerals on the Earth's surface.

Altitude: The height of an object or point in relation to sea level or ground level.
Valley: A low area between hills or mountains, typically with a river or stream flowing through it.
Ridge: A long, narrow raised part of a surface or land, typically formed by the meeting of two slopes.
Glacier: A slowly moving mass or river of ice formed by the accumulation and compaction of snow on mountains or near the poles.

IV. General Geological Terms
Crust: The outermost solid layer of the Earth.
Mantle: The layer of hot, solid rock between the Earth's crust and core.
Core: The innermost layer of the Earth, consisting of a solid inner core and a liquid outer core.
Plate Tectonics: The theory that the Earth's outer shell is divided into several large plates that glide over the mantle, causing earthquakes, volcanoes, and mountains.
Boundary (Plate Boundary): The place where two tectonic plates meet.
Convergent Boundary: A plate boundary where two plates move towards each other, often leading to mountains or volcanoes.
Divergent Boundary: A plate boundary where two plates move away from each other, often creating new crust (e.g., mid-ocean ridges).
Conservative/Transform Boundary: A plate boundary where two plates slide past each other horizontally, often causing earthquakes.
Geology: The science that deals with the Earth's physical structure and substance, its history, and the processes that act on it.
Landform: A natural feature of the Earth's surface.

Art & Design

Substantive Knowledge

In Art & Design, the learning theme of '**Earthquakes, Volcanoes & Mountains'** shifts the focus from scientific data to **texture, form, and the awe-inspiring power of nature**. **Substantive knowledge** here involves understanding how to represent physical height, heat, and seismic energy through various media.

1. Texture and Surface: Tectonic Forces
Pupils should learn how to translate the "chaos" of an earthquake or the roughness of a mountain into tactile art.

Impasto Technique: Using thick layers of paint (often with palette knives) to create physical "ridges" that mimic mountain ranges or jagged fault lines.
Mixed Media: Incorporating sand, grit, or sawdust into paint to replicate the volcanic ash or rocky terrain of a summit.
Sgraffito: A technique of scratching through a surface layer to reveal colours underneath—ideal for representing glowing lava beneath a crust of cooling rock or "cracks" in the earth.
2. Form and Sculpture: Building Height
Volcanoes and mountains provide a perfect context for 3D construction and the concept of "scale."

Armatures: Knowledge of how to build an internal support (using wire, card, or crumpled paper) to allow a structure to grow vertically without collapsing.
Relief Sculpture: Creating a "topographic" map in clay or Modroc, where pupils learn to represent height through varying depths of material.

Negative Space: Understanding the "voids" or "craters" in a volcanic form and how they contrast with the solid mass of the mountain.

3. Colour Theory: Temperature and Mood
The "Extreme Earth" theme is a masterclass in using colour to convey environmental conditions.

Warm vs. Cool Palettes: Using fiery oranges, magentas, and yellows to represent volcanic heat (magma) versus icy blues, whites, and greys for mountain peaks and glaciers.
Atmospheric Perspective: Learning that colours become lighter, less detailed, and more "blue" as mountains recede into the distance to create the illusion of depth.
Tints and Shades: Creating "value" scales to show how light hits one side of a mountain (tint) while the other remains in shadow (shade).



4. Artistic Movements and Context
Pupils should study how professional artists have historically responded to these natural phenomena.

The Inspirational: Knowledge of the concept that nature can be both beautiful and terrifying (e.g., the works of **J.M.W. Turner** or **Katsushika Hokusai**).
Hokusai's "36 Views of Mount Fuji": Understanding how the same subject can be captured from different perspectives and in different "moods" of weather.
Andy Warhol's "Vesuvius": Exploring how "Pop Art" used bright, non-naturalistic colours to represent the energy of a volcanic eruption.

Key Vocabulary for Art & Design

Term	Definition
Perspective	The art of representing three-dimensional objects on a two-dimensional surface.

Composition	How the elements of an artwork (mountains, lava, sky) are arranged.
Form	A three-dimensional object (or the illusion of one).
Texture	The perceived surface quality of a work of art (rough, smooth, jagged).

Disciplinary Knowledge

The **disciplinary knowledge** for Key Stage 2 Art & Design, in relation to the learning theme **'Volcanoes, Earthquakes, and Mountains'**, focuses on **developing mastery of techniques** and **evaluating and appreciating art** through the lens of these natural phenomena.

Developing Art & Design Techniques

The geological theme provides a powerful stimulus for pupils to experiment with and master specific artistic techniques.

Drawing:

Using **line** to capture the texture and shape of jagged mountains, the flow of lava, or the cracks of an earthquake fault line.

Experimenting with **tone** and **shading** (e.g., using **charcoal** or **pencil**) to depict the depth and drama of a volcanic crater or a mountain range, such as drawing Mount Vesuvius.

Painting:

Exploring **colour theory** by focusing on **warm colours** (reds, oranges, yellows) to represent **lava** and **eruptions** and contrasting them with cooler colours (blues, greys) for ash and rock.

Mastering techniques to represent movement and force, such as **splattering**, **flicking**, **dripping**, or **blowing paint** (with a straw) to create the texture and explosive motion of an eruption.

Using **watercolour** for a less controlled, fluid effect that can mimic moving water or molten rock.

Sculpture/3D Work:

Improving **modelling** skills using materials like **clay** or **papier-mâché** to construct three-dimensional forms of volcanoes, mountains, or seismic landscapes.

Exploring **texture** by adding materials (like sand or coffee grounds) to represent rough volcanic rock or creating layered surfaces to show geological strata.

Collage and Mixed Media:

Using **collage** (cutting, tearing, and layering materials like paper, tissue, or fabric) to build up complex, textured mountain or earthquake-shattered landscapes. This involves selecting materials based on their **texture** and **colour** to enhance the meaning of the work.

Evaluating and Appreciating Art

Connecting the natural theme to art history and critique helps pupils understand the role of art in recording and interpreting the world.

Critique and Evaluation:

Using the **language of art, craft, and design** (**line, tone, texture, colour, form**) to evaluate and critique their own work and the work of peers, making suggestions for improvement.

Explaining their choices of **materials** and **techniques** and how these choices effectively convey the power and scale of volcanoes, earthquakes, or mountains.

Knowledge of Artists:
Studying the **work and distinctive styles of significant artists** who have depicted these natural forces, such as:
J.M.W. Turner's dramatic interpretations of volcanic eruptions (like Mount Vesuvius).
Andy Warhol's 'Vesuvius' **Pop Art** prints, which introduce the concept of using bold colour and repetition to interpret a natural disaster .
Comparing how different artists, from different historical or cultural contexts, have represented the same natural phenomenon (e.g., comparing a traditional landscape painting of a mountain to a modern abstract interpretation).

Learning Objectives

Art & Design **learning objectives** for the learning theme, **'Earthquakes, Volcanoes & Mountains'** aiming to blend artistic exploration with scientific understanding:

Exploring and Developing Ideas:
Pupils will be able to research and gather visual information about the textures, colours, and forms of earthquakes (e.g., cracked earth, collapsed structures), volcanoes (e.g., lava flows, ash clouds, conical shapes), and mountains (e.g., jagged peaks, layered rock, snow-capped summits).
Pupils will be able to generate initial ideas for artwork inspired by the power and impact of earthquakes, the dramatic eruptions of volcanoes, and the majestic scale of mountains, using techniques like sketching, mind mapping, and collage.
Pupils will be able to experiment with a range of materials (e.g., clay, paint, textiles, recycled materials) to represent the different textures and characteristics of these natural phenomena.
Pupils will be able to develop their ideas through drawing, painting, and sculpture, considering composition, scale, and perspective to convey the grandeur or destruction associated with their chosen subject.
Pupils will be able to discuss and refine their ideas based on observations and feedback, considering how their artwork communicates the forces and beauty of the Earth's dynamic landscape.

Mastering Techniques:
Pupils will be able to explore and use colour effectively to represent the heat of lava, the coolness of snow, or the muted tones of rock formations.
Pupils will be able to experiment with different paint application techniques (e.g., thick impasto for lava, thin washes for atmospheric perspective in mountain ranges).
Pupils will be able to develop skills in working with clay to create three-dimensional representations of volcanic cones or the fractured surfaces caused by earthquakes.
Pupils will be able to explore layering and texture in collage using various materials to depict the different strata of mountains or the chaotic aftermath of an earthquake.
Pupils will be able to learn about and apply techniques for creating a sense of depth and distance in their artwork, such as overlapping, size variation, and changes in colour and tone when depicting mountains.

Taking Inspiration from Artists:
Pupils will be able to learn about artists who have depicted landscapes and natural forces (e.g., J.M.W. Turner's dramatic skies, Ansel Adams' photographs of mountains).

Pupils will be able to discuss how these artists have used different techniques and styles to capture the essence of their subjects.
Pupils will be able to use the work of other artists as inspiration for their own creations, adapting and developing ideas rather than simply copying.

Evaluating and Analysing:
Pupils will be able to talk about their own artwork, explaining the choices they made in terms of materials, techniques, and composition in relation to their chosen subject.
Pupils will be able to identify and discuss the strengths and areas for development in their own and others' artwork, using appropriate art vocabulary.
Pupils will be able to make connections between their artwork and their understanding of earthquakes, volcanoes, and mountains from their science lessons.

Lesson Ideas

This 6-week Medium-Term Plan (MTP) for Key Stage 2 Art & Design uses the learning theme of **"Earthquakes, Volcanoes & Mountains"** to develop technical confidence across 2D, 3D, and digital mediums. It runs concurrent pathways for **Lower Key Stage 2** and **Upper Key Stage 2 (Years 5/6)**, showing a clear progression from core tactile exploration to advanced composition, texturing, and mixed-media installation. Across this unit, pupils build **substantive knowledge** (the colour wheel, tone, texture, printing techniques, ceramic rules, and art history) while exercising **disciplinary knowledge** (thinking like an artist by making independent creative choices, evaluating abstract concepts, manipulating media to convey energy, and critiquing compositions).

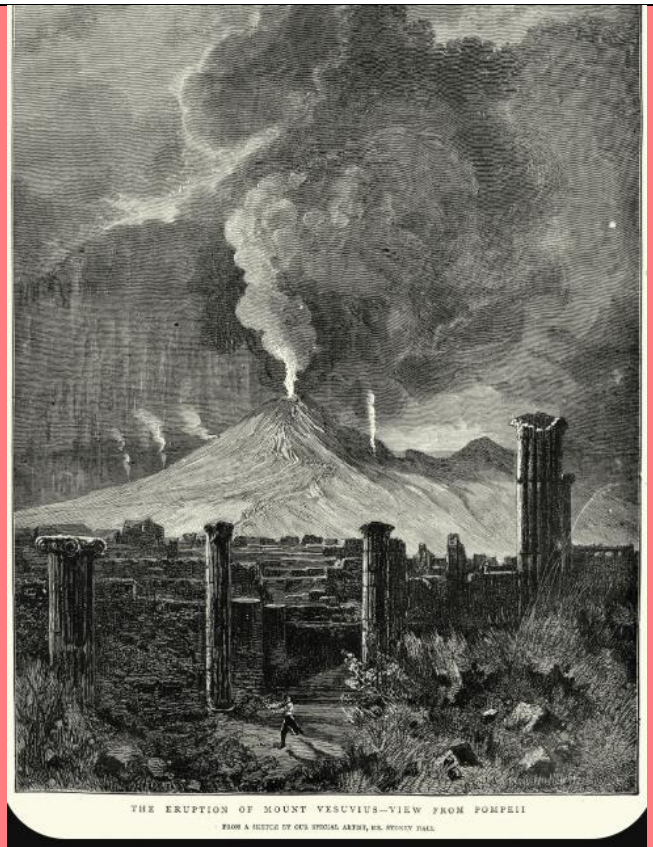
Unit Title: Forces of Nature: Tectonic Textures, Eruptions, and Ridges
Duration: 6 Weeks (Approx. 1.5 – 2 hours per week)
Core Resources: Sketchbooks, charcoal, soft pastels, acrylic paints, thick printing foam tiles, water-based printing inks, rollers, terracotta air-drying clay, slip, wire, mod-roc, and mixed-media collage remnants (sand, tissue paper, string).

Weekly Progression Scheme
Week 1: Capturing the Mountain Silhouette (Sketchbooks & Line Work)
The Artistic Focus: Investigating perspective, contour line drawing, and tectonic scale.
Substantive Knowledge:
LKS2: Defining **silhouette** (the dark shape and outline of someone or something visible against a lighter background). Identifying foreground, midground, and background lines.
UKS2: Understanding **atmospheric perspective** (objects in the distance appear lighter, less detailed, and bluer due to the atmosphere). Defining cross-hatching and stippling to create a sense of geological mass.
Disciplinary Knowledge:
Deconstructing a landscape photo visually into structural lines and translating massive three-dimensional landforms into balanced multi-layered compositions within a sketchbook layout.
Learning Theme Activity: *The Ridge Profile Study.*
LKS2 (Y3/4): Pupils look at artwork featuring mountains, such as Hokusai's *Thirty-Six Views of Mount Fuji*. In their sketchbooks, they use charcoal to draw a series of overlapping mountain horizons, focusing on bold lines to block out sharp volcanic peaks against a soft pastel sky.
UKS2 (Y5/6): Pupils analyse deep tectonic landscapes. They sketch mountain ranges using fine-liners and graphite, using light tone blocks for distant ranges and intense cross-hatching in the foreground to create depth. They annotate their pages with observations on how light shifts over rough rock faces.



Pupils analyze how artists like Hokusai use framing, line work, and deep perspective to capture the quiet scale of volcanic peaks.. Source: Universal History Archive / Universal History Archive/Universal Images Group via Getty Images

Week 2: Volcanic Eruptions – The Expressive Palette (Colour & Texture)
The Artistic Focus: Using expressive brushwork and colour theory to convey explosive energy.
Substantive Knowledge:
LKS2: Distinguishing between **warm colours** (reds, oranges, yellows) and **cool colours** (blues, greens, purples). Knowing that mixing warm colours together creates vibrant, fiery tones.
UKS2: Understanding **complementary colours** (colours opposite each other on the colour wheel, like blue and orange) and how placing them side by side makes both colours look brighter and more intense.
Disciplinary Knowledge:
Expressive Media Manipulation: Selecting brush tools and modulating brush strokes intentionally (e.g., stabbing vs. sweeping) to translate physical energy and heat onto canvas.
Learning Theme Activity: *The Magma Burst Canvas.*
LKS2 (Y3/4): Pupils look at historical paintings of Mount Vesuvius erupting. They map out an exploding volcano vent, using palette knives and thick acrylic paint to layer warm colours over a cool, dark night background, creating a high-contrast texture.
UKS2 (Y5/6): Pupils investigate abstract representations of tectonic heat. They utilise complementary colour pairings (e.g., brilliant orange lava flows cutting through a deep midnight blue mountain shadow). They mix sand or PVA glue into their paint to build a thick texture (impasto), creating a surface that feels as raw and jagged as cooled volcanic rock.



Pupils study historical paintings of eruptions to see how artists use fiery warm colors and smoky textures to capture volcanic scale.. Source: duncan1890 / Getty Images

Week 3: Fault Lines & Shockwaves (Collage & Mixed-Media)
The Artistic Focus: Deconstructing surfaces to represent seismological destruction and movement.
Substantive Knowledge:
LKS2: Knowing that **collage** involves assembling different materials together to form a new whole. Understanding how jagged edge shapes can communicate tension.
UKS2: Defining **juxtaposition** in art (placing two contrasting concepts or textures close together). Understanding how torn lines and raw fractures can mirror real seismograph readings.
Disciplinary Knowledge:
Compositional Construction: Fragmenting and rebuilding a structured surface to visually express tension, stress, and broken ground.
Learning Theme Activity: *The Seismograph Fractured Panel.*
LKS2 (Y3/4): Pupils paint a landscape pattern, then tear it up into jagged pieces. They rearrange and glue these fragments onto a black card base, leaving narrow gaps to represent earthquake fault lines.
UKS2 (Y5/6): Pupils create a mixed-media piece that captures the stress of tectonic movement. They layer corrugated card, crumpled tissue paper, and taught string across a hard board. They slice into these layers with scissors or craft tools, shifting the panels out of alignment to show how land shifts during an earthquake.

Week 4: The Tectonic Relief (3D Clay Foundations)
The Artistic Focus: Managing structural clay to sculpt relief depths and geographic forms.
Substantive Knowledge:

LKS2: Defining **relief sculpture** (artwork that projects forward from a flat background panel). Knowing the core joining rule: **score and slip** (scratching wet clay surfaces and applying liquid clay cement).
UKS2: Defining **subtractive sculpture** (carving away material) and **additive sculpture** (building up layers). Knowing how clay behaves as it dries (shrinking and cracking if it's too thick).
Disciplinary Knowledge:
Coordinating finger pressure and sculpting tools to build stable three-dimensional forms out of raw, pliable clay blocks.
Learning Theme Activity: *The Topographical Plaque.*
LKS2 (Y3/4): Pupils roll out a flat terracotta clay tile base. They use the *score and slip* technique to attach overlapping clay slabs, building a step-like mountain ridge with deep, textured valleys.
UKS2 (Y5/6): Pupils create an intricate volcanic caldera cross-section model. They use subtractive carving methods to hollow out a deep central crater basin, and add fine wire or clay ribbons to build up internal magma chambers and rock layers.

Week 5: Printing the Earth's Crust (Printmaking & Monoprinting)
The Artistic Focus: Incising designs into plates to print repeated, high-contrast textures.
Substantive Knowledge:
LKS2: Defining **printmaking** as transferring an image from one surface (a plate) to another (paper). Knowing that lines carved into a plate will print as blank, un-inked spaces.
UKS2: Understanding the differences between relief printing and **monoprinting** (a form of printmaking that makes unique, one-off prints). Knowing how to use an ink roller (*brayer*) to apply a thin, even coat of ink.
Disciplinary Knowledge:
Regulating Line Marks: Carving fine patterns into a delicate printing plate with consistent pressure to create clean prints without breaking through the surface.
Learning Theme Activity: *The Strata Print Series.*
LKS2 (Y3/4): Pupils use ballpoint pens to press deep lines into a soft foam tile, creating a design based on mountain strata and rock layers. They roll water-based ink across the surface and press it onto tinted paper to create a crisp relief print.
UKS2 (Y5/6): Pupils create multi-layered prints of volcanic landscapes. They ink up a smooth plastic plate to make a textured background monoprint. Once that background is dry, they overlay it with a sharp block print showing structural silhouettes, experimenting with colour layers to capture an smoky atmospheric landscape.

Week 6: The Tectonic Exhibition – Appraisal & Presentation
The Artistic Focus: Displaying a body of work thoughtfully and reviewing peers' creations constructively.
Substantive Knowledge:
LKS2/UKS2: Understanding the role of an art gallery **curator** in selecting, organising, and explaining artwork to a public audience.
Technical Vocabulary: *Silhouette, warm/cool colours, complementary colours, impasto, relief sculpture, score and slip, subtractive, printmaking, atmospheric perspective, texture.*
Disciplinary Knowledge:
Reflective Appraisal & Curation: Evaluating your own creative choices throughout the unit, justifying changes to your work, and analysing how specific textures can evoke different feelings.
Learning Theme Activity: *The Forces of Nature Exhibition.*
The classroom becomes a geocentric art gallery. Pupils mount their sketchbook studies, volcanic canvases, torn collages, clay reliefs, and print series onto display stands. They draft clear caption labels detailing their technical choices and ideas. Pupils then take part in a silent gallery walk, reviewing their peers' creations

with sticky notes that focus on technical success: *"The thick impasto texture here makes the volcano look genuinely hot and dangerous."*

Assessment Matrix (Progression Indicators)

Phase	Working Towards	Expected Standard	Greater Depth
Lower Key Stage 2 *(Years 3 & 4)*	• Lines in sketches are shaky and fail to capture the balanced geometry of landforms. • Blends warm and cool colours together untidily, resulting in flat, murky brown tones. • Clay pieces fall off because the joints were not scored and slipped. • Printing lines are shallow or uneven, making the final prints look smudged.	• Uses clear charcoal outlines to block out distinct mountain silhouettes. • Applies warm and cool colours deliberately to create an eye-catching, fiery volcano scene. • Joins clay slabs successfully using the score-and-slip method to build relief layouts. • Presses deep, clean lines into foam blocks to make sharp strata prints. • Reviews work using basic artistic terms like *silhouette* and *texture*.	• Arranges lines thoughtfully in sketchbooks to show clear foreground and background depth. • Uses thick, varied brushstrokes to create a sense of real movement and energy on canvas. • Sculpts highly detailed clay reliefs with neat, clean edges and deep valleys. • Varies ink application layers on purpose to add tone and variety across a series of prints.
Upper Key Stage 2 *(Years 5 & 6)*	• Figure drawings lack structural alignment, remaining rigid and flat. • Wire armatures collapse or twist because the joints were loosely fastened. • Mod-roc finishes look fuzzy and loose because the wet plaster paste was not smoothed down. • Paint applications are heavy and flat, hiding the sculpture's textures.	• Maps human proportions accurately, capturing a clear *contrapposto* weight shift. • Engineers a stable, self-supporting wire armature anchored to a solid base plat. • Applies mod-roc in clean, smooth layers to define clear muscle groups. • Manages overlapping depth layers successfully within shallow clay relief carvings. • Layers dark washes and dry-brush metallics to achieve a convincing aged-bronze finish.	• Uses fluid gesture lines to map out anatomical weight distribution and tension. • Designs high-angle, dynamic wire skeletons that balance perfectly on tiny contact points. • Sculpts refined muscle structures and sharp clothing drapery out of plaster bandages. • Generates an optical illusion of deep distance within a shallow 2cm relief framework. • Formulates advanced critiques: *"The turquoise Verdigris wash breaks up the bronze texture, making it look authentically aged."*

Other Information, Ideas and Resources

Earthquakes:

Shaking Structures (Design & Technology cross-over): Challenge pupils to design and build model buildings (using cardboard, straws, LEGO, etc.) that can withstand a "shake test." You can create a simple shake table using a tray and marbles or by gently wobbling the table. This combines structural design with an understanding of earthquake impact.

Earthquake Landscapes (Painting/Collage): Explore the visual impact of earthquakes. Pupils can paint or create collages showing cracked earth, fallen buildings, and dramatic dust clouds. They could use textured materials to represent the broken ground.

Seismic Wave Art (Drawing/Pattern): Introduce the concept of seismic waves (P-waves, S-waves). Pupils can create abstract art representing these waves using lines, patterns, and different colours. They could explore how the waves change as they travel through the Earth.

"Before and After" Dioramas: Divide a shoebox or similar container to create two scenes: a peaceful landscape before an earthquake and the same landscape after, showing the devastation. This encourages storytelling and visual representation of change.

Earthquake Survival Kits (Design & Technology cross-over): Discuss what items would be essential in an earthquake survival kit. Pupils can then design and create a model or drawing of a kit, labelling the contents and explaining their purpose.

Volcanoes:

Erupting Volcano Models (Sculpture/Mixed Media): This is a classic! Pupils can build volcano models using clay, papier-mâché, or even recycled materials. The exciting part is making them "erupt" using baking soda and vinegar (with adult supervision, of course!). This combines model-making with a scientific demonstration.

Lava Flow Art (Painting/Marbling): Explore the vibrant colours and textures of lava. Pupils can experiment with thick paints, marbling techniques, or even using glue and glitter to represent the molten rock flowing down the volcano.

Volcanic Landscapes (Painting/Drawing): Focus on the dramatic shapes and colours of volcanic landscapes, including the cone, crater, and surrounding terrain. They could use different shades of brown, grey, red, and orange to capture the scene.

Volcanic Ash Drawings (Drawing): Use charcoal or soft pastels to create drawings that evoke the dark, dusty atmosphere after a volcanic eruption. They can focus on silhouettes of trees or buildings covered in ash.

Volcano Cross-Sections (Drawing/Collage): Help pupils understand the internal structure of a volcano by creating cross-section diagrams. They can label the magma chamber, vent, and layers of ash and rock, using different materials for each part in a collage.

Mountains:

Layered Mountainscapes (Painting/Collage): Explore how mountains appear to change colour and texture with distance (atmospheric perspective). Pupils can create layered paintings or collages using different shades of blue and green, with textured materials for the closer peaks.

Mountain Range Silhouettes (Cut Paper/Painting): Focus on the distinctive shapes of mountain ranges against the sky. Pupils can create striking silhouettes using black paper cut-outs or dark paint on a colourful background.

3D Mountain Models (Sculpture/Cardboard Construction): Challenge pupils to build 3D models of different types of mountains (e.g., fold mountains, block mountains) using cardboard, clay, or other materials. They can learn about how these mountains are formed and represent their unique features.

Mountain Habitats (Dioramas): Explore the different plants and animals that live in mountain environments. Pupils can create dioramas showcasing a specific mountain habitat, including the appropriate flora and fauna.
Mapping Mountain Ranges (Drawing/Design): Introduce the concept of contour lines on maps. Pupils can create their own simplified maps of imaginary mountain ranges, using lines to represent different elevations.

Connecting Themes:
Forces of Nature (Mixed Media): Encourage pupils to create pieces that combine elements of earthquakes, volcanoes, and mountains to represent the powerful forces shaping our planet.
Dramatic Landscapes (Photography/Digital Art - if resources allow): If you have access to technology, pupils could explore photographs of these natural phenomena and try to recreate the dramatic lighting and composition in their own digital artwork.

Volcano inspired art – Turner to Warhol
https://www.theguardian.com/artanddesign/gallery/2010/aug/01/art-volcano-warhol-turner
https://www.twinkl.co.uk/search?q=volcano+art&c=244&ca=24&ct=sen&r=teacher

Paul Cezanne (1839-1906) French impressionist and painter painted many pictures that depicted mountains.
Giovanni Segantini (1858 – 1899), an Italian painter known for his large pastoral landscapes of the Alps.

Earthquake art – making patterns from seismographs.

Considerations for Implementation

Provide visual resources: Show photographs and videos of earthquakes, volcanoes, and mountains to inspire their artwork.
Discuss the science: Briefly explain the geological processes behind these phenomena to give their art context.
Encourage experimentation: Let pupils explore different materials and techniques.
Focus on expression: Encourage them to convey the power, beauty, and sometimes destructive nature of these forces.

Computing

Substantive Knowledge

In Key Stage 2 Computing, the **'Earthquakes, Volcanoes & Mountains'** learning theme provides a high-stakes, data-rich context for learning about **simulations, data logging, and communication systems**.
Substantive knowledge here centres on how technology is used to monitor the Earth and keep people safe.

1. Computer Modelling and Simulations
Pupils should understand that computers can "mimic" real-world natural disasters to help us predict what might happen.

Variables and Rules: Knowledge that a simulation (like a volcano eruption model) is built on a set of "if-then" rules. *Example: IF the pressure reaches X, THEN the lava flows at speed Y.*
Predictive Modelling: Understanding that by changing variables (e.g., the viscosity of the lava or the steepness of the mountain), we can see different outcomes without real-world danger.
Limitations: Recognising that a digital model is a simplification and cannot account for every unpredictable "real life" factor.

2. Data Logging and Sensors
This is the "Internet of Things" (IoT) in a geographic context. Pupils need to know how we collect data from places humans cannot safely go.

Sensors: Identifying the types of hardware used to monitor the Earth, such as **Seismometers** (measuring vibrations), **Thermal Cameras** (measuring heat), and **Gas Sensors** (detecting sulphur dioxide).
Remote Data Collection: Knowledge that data is often sent wirelessly from the mountain/volcano to a laboratory via satellites or radio waves.
Intervals and Trends: Understanding that sensors take readings at set intervals (e.g., every 5 minutes) and that software turns these numbers into graphs to show "trends" (e.g., a steady rise in temperature).

3. Communication and E-Safety in Emergencies
Computing plays a vital role in how information is shared during an earthquake or eruption.

Early Warning Systems: Knowledge of how automated systems send "push notifications" or SMS alerts to millions of people in seconds when a seismic threshold is met.
Reliability of Information: Evaluating digital content. In a crisis, how do we distinguish between an official government tweet/alert and a "fake news" post on social media?
Search Engine Sophistication: Using advanced search techniques (Boolean operators like AND/OR) to find specific data on tectonic events, such as finding "Etna AND eruption AND 2024" but excluding "history."

4. Digital Content Creation: Mapping and 3D Modelling
Pupils use specific software tools to represent geographical features.

GIS (Geographic Information Systems): Knowledge that digital maps (like Google Earth) are built in "layers"—one layer for the terrain, one for heat maps, and one for human settlements.
CAD (Computer-Aided Design): Using 3D modelling software (like Tinkercad) to design a "quake-proof" building, understanding how different shapes behave under virtual stress.

Technical Vocabulary for Computing

Term	Definition
Simulation	A program that models a real-life situation to test different outcomes.
Data Logger	An electronic device that records data over time with a sensor.
Input	The data coming from a sensor (e.g., the ground shaking).
Binary	The 1s and 0s that represent all digital data, including seismic graphs.

Disciplinary Knowledge

The **disciplinary knowledge** of **Computing** in the context of **'Volcanoes, Earthquakes, and Mountains'** focuses on developing skills in **data handling, computational thinking, and digital content creation** to model, represent, and communicate information about these physical processes.

1. Data Handling and Computational Thinking

This area focuses on how scientists (like seismologists and volcanologists) use data to monitor, analyse, and predict natural events, and how pupils can perform similar tasks.

Data Collection and Logging:

Understanding that data about earthquakes (magnitude, depth, location) and volcanoes (temperature, gas levels, ground movement) are collected automatically using **sensors** and **data loggers**.

In a practical context, using a data logger or simple sensor (e.g., a thermometer or light sensor) to collect data over time. For example, logging the **"temperature"** of a simulated volcano model over a period.

Data Representation and Analysis:

Collecting, organising, and presenting geographical data related to the theme (e.g., location of volcanoes/earthquakes, mountain heights) using **spreadsheets** or databases.

Creating different types of **charts and graphs** (bar charts, line graphs) to visually represent the data and identify **patterns** (e.g., graphing the number of earthquakes over a decade or the height of mountains).

Understanding how **filtering and sorting** data (e.g., sorting earthquakes by magnitude or date) can help answer geographical questions.

Algorithms and Modelling:

Designing and writing simple **algorithms** (using block-based coding like Scratch) to model or simulate a natural process, such as a volcanic eruption or the movement of tectonic plates .

Identifying the **inputs** (e.g., plate speed, magma pressure) and **outputs** (e.g., eruption size, earthquake magnitude) of their simple models.

2. Digital Systems and Digital Mapping

This focuses on using modern technology to visualise geographical information and understand global systems.

Geographical Information Systems (GIS):

Using **digital mapping tools** (like Google Maps/Earth or an online GIS application) to **locate** globally significant volcanoes (e.g., Mount Fuji), mountain ranges (e.g., The Himalayas), and historical earthquake epicentres.

Exploring **layers of data** on digital maps, understanding that different datasets (like plate boundaries, volcano locations, or population density) can be layered and viewed together to find **relationships** and patterns (e.g., the relationship between plate boundaries and the Ring of Fire).

Internet and Research:

Using search technologies effectively to **safely and critically research** case studies of specific eruptions or earthquakes, learning to evaluate the reliability of different **digital sources** (websites, news reports).

Understanding the role of the **Internet** and **satellites** in sharing real-time data and imagery globally for disaster monitoring and response.

3. Creating Digital Content

This involves using digital tools to communicate their learning about the theme.

Multimedia Presentation:

Creating effective **multimedia presentations** (e.g., using Google Slides or PowerPoint) to explain the formation of a fold mountain or the causes/effects of an earthquake, combining text, images, and embedded video clips.

Digital Storytelling:
Using digital tools (e.g., animation software, stop-motion, or video editing) to create a **public information video** or a **news report** about a historical natural disaster (e.g., the eruption of Vesuvius or the 1906 San Francisco earthquake), focusing on clear communication and audience.

Digital Artwork:
Creating **digital images** or using image editing software to design posters, diagrams (e.g., a cross-section of a volcano), or infographics to communicate complex concepts visually.

Learning Objectives

Computing **learning objectives** for Key Stage 2 pupils focusing on **'Earthquakes, Volcanoes & Mountains'** that blend of understanding, application, and creative use of technology. They categorised for clarity:

Understanding and Information Handling:
Pupils can use search engines effectively to find reliable information about the causes and effects of earthquakes, volcanoes, and the formation of mountains.
Pupils can identify and evaluate different types of digital information (text, images, videos, animations) related to these geographical phenomena.
Pupils can collect and organise information about specific earthquakes, volcanic eruptions, or mountain ranges using digital tools like spreadsheets or simple databases.
Pupils can present their research findings in a clear and organised digital format, such as a slide presentation or a digital poster.

Application and Analysis:
Pupils can use interactive maps and online simulations to explore the distribution of earthquakes, volcanoes, and mountain ranges globally and identify patterns.
Pupils can create simple data visualisations (e.g., bar charts) to compare the magnitude of different earthquakes or the height of various mountains using digital tools.
Pupils can use digital drawing or animation software to illustrate the processes involved in earthquakes, volcanic eruptions, or mountain formation.
Pupils can use digital storytelling tools to create narratives about the impact of these natural events on people and the environment.

Creating and Communicating:
Pupils can design and create an interactive quiz or game about earthquakes, volcanoes, and mountains using coding platforms or presentation software with hyperlinking.
Pupils can collaborate online to create a shared digital resource (e.g., a wiki page or a collaborative document) about a specific aspect of these topics.
Pupils can use video editing software to create a short documentary or news report about a significant earthquake, volcanic eruption, or mountain expedition.
Pupils can use digital communication tools (e.g., email or online forums, with appropriate safety measures) to share their learning and ask questions with others.

E-Safety and Responsible Use:

Pupils can understand the importance of evaluating the reliability of online sources when researching these topics.
Pupils can demonstrate an understanding of safe and responsible online communication when sharing their work or collaborating with others.
Pupils can acknowledge the sources of information and images they use in their digital creations.

Lesson Ideas

This 6-week Medium-Term Plan for Key Stage 2 Computing uses the themes of **"Earthquakes, Volcanoes & Mountains"** to deliver a structured, hands-on computer science curriculum. It outlines parallel tracks for **Lower Key Stage 2** and **Upper Key Stage 2**, showing a clear progression in logical complexity, data sorting, and design independence. Across this unit, pupils build **substantive knowledge** (algorithms, selection logic, variables, database architecture, data capture networks, and 3D coordinate geometry) while exercising **disciplinary knowledge** (thinking like a computer scientist by decomposing systemic problems, debugging broken loops, analysing environmental data patterns, and modelling physical terrain digitally).

Unit Title: Tectonic Code: Simulating, Mapping, and Analysing the Earth's Crust
Duration: 6 Weeks (Approx. 1 hour per week)
Core Software Tools: Scratch (MIT Block Programming Tool), Google Sheets or Microsoft Excel (Spreadsheets), and Tinkercad or vector-design tools.

Weekly Progression Scheme
Week 1: Coding the Volcanic Infiltration (Algorithms & Sequencing)
The Computing Focus: Breaking down mechanical tasks into logical, sequential algorithms.
Substantive Knowledge:
LKS2: Defining an **algorithm** as a precise, step-by-step set of instructions to solve a problem. Understanding that computers execute steps in a strict linear sequence.
UKS2: Defining **decomposition** (breaking a complex system into smaller, manageable parts). Understanding that **efficiency** in code minimises block repetition and processor load.
Disciplinary Knowledge:
Algorithmic Planning: Designing and debugging optimal movement paths on a grid, translating physical movements into unambiguous programming scripts.
Learning Theme Coding Activity: *The Core Rover Infiltration.*
LKS2 (Y3/4): Pupils design an algorithm on paper to steer a robotic rover safely through an underground magma chamber to reach a sensor node. They translate this plan into Scratch using sequential code blocks (move 10 steps, turn 90 degrees).
UKS2 (Y5/6): Pupils decompose a multi-stage cave route. They must write optimised scripts by identifying repeating patterns along the route, utilising loops (repeat until touching goal), and building custom sub-procedures (Define: Turn_Corner) to handle complex junctions cleanly.

Week 2: Seismograph Warnings (Variables & Conditional Logic)
The Computing Focus: Using data variables and conditional logic gates to trigger software events.
Substantive Knowledge:
LKS2: Defining a **variable** as a named space in a computer's memory that stores a value that can change (such as a tremor score).
UKS2: Defining **selection** (using IF... THEN... ELSE logical structures). Using **Boolean operators** (AND, OR, NOT) to evaluate multiple conditional inputs.
Disciplinary Knowledge:

Logical Reasoning & Predictive Trace: Systematically tracing variable values through an active script loop to predict an output and pinpoint hidden logical errors (*debugging*).

Learning Theme Coding Activity: *The Earthquake Alert Simulator.*
LKS2 (Y3/4): In Scratch, pupils create a virtual seismograph. They initialise a variable called Tremor_Level. They program an event loop: IF Tremor_Level > 5, THEN play sound (Siren) AND broadcast (Evacuate). They test how manual slider adjustments trigger the alarm.
UKS2 (Y5/6): Pupils expand the system into a multi-hazard monitoring station. They build complex conditional loops using Boolean criteria: IF Tremor_Level > 7 AND Gas_Sensor = True, THEN sound Red_Alert, ELSE IF Tremor_Level > 4 OR Gas_Sensor = True, THEN sound Amber_Warning, ELSE display (Status Normal). They debug code errors where conditional priorities conflict.

Week 3: Crowdsourcing the Crisis (Data Networks & Cybersecurity)
The Computing Focus: Understanding how data travels across networks and evaluating cybersecurity vulnerabilities.
Substantive Knowledge:
LKS2: Knowing that the **Internet** is a global network of interconnected computers. Understanding that data travels in small chunks called **packets** across a Local Area Network (LAN).
UKS2: Explaining how routers, IP addresses, and DNS (Domain Name System) direct data across the Wide Area Network (WAN). Understanding the threat of **data corruption** or network bottlenecks during a crisis.
Disciplinary Knowledge:
Network Systems Analysis: Mapping data pathways across network node charts, diagnosing transmission failures, and pinpointing single points of system failure.
Learning Theme Coding Activity: *The Disaster Network Simulation.*
LKS2 (Y3/4): Pupils simulate an emergency alert network. They map how a packet containing an earthquake photo travels from an observer's phone, through a local router "node," to an emergency response centre. They test what happens to communication when a local node breaks.
UKS2 (Y5/6): Pupils analyse how global networks handle high traffic during an eruption crisis. They map the journey of a data packet from a volcano observation camera in Iceland to a school laptop in the UK, explicitly detailing the technical jobs of IP addresses, routers, and undersea fibre-optic channels. They write a contingency routing plan to bypass broken data links.

Week 4: The Global Hazard Index (Databases & Spreadsheets)
The Computing Focus: Organising, filtering, and interrogating multi-attribute datasets.
Substantive Knowledge:
LKS2: Defining a flat-file database structure: a **record** (all data about one item) and a **field** (one category of data within a record).
UKS2: Understanding database **queries**. Using conditional search criteria operators (=, >, <) to filter large datasets down to targeted information.
Disciplinary Knowledge:
Data Interrogation: Designing and running advanced database filters to extract meaningful trends from extensive geological records.
Learning Theme Coding Activity: *Interrogating the Global Volcanic Matrix.*
LKS2 (Y3/4): Pupils build a flat-file database spreadsheet cataloguing famous global volcanoes. Fields include: Name, Country, Type (Shield/Stratovolcano), Elevation (m), and Last Eruption Year. They practice sorting fields alphabetically and filtering columns to isolate only "Shield" volcanoes.

UKS2 (Y5/6): Pupils handle an extensive spreadsheet logging major global earthquakes. They execute multi-layered relational query searches using spreadsheet formulas, such as filtering for records where Magnitude > 7.0 AND Depth (km) < 10, analysing the output data to identify the most hazardous zones.

Week 5: Reconstructing Mount Fuji (3D Spatial CAD Design)
The Computing Focus: Manipulating geometric shapes in a 3D digital workspace using coordinate axes.
Substantive Knowledge:
LKS2: Understanding the **X, Y, and Z axes** inside a 3D modelling platform. Knowing how to *group* and *align* basic solid geometric shapes (primitives).
UKS2: Defining **subtractive design** (using "hole" or negative objects to hollow out solid geometries). Understanding scale factor transformations across coordinates.
Disciplinary Knowledge:
Spatial Digital Rendering: Transforming a cross-sectional 2D sketch into a structurally accurate, balanced 3D digital model.
Learning Theme Coding Activity: *Volcano Architectural Rendering.*
LKS2 (Y3/4): Using Tinkercad, pupils build a 3D model of a volcanic mountain. They drag a cone shape onto the grid workspace, scaling its X, Y, and Z dimensions to create realistic slopes, and align a cylinder primitive on top to serve as the main pipe.
UKS2 (Y5/6): Pupils design an accurate stratovolcano model featuring an internal magma chamber. They apply subtractive design: taking a large solid cone, dropping a slightly smaller "hole" cone inside it, and grouping the objects to hollow out the inner mountain. They insert intersecting tubes to model side vents, ensuring the shapes are aligned perfectly along coordinate parameters.

Week 6: The Tectonic Dashboard (Appraisal & Systems Evaluation)
The Computing Focus: Critically evaluating code logic and software system designs.
Substantive Knowledge:
LKS2/UKS2: Recalling core evaluation metrics: *user-interface clarity, execution speed, algorithmic efficiency, and database layout logic*.
Technical Vocabulary: *Algorithm, variable, conditional selection, Boolean logic, data packet, record, field, query, X/Y/Z axes, subtractive design, debugging.*
Disciplinary Knowledge:
Reflective Appraisal & Systems Debugging: Assessing your finished code or design models against a strict technical brief, isolating bugs, and writing structured upgrade logs.
Learning Theme Coding Activity: *The Tectonic Review Panel.*
Pupils pair up to evaluate each other's Scratch simulators, spreadsheet indexes, or 3D volcano models. They complete an interactive debugging log, running code stress tests (e.g., typing invalid numbers into the seismograph to see if the system crashes). Pupils write an explicit software update ticket: *"The simulation script ran correctly, but the nested IF loop was too complicated. I can make the code more efficient by combining the conditions with an AND block."*

Assessment Matrix (Progression Indicators)

Phase	Working Towards	Expected Standard	Greater Depth
Lower Key Stage 2 *(Years 3 & 4)*	• Programs code scripts by trial-and-error, ignoring logical sequencing guidelines. • Inputs data into a variable box but cannot explain how it updates during code execution. • Struggles to navigate files, typing values into the wrong field columns.	• Decomposes a simple movement path into a logical sequence of directional code blocks. • Integrates a variable change loop accurately inside a conditional statement block (IF...THEN). • Traces a data packet's basic journey across a simple hub network. • Sorts and filters flat-file spreadsheets using simple column drop-down selectors. • Scales and groups cone and cylinder primitives cleanly along a 3D grid system.	• Anticipates where a movement script logic will fail before running it, fixing errors instantly. • Connects multiple variables together to trigger multi-layered software alarms. • Explains clearly how data changes travel across local network loops. • Formulates multi-layered query searches across spreadsheet tables independently.
Upper Key Stage 2 *(Years 5 & 6)*	• Writes highly repetitive, messy scripts without using repeat loops or sub-procedures. • Confuses basic Boolean operators, using AND blocks where an OR logic gate is needed. • Loses track of shapes in 3D cad programs, placing primitives at incorrect Z-depths.	• Minimises overall script length by applying nested repeat loops and custom procedural blocks. • Employs multi-layered selection loops combining variables and complex Boolean operators. • Maps internet data packet routing configurations across routers, IP steps, and DNS lookups. • Interrogates an extensive data file using conditional query formulas (>, <, =). • Uses negative hole objects to carve complex internal features out of solid 3D models. • Evaluates software performance objectively,	• Refines functional scripts to maximise processing execution speeds. • Implements multiple live sensor inputs to build an interactive disaster simulation app. • Pinpoints network single-point-of-failure vulnerabilities on a regional mapping diagram. • Discovers data layout errors or gaps in public data sheets, correcting them manually. • Designs highly detailed 3D scale models showing intricate intersecting structural parts. • Drafts professional-standard code upgrade tickets to streamline existing programs.

		documenting bugs clearly using technical vocabulary.	

Other Information, Ideas and Resources

Data Handling & Analysis:

Earthquake Data Exploration:

Idea: Provide pupils with a simplified dataset of past earthquakes (date, location, magnitude). They can use a spreadsheet program (like Google Sheets or Microsoft Excel) to:
Sort the data by magnitude to find the strongest earthquakes.
Filter the data by location to see where earthquakes are most frequent.
Create simple charts (bar graphs showing frequency in different regions, line graphs showing magnitude over time - simplified).
Computing Skills: Data input, sorting, filtering, basic charting.

Volcano Location Analysis:

Idea: Give pupils a list of famous volcanoes with their latitude and longitude. They can use an online mapping tool (like Google Maps) and input the coordinates to locate them. They could then create a simple document or presentation to show the distribution of volcanoes around the world.
Computing Skills: Using online mapping tools, data input (coordinates).

Mountain Height Comparison:

Idea: Provide a table of famous mountains and their heights. Pupils can use a spreadsheet to sort them by height and create a bar chart to visually compare their sizes.
Computing Skills: Data input, sorting, basic charting.

Programming & Algorithms:

Earthquake Shake Simulation:

Idea: Using a block-based programming language like Scratch, pupils could create a simple simulation of the ground shaking during an earthquake. They could control the intensity and duration of the "shake" and perhaps even add visual elements like buildings that wobble.
Computing Skills: Basic programming concepts (events, loops, variables), animation.

Volcanic Eruption Animation:

Idea: In Scratch, pupils could design an animation of a volcanic eruption. They could program different stages: magma rising, the eruption itself with lava and ash, and the aftermath.
Computing Skills: Programming concepts (sequences, events, animation, simple drawing).

Mountain Range Generation (Simple):

Idea: A more advanced activity could involve a very basic algorithm in Scratch where pupils define rules for drawing a simple mountain range (e.g., draw a series of triangles with varying heights and widths).
Computing Skills: Basic algorithms, loops, drawing commands.

Digital Literacy & Research:

Creating Digital Presentations:

Idea: Pupils can research different types of earthquakes, volcanoes, or mountains using safe and age-appropriate online resources. They can then create digital presentations (using PowerPoint, Google Slides, or similar) including text, images, and even short video clips.
Computing Skills: Online research, creating and formatting presentations, image and video insertion.

Interactive Quizzes:

Idea: Pupils can create interactive quizzes about the topic using platforms like Kahoot! or Quizizz. This involves formulating questions and answers and selecting appropriate formats.
Computing Skills: Understanding quiz formats, question writing, using online quiz platforms.
Digital Storytelling:
Idea: Pupils could create a digital story (using tools like Storybird or Book Creator) about a fictional event involving an earthquake, volcano, or a journey through a mountain range. This can combine text, images, and even audio.
Computing Skills: Digital storytelling tools, combining different media.

Computational Thinking Concepts:
Throughout these activities, encourage pupils to think like computer scientists by:
Decomposition: Breaking down complex phenomena (like an earthquake) into smaller, manageable parts for simulation or explanation.
Pattern Recognition: Identifying patterns in earthquake locations or volcanic activity (though simplified for this age group).
Abstraction: Focusing on the key features of an earthquake, volcano, or mountain for a simulation or model.
Algorithms: Creating step-by-step instructions for a program or a process (like locating volcanoes on a map).
Evaluation: Testing their simulations or presentations and identifying areas for improvement.

Interpret information from https://www.usgs.gov/natural-hazards/earthquake-hazardsWhich gives info about earthquakes in real time.
https://www.bgs.ac.uk/geology-projects/earthquake-seismology/

Interpret information from:
https://www.usgs.gov/products/data-and-tools/real-time-data/volcanoes Which gives info about volcanic eruptions in real time.
https://www.bgs.ac.uk/geology-projects/volcanoes/
Use Google Earth to locate tectonic plates, which are visible (San Andreas Fault), volcanoes and mountains.

Create your own model of Everest https://www.rgs.org/schools/teaching-resources/make-your-own-model-of-everest/

Considerations for Implementation

Start Simple: Begin with basic activities and gradually introduce more complex tasks as their skills develop.
Scaffolding: Provide clear instructions, templates, and support materials.
Real-World Connections: Emphasise the real-world relevance of these natural phenomena and how scientists use technology to study them.
Safety: Ensure pupils are using safe and age-appropriate online resources.

Design & Technology

Substantive Knowledge

In Design & Technology, the **'Earthquakes, Volcanoes & Mountains'** learning theme focuses on **structural engineering and human survival**. The **substantive knowledge** centres on how we design products and buildings to withstand the immense forces of nature.

1. Structural Engineering: Quake-Proofing

The most critical **substantive knowledge** in this piece of learning is understanding how to make a rigid structure "flexible" enough to survive an earthquake.

Reinforcement: Knowledge of how to strengthen joints using **triangulation** (bracing) to prevent a building from "pancaking" or shearing.
Base Isolation: Understanding the concept of "floating" a building on flexible pads (like rubber or springs) to decouple it from the shaking ground.
Tuned Mass Dampers: Knowledge of how a heavy weight (pendulum) at the top of a skyscraper can move in the opposite direction of a quake to keep the building balanced.
Material Choice: Comparing the properties of materials—why steel and wood (flexible) often perform better than unreinforced brick or concrete (brittle) during seismic waves.

2. Mechanical Systems: Monitoring and Warning
Building on "Mechanisms," pupils learn how devices can be designed to respond to physical movement.

The Seismograph Mechanism: Understanding how to build a physical model that translates ground movement into a visual record (e.g., using a suspended pen and a moving roll of paper).
Alarms and Switches: Knowledge of how to design a simple "tilt switch" or "vibration sensor" circuit that triggers a warning light or buzzer when a tectonic event is simulated.

3. Product Design: Survival and Shelters
This area focuses on "User-Centred Design" for people living in high-risk zones or for explorers on mountains.

Temporary Shelters: Knowledge of how to design portable, lightweight, and wind-resistant structures (like geodesic domes or specialised tents) for mountain expeditions or disaster relief.
Functionality in Extremes: Designing a "Survival Kit" where every item must be multi-functional, lightweight, and durable (e.g., a hand-cranked radio or a thermal emergency blanket).
Textile Properties: Understanding why specific fabrics are used for mountain gear, focusing on **insulation, waterproofing, and breathability**.

4. Food Technology: Nutrition for Extremes
Linking to the "Mountain" aspect of the theme, pupils look at food prep in environments without kitchens or electricity.

Energy Density: Knowledge of why explorers need "high-energy" foods (fats and sugars) and how to design a balanced meal bar for a mountain climber.
Dehydration and Rehydration: Understanding how removing water from food makes it lighter to carry and how it can be prepared using minimal fuel.

Technical Vocabulary for DT

Term	Definition
Shear Force	A force that pushes parts of a body in opposite directions (common in earthquakes).
Triangulation	The use of triangular shapes to give stability to a structure.
Prototype	A preliminary model of a design used to test a concept or process.
Brittle	A material property where a substance breaks or shatters without bending first.

Why this matters
The "big idea" here is **resilience**. Pupils learn that while we cannot stop an earthquake or a volcano, we can use "design thinking" and engineering to minimise the impact on human life.

Disciplinary Knowledge

The **disciplinary knowledge** for Key Stage 2 **Design & Technology**, when linked to the learning theme **'Volcanoes, Earthquakes, and Mountains,'** focuses on applying **design principles, technical knowledge (structures and mechanisms), and practical skills** to solve real-world problems inspired by these natural events.

🛠 **1. Structures and Mechanisms (Technical Knowledge)**
This is the core DT discipline, focusing on how objects are built and how they function, specifically relating to stability and movement.

Structures:
Understanding the concepts of **strength** and **stability** in relation to structures.
Investigating and testing different **frameworks** (e.g., box frames, triangular supports) to determine which is most **resistant to lateral forces** (like the shaking of an earthquake).
Learning about materials that can absorb movement (e.g., rubber or springs) and applying this knowledge to design structures that are **earthquake-proof**. This involves exploring concepts like **strengthening, stiffening, and reinforcing** materials.
Designing and making models of different types of mountain structures (fold, fault block, volcanic) using appropriate construction methods.

Mechanisms:
Learning about simple mechanical components like **levers, linkages, pivots, and gears**.
Applying mechanisms to simulate the movement of a natural phenomenon, such as designing a **model volcano with a lever or linkage** to make the top 'erupt' or 'open' .
Creating a simple **shaking platform** powered by a **cam mechanism** or eccentric wheel to test the stability of their earthquake-resistant buildings.

💡 **2. Designing and Making**
This involves the practical application of knowledge through the iterative design process.

Design Process:

Investigating and analysing existing structures and products (e.g., modern anti-seismic buildings, historical lava flow barriers).
Developing a **design brief** based on a scenario (e.g., "Design a stable house for a volcanic region" or "Build a model of a new mountain range").
Generating **original ideas** through sketching, modelling, and producing detailed plans/templates.
Selecting appropriate tools and equipment to measure, mark out, cut, shape, and join a range of materials safely and accurately (e.g., using saws for wood, scoring for plastic, or joining with glue/tape/fasteners).

Evaluation:
Evaluating their products against the original design criteria, including the effectiveness of the structure or mechanism.
Testing and modifying their designs based on the results of their structural integrity tests (e.g., making their model building stronger after it collapses on the shaking table).

3. Cooking and Nutrition
While less direct, DT also includes food technology, which can be linked through cultural or geographical contexts.

Food Preparation:
Investigating foods grown in volcanic soil (e.g., coffee, bananas) and preparing a simple dish using these ingredients.
Learning about the importance of safe and hygienic food preparation techniques, especially in regions prone to natural disasters.
Developing **design skills** by presenting food attractively (e.g., making a plate of food resemble a mountain landscape).

Learning Objectives

Overall DT Focus for this Learning Theme:
Understanding Forces and Structures: Exploring how natural forces (tectonic plate movement) can cause significant geological events and how structures can be designed to withstand or represent these.
Problem Solving & Innovation: Applying scientific knowledge to design and make solutions or models.
Material Exploration: Investigating and selecting appropriate materials for specific purposes.
Developing Making Skills: Practicing a range of practical skills, including measuring, cutting, joining, and finishing.
Evaluation & Refinement: Critically assessing their own work and making improvements.

Year 3/4
Understanding the Design Brief:
To identify a simple design need related to earthquakes, volcanoes, or mountains (e.g., a model volcano, a simple earthquake-resistant structure).
To suggest simple ideas for products based on their understanding of the topic.

Generating Ideas & Planning:
To generate ideas for a product through drawing, talking, and simple modelling.
To select and use appropriate tools and materials for a given task with some guidance.

Making & Developing:

To measure, cut, and join materials with increasing accuracy (e.g., cutting cardboard for a mountain model, joining paper for a volcano cone).
To demonstrate basic construction techniques (e.g., folding, gluing, taping).
To explore simple mechanisms related to the topic (e.g., a simple lever to represent plate movement, a tube for a volcano eruption).

Evaluating & Refining:
To describe what they like about their product and what they might change.
To test their product against the original design idea.

Knowledge & Understanding in DT:
To understand that different materials have different properties suitable for specific uses (e.g., strong cardboard for a structure, flexible paper for a lava flow).
To understand how simple structures can be made more stable.

Example Activities for Year 3/4:
Designing and making a simple 3D model of a volcano that can "erupt" (using baking soda and vinegar).
Building a model mountain range using recycled materials.
Designing and testing a simple "earthquake-proof" building on a shaking table.

Year 5/6
Understanding the Design Brief:
To analyse a design brief and identify key features and constraints (e.g., designing an earthquake-resistant building for a specific location, creating an interactive model of plate tectonics).
To research existing products/solutions related to the topic and explain how they work.

Generating Ideas & Planning:
To generate innovative ideas for products, considering user needs and specific features.
To produce detailed plans and drawings, including some annotation, before making.
To independently select and use a wider range of appropriate tools and materials.

Making & Developing:
To measure, mark out, cut, shape, and join materials with precision.
To combine different materials and components effectively to create a functional product.
To explore and use more complex mechanisms (e.g., pulleys, gears, simple electrical circuits for lighting a volcano model or creating movement).
To incorporate decorative and aesthetic features to enhance the product.

Evaluating & Refining:
To critically evaluate their product against the design brief and suggest specific improvements.
To test and modify their product based on the results of their testing.
To understand the concepts of strength, stability, and rigidity in relation to structures.

Knowledge & Understanding in DT:
To understand how structures can be strengthened and stiffened (e.g., triangulation, bracing, foundations).
To understand how simple systems (mechanical or electrical) can be used to create movement or effects.
To consider the environmental impact of material choices.

Example Activities for Year 5/6:
Designing and building an earthquake-resistant model skyscraper, testing its stability on a shake table, and iterating on the design.
Creating an interactive model demonstrating tectonic plate movement, potentially incorporating simple motors or levers.
Designing and making a functional model of a geological feature (e.g., a geyser, a fault line) that incorporates a simple mechanism or electrical circuit.
Developing a "warning system" for a volcano or earthquake, using simple circuits and sensors (e.g., light or sound alarms).

Lesson Ideas

This 6-week Medium-Term Plan for Key Stage 2 DT uses the geographic themes of **"Earthquakes, Volcanoes & Mountains"** to explore structural engineering, mechanical systems, and material behaviours. It features concurrent progression pathways for **Lower Key Stage 2** and **Upper Key Stage 2**, ensuring a clear development from basic physical triangulation to complex kinetic mechanisms and strict design evaluations. Across this unit, pupils build **substantive knowledge** (structural reinforcing, levers, linkage configurations, cams, pulleys, material tolerances, and design criteria) while developing **disciplinary knowledge** (thinking like an engineer by building rapid prototypes, testing structures to destruction, optimising friction variables, and evaluating safety design criteria).

Unit Title: Kinetic Earth: Structural Engineering and Tectonic Mechanisms
Duration: 6 Weeks (Approx. 1.5 – 2 hours per week)
Core Resources: Corrugated cardboard sheets, wooden dowels (4mm and 6mm), triangular corner card braces, elastic bands, hand drills/hole punches, junior hacksaws, PVA glue, component hot glue, masking tape, and assorted test weights.

Weekly Progression Scheme
Week 1: Tectonic Stability – Triangulation & Cross-Bracing
The DT Focus: Analysing existing structures and exploring methods to reinforce weak frame systems.
Substantive Knowledge:
LKS2: Knowing that square frames distort easily under load, whereas **triangles** are naturally rigid shapes used to **reinforce** weak frameworks.
UKS2: Defining structural **compression** (pushing/squashing forces) and **tension** (pulling/stretching forces). Understanding how cross-bracing distributes forces safely across a frame structure during lateral movement.
Disciplinary Knowledge:
Structural Evaluation & Load Stress Testing: Stress-testing material frames to point out engineering failures and modifying designs systematically to boost stability.
Learning Theme Design Activity: *The Earthquake-Proof Observation Tower.*
LKS2 (Y3/4): Pupils look at structural towers in volcanic zones. They assemble basic open square frames using thin wood sticks or square card tubes. They discover how easily the shape distorts sideways until they introduce card triangular corner reinforcements (*gussets*) to anchor the frames rigidly.

UKS2 (Y5/6): Pupils engineer a multi-story skeletal frame tower using dowels. They introduce explicit diagonal cross-bracing wires or strips, analysing how tension vectors counter structural twisting when their base board is physically shaken on a custom testing table.

Week 2: Mechanical Fault Lines – Levers & Linkages
The DT Focus: Designing a functional product with moving parts that meet a specific functional user brief.
Substantive Knowledge:
LKS2: Defining a **lever** (a rigid bar moving on a fixed pivot point) and a **pivot** (the central point around which a mechanism turns). Knowing how a mechanical movement can simulate a geographic shift.
UKS2: Differentiating between **first, second, and third-class levers** based on the positions of the effort, load, and fulcrum. Defining **parallel linkages** and how they change the direction of an initial input force.
Disciplinary Knowledge:
User-Centred Ideation: Translating mechanical behaviours into annotated technical sketches featuring component indicators, clearance markings, and directional force arrows.
Learning Theme Design Activity: *The Convergent Plate Simulator.*
LKS2 (Y3/4): The Design Brief: *"Create a moving mechanical display that shows one tectonic plate sliding beneath another."* Pupils sketch and design a first-class lever system, using a cardboard arm mounted on a split-pin pivot to drop a "crust layer" when an input handle is pushed.
UKS2 (Y5/6): The Design Brief: *"Create a parallel linkage mechanism that moves two mountain ridges upward simultaneously when a single lever handle is pulled."* Pupils design a moving multi-bar card linkage matrix using exact measurement indicators to prevent the mechanism from binding.

Week 3: Fabricating the Prototype – Measuring, Cutting & Jointing
The DT Focus: Developing tool autonomy and material precision during mechanical fabrication.
Substantive Knowledge:
LKS2: Knowing workshop safety rules for card cutters, punches, and cold white adhesives. Understanding how accurate initial measurements prevent component waste.
UKS2: Knowing how to use a junior hacksaw safely to trim timber axles. Understanding how **pulleys** change the plane and direction of rotational force transmission.
Disciplinary Knowledge:
Precision Manufacture: Matching raw materials accurately against scale lines and using hand tools safely to cut clean, repeatable, functional joints.
Learning Theme Design Activity: *Assembling the Tectonic Displays.*
LKS2 (Y3/4): Pupils construct their Week 2 sliding plate prototypes. They measure out card components precisely, cutting straight tracks and securing split-pin pivots with cardboard washers to balance movement against mechanical friction.
UKS2 (Y5/6): Pupils construct their multi-bar mountain linkage mechanisms. They safely use junior hacksaws and bench hooks to cut down wooden support shafts, using structural glue layers to fix the framing blocks squarely to a solid base.

Week 4: Rotary Motion to Volcanic Eruption – Cams & Crunches
The DT Focus: Transforming motion types using complex mechanical control units.
Substantive Knowledge:
LKS2: Knowing that mechanical friction points can slow down or stall moving axles.

UKS2: Understanding how a **cam mechanism** converts rotary motion (turning round) into linear motion (moving up and down). Identifying shapes of cams (eccentric circle, pear-shaped) and how they control the timing of a *follower* rod.
Disciplinary Knowledge:
Mechanical Troubleshooting: Modifying cam alignments and follower shapes systematically to smooth out motion jumps and prevent mechanism jams.
Learning Theme Design Activity: *The Exploding Volcano Machine.*
LKS2 (Y3/4): Pupils fine-tune their sliding plates. If a card ridge catches or jams, they adjust the guide tracks or expand clearance slots, checking that the system runs smoothly three consecutive times.
UKS2 (Y5/6): Pupils introduce a rotary control box beneath a model volcano. They mount an eccentric cardboard cam on a dowel axle. As the handle rotates, the cam lifts a vertical slider rod (*follower*), causing a red "ash cloud" card to rise out of the mountain peak before dropping back down.



UKS2 pupils design cam mechanisms to convert manual rotation into vertical volcanic movements.. Source: Instructables

Week 5: Nutritional Engineering – Emergency Survival Bars
The DT Focus: Modifying a recipe texturally to satisfy a strict nutritional and functional brief.
Substantive Knowledge:
LKS2: Understanding that food production requires strict hygiene routines (*hand washing, sanitising work tops, claw/bridge knife safety holds*).
UKS2: Understanding dietary energy balancing (*complex carbohydrates provide slow-burn fuel; proteins assist structural tissue repair*). Knowing how resource scarcity during geographic crises requires durable, energy-dense food profiles.
Disciplinary Knowledge:
Material Processing & Recipe Formulation: Measuring dry weight metrics precisely using scales and combining ingredients to alter consistency, stickiness, and structural density.
Learning Theme Design Activity: *Formulating the Mountain Rescue Ration.*

LKS2 (Y3/4): Pupils formulate a cold-press oat and dried fruit snack bar for emergency survival bags. They use the *claw hold* to slice dried apricots safely, and mix binder agents (honey/oat milk) to form a dense bar that doesn't crumble when packed.
UKS2 (Y5/6): Pupils design an optimised energy bar for high-altitude rescue teams. They calculate weight portions using digital scales, balancing slow-release oats against protein-rich crushed seeds to maximise calorie density while ensuring the bar remains shelf-stable and compact.

Week 6: The Testing Ground Festival – Critique & Systems Review
The DT Focus: Evaluating an engineered product objectively against an initial design criteria matrix.
Substantive Knowledge:
LKS2/UKS2: Recalling core evaluation metrics: *mechanical reliability, load efficiency, user ergonomics, material cost, and aesthetic look*.
Technical Vocabulary: *Cross-bracing, compression, tension, pivot, fulcrum, parallel linkage, eccentric cam, follower, calorie density, load capacity.*
Disciplinary Knowledge:
Analytical Evaluation: Testing structural designs to failure under heavy load variables, using performance data to target explicit design upgrades.
Learning Theme Design Activity: *The Geocentric Design Fair.*
Pupils pitch their completed structural models, volcanic machines, or energy bars to a review panel. Towers are placed on a shake table and loaded with iron weights to check their load capacities. Cam machines are run continuously to track their mechanical reliability. Pupils log performance metrics in their design books, concluding with a formal evaluation summary: *"My cam follower kept twisting because the guide hole was cut too wide. In a future model, I would add a longer vertical guide tube to keep the rod aligned."*

Assessment Matrix (Progression Indicators)

Phase	Working Towards	Expected Standard	Greater Depth
Lower Key Stage 2 *(Years 3 & 4)*	• Cuts cardboard profiles untidily, ignoring measured dimension marks. • Lever arms catch and lock because split pins are squeezed down too tightly without movement gaps. • Forgets basic hand-washing steps unless actively reminded during food preparation tasks.	• Cuts out card panels cleanly along marked dimensions using a standard metric ruler. • Assembles a functional first-class lever featuring an independent pivot point. • Makes caught edges smooth systematically to make a moving system slide reliably. • Demonstrates bridge and claw knife holds independently when preparing snack ingredients.	• Modifies designs dynamically based on structural failures, adding card gussets to square joints. • Explains mechanical movements clearly: *" Shifting the pivot further up makes the plate drop faster with less effort."* • Adjusts food moisture levels independently to prevent an emergency bar from crumbling.
Upper Key	• Builds frames without checking squareness,	• Integrates diagonal cross-bracing into a frame tower	• Crafts highly efficient structural frames that

Stage 2 *(Years 5 & 6)*	leading to unstable towers that lean. • Parallel linkages bind and lock because axle holes are drilled off-centre. • Mixes food ingredients haphazardly without using scales, making wet or oily bars.	to distribute lateral shear forces. • Employs parallel linkages or cam loops that transform input movements accurately. • Controls a junior hacksaw safely, keeping cuts square and perpendicular to the dowel line. • Evaluates a mechanical project objectively against a multi-point user brief.	optimise strength-to-weight ratios under stress. • Solves mechanical binding in cam shafts by reshaping followers or shifting axle depths. • Justifies material selections logically: *"I picked thick corrugated card for the cam box because it resists bending forces."* • Adjusts ingredient weights mathematically to hit a specific macronutrient goal.

Other Information, Ideas and Resources

Focusing on Earthquakes:
Earthquake-Resistant Structures:
The Challenge: Design and build a model of a building that can withstand shaking.
DT Activities:
Research: Investigate how real buildings are made earthquake-resistant (e.g., reinforced foundations, flexible materials, cross-bracing).
Design: Sketch and plan their building, considering materials and construction techniques.
Making: Construct their model using materials like cardboard, straws, wooden blocks, LEGO, or K'NEX.
Testing: Devise a way to test their building's stability (e.g., shaking a tray it's on, using a vibrating device).
Evaluation: Analyse what worked well and what could be improved.
Curriculum Links: Forces, materials, structures.

Earthquake Early Warning System Model:
The Challenge: Design and create a model of a simple system that could warn people before an earthquake.
DT Activities:
Research: Learn about how early warning systems work (simplified version focusing on detecting initial tremors).
Design: Brainstorm different ways to detect movement and signal a warning (e.g., using a tilt sensor, a rolling ball triggering a switch, a simple circuit with a light or buzzer).
Making: Construct their model using craft materials, simple electronics (if appropriate and safe), or programmable components like Crumble or micro:bit (with adult supervision).
Testing: Experiment with triggering the warning system.
Evaluation: Discuss the effectiveness and limitations of their design.
Curriculum Links: Electricity (simple circuits), sensors, control.

Focusing on Volcanoes:
Working Model Volcano:
The Challenge: Design and build a model volcano that can erupt (safely!).
DT Activities:

Research: Investigate the structure of a volcano and how eruptions occur.
Design: Plan the shape and construction of their volcano using materials like cardboard, plastic bottles, papier-mâché, or clay.
Making: Construct their volcano, ensuring a cavity for the "lava."
Eruption: Experiment with safe ways to simulate an eruption (e.g., bicarbonate of soda and vinegar, coloured water and a pump).
Evaluation: Discuss how realistic their model is and what they learned about volcanic eruptions.
Curriculum Links: Materials, chemical reactions (safe examples).
Volcanic Landscape Diorama with Features:
The Challenge: Design and create a diorama showing different features of a volcanic landscape (e.g., crater, lava flows, ash clouds, volcanic bombs).
DT Activities:
Research: Learn about the different features associated with volcanoes.
Design: Plan their diorama, deciding on the scale and materials.
Making: Construct the landscape using cardboard boxes, Modroc, clay, paint, and other craft materials. They can create textured surfaces to represent lava flows and use cotton wool for ash clouds.
Evaluation: Explain the different features they have included in their diorama.
Curriculum Links: Materials, landscape features.

Focusing on Mountains:
Model Mountain Range with Different Types of Mountains:
The Challenge: Design and build a model mountain range showcasing different types of mountains (e.g., fold mountains, block mountains, volcanic mountains).

DT Activities:
Research: Investigate how different types of mountains are formed.
Design: Plan their mountain range, labelling the different types of mountains.
Making: Construct their model using materials like cardboard, Modroc, clay, or even layered foam. They can use paint and textures to differentiate the mountain types.
Evaluation: Explain how each type of mountain in their model was formed.
Curriculum Links: Landforms, geological processes.
Mountain Rescue Vehicle Design:
The Challenge: Design and model a vehicle that could be used to rescue people in a mountainous region.

DT Activities:
Research: Consider the challenges of navigating mountainous terrain and the needs of rescue teams.
Design: Sketch and plan their vehicle, thinking about features like robust wheels, carrying capacity, communication equipment, and potentially even adaptations for different weather conditions.
Making: Construct a model of their vehicle using materials like LEGO, K'NEX, cardboard, or recycled materials.
Evaluation: Explain the features of their vehicle and how they would help in a mountain rescue.
Curriculum Links: Mechanisms (wheels, axles), structures, purpose-driven design.
Food Tech – Making chocolate soil https://www.bbcgoodfood.com/user/243939/recipe/chocolate-soil-crumbs
Making Rocky Road https://www.bbcgoodfood.com/recipes/easy-rocky-road
Edible Sedimentary rock https://rainydaymum.co.uk/edible-sedimentary-rock-activity/
Edible Igneous Rock https://rainydaymum.co.uk/edible-igneous-rock-activity/

Geology Kitchen https://www.youtube.com/watch?v=pg_jKJFbA2A
How to make edible rocks https://elementalscience.com/blogs/science-activities/67260355-how-to-make-edible-rocks-earth-science-activity

Considerations for Implementation

General DT Considerations for all Projects:
User Needs: Encourage pupils to think about who might be affected by earthquakes, volcanoes, or live in mountainous regions and how their designs could help.
Materials and Tools: Provide a range of appropriate materials and tools, ensuring safe usage and adult supervision.
Joining Techniques: Explore different ways of joining materials (e.g., gluing, taping, slotting, using connectors).
Finishing Techniques: Consider how the models will be finished (e.g., painting, labelling).
Evaluation: Encourage pupils to evaluate their designs against the initial brief and identify areas for improvement.

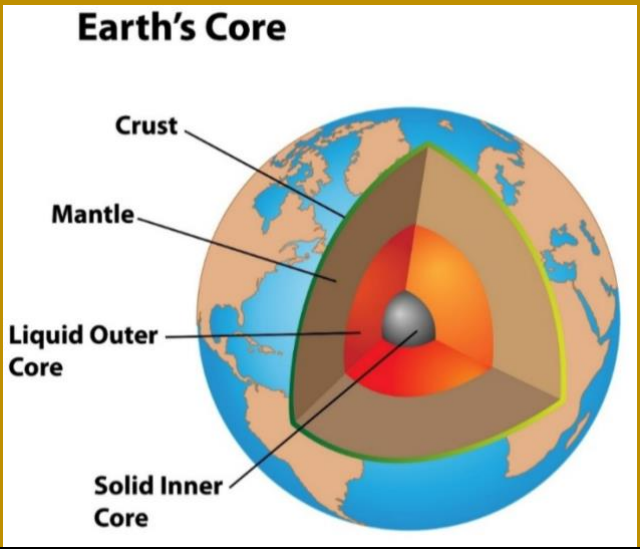
Geography

Substantive Knowledge

In Key Stage 2 Geography, the learning theme of '**Earthquakes, Volcanoes & Mountains'** is the cornerstone of understanding "Physical Geography." The **substantive knowledge** focuses on the internal structure of the Earth and the colossal forces that shape the surface of our planet.

1. The Structure of the Earth
Before understanding disasters, pupils must know what lies beneath their feet.

Layers of the Earth: Knowledge of the four distinct layers:
Inner Core: A solid metal ball of iron and nickel.
Outer Core: Liquid metal that creates Earth's magnetic field.
Mantle: Semi-molten rock (magma) that moves in currents.
Crust: The thin, rocky outer "skin" we live on.
Tectonic Plates: Understanding that the crust is not one solid piece but is broken into massive "plates" that float on the mantle.



2. Plate Tectonics and Plate Boundaries
The "why" behind the movement. Pupils should know that plates move due to **convection currents** in the mantle and interact in three main ways:

Constructive (Divergent): Plates pull apart, allowing magma to rise and create new land (common in the Atlantic Ocean).
Destructive (Convergent): Plates push together. Often, one plate slides under another (subduction), melting into magma and creating volcanoes or folding upwards to create mountains.
Transform (Conservative): Plates slide past each other. They often get "stuck," and the sudden release of built-up pressure causes an earthquake.

3. Volcanoes: Opening a Vent
Pupils should move beyond "lava" and understand the anatomy and types of volcanoes:

Key Features: Identifying the **magma chamber**, **main vent**, **crater**, and **ash cloud**.
Active, Dormant, and Extinct: Knowing the lifecycle of a volcano (currently erupting, "sleeping," or never to erupt again).
The Ring of Fire: Locating the horseshoe-shaped area in the Pacific Ocean where the vast majority of the world's volcanoes and earthquakes occur.

4. Earthquakes: Shaking the Ground
Understanding the measurement and mechanics of seismic activity:

Focus and Epicentre: The **focus** is where the earthquake starts underground; the **epicentre** is the point directly above it on the surface.
Seismic Waves: Knowing that energy travels through the Earth in ripples or waves.
Measurement: Knowledge of the **Richter Scale** (magnitude) and the use of a **Seismometer**.
Tsunamis: Understanding that underwater earthquakes can displace massive amounts of water, creating devastating waves.

5. Mountains: Folding and Faulting
Mountains are the "wrinkles" of the Earth. **Substantive knowledge** includes:

Fold Mountains: Formed when two plates collide and the land buckles upwards (e.g., the Himalayas).
Volcanic Mountains: Formed by the accumulation of erupted lava (e.g., Mount Fuji).
Climate and Altitude: Understanding that as you go higher up a mountain, the temperature drops and the vegetation changes (the "tree line").

Key Geographical Vocabulary

Term	Definition
Magma	Molten rock located *underneath* the Earth's surface.
Lava	Molten rock that has broken *through* to the surface.
Magnitude	The measurement of the "size" or energy of an earthquake.

Topography	The arrangement of the natural and physical features of an area.

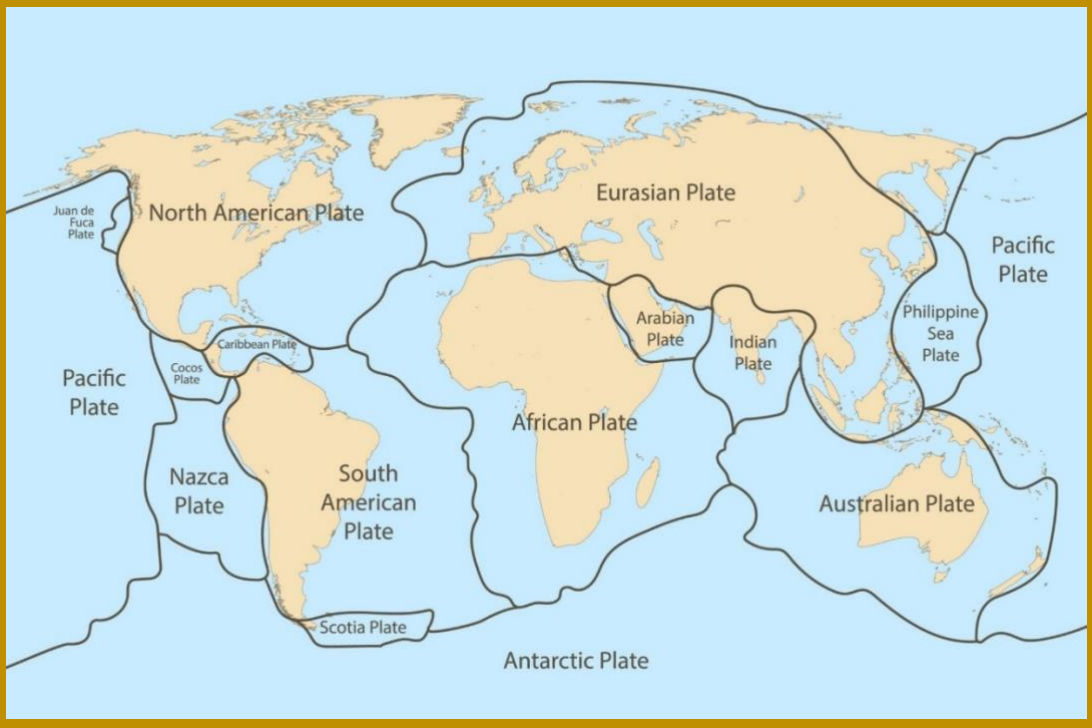
Disciplinary Knowledge

The **disciplinary knowledge** for Key Stage 2 **Geography** in relation to **'Volcanoes, Earthquakes, and Mountains'** focuses on three key areas: **Locational Knowledge**, **Physical Processes**, and **Geographical Skills & Enquiry**. This learning theme is foundational for understanding the dynamic nature of the Earth.

🗺️ 1. Locational Knowledge and Distribution

Geographers focus on *where* things are and *why* they are there.

Global Context: Locating the **seven continents** and **five oceans** to provide a global context for the physical features being studied.
Distribution Patterns: Identifying that volcanoes and earthquakes are **not randomly distributed** but tend to occur along **tectonic plate boundaries**.
Globally Significant Locations: Naming and locating major examples of:
Mountain Ranges (e.g., The Himalayas, The Alps, The Andes).
Volcanoes (e.g., Mount Vesuvius, Mount Fuji, Mauna Loa).
The **"Ring of Fire"** as a globally significant zone of frequent volcanic and seismic activity.



Place Knowledge: Studying a **case study** of a specific eruption (e.g., Mount Vesuvius, Pompeii, or Montserrat) or earthquake (e.g., San Francisco 1906, Nepal 2015) to understand its physical and human impact on a particular place.

🌍 2. Physical Processes and Formation

This is the **physical geography** element, focusing on *how* these features are formed.

Earth Structure: Understanding the basic structure of the Earth in **layers**: the inner core, outer core, mantle, and **crust**.

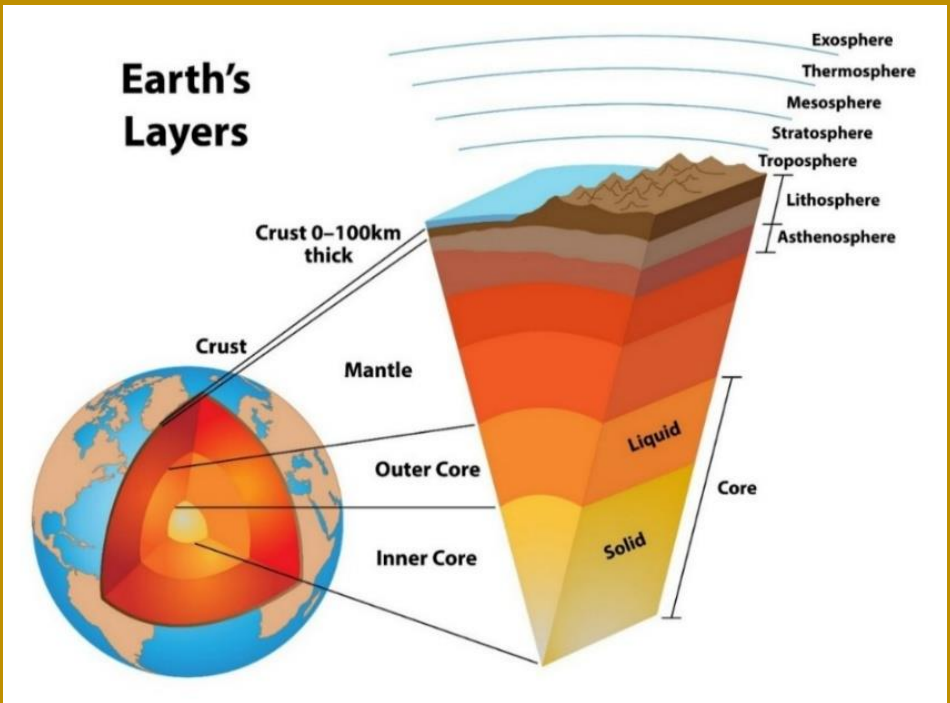


Plate Tectonics (Basic): Understanding that the Earth's **crust** is broken into enormous pieces called **tectonic plates** (continental and oceanic) that fit together like a jigsaw puzzle and are constantly, albeit very slowly, moving.
Formation of Features: Understanding the connection between plate movement and the landforms:
Mountains: Formed when two plates **collide** (converge), forcing the ground upward to create **Fold Mountains** (the most common type).
Volcanoes: Formed at cracks in the Earth's crust (usually at plate boundaries) where **magma** (molten rock beneath the surface) escapes as **lava** (molten rock on the surface), ash, and gas. Understanding the difference between **active, dormant, and extinct** volcanoes.
Earthquakes: Caused by the sudden release of built-up **pressure** or energy when plates move towards or past each other, causing the ground to **shake** along a fault line or plate margin.
Consequences: Knowing the primary (immediate) and secondary (long-term) effects of these natural hazards on the natural environment (e.g., tsunamis, landslides, ash clouds) and the economy/society.

📊 3. Geographical Skills & Human Interaction

Geographers use specific tools to investigate and communicate their findings, and they analyse the relationship between humans and the physical world.

Mapping Skills: Using **atlases**, globes, and **digital maps** (like Google Earth) to locate features using **latitude and longitude** and/or **grid references**. Interpreting **relief maps** (showing height) to identify mountainous regions.
Data Analysis: Understanding how geographers/scientists (e.g., **volcanologists** and **seismologists**) use data (e.g., the **Richter Scale** for earthquakes) and maps to identify **patterns** in the distribution and frequency of events.
Human/Physical Interaction:
Hazards & Mitigation: Considering the ways people **respond** to the dangers (e.g., search and rescue, evacuation) and **adapt** to living in hazardous areas (e.g., building earthquake-resistant structures, using fertile volcanic soil for farming).
Reasons for Settlement: Understanding the **benefits** of living near volcanoes (e.g., fertile soil, geothermal energy, tourism) despite the risks.

Learning Objectives

The geography **learning objectives** should focus on developing their locational knowledge, understanding of physical processes, and geographical skills.

Locational Knowledge:
Locate major mountain ranges and volcanoes: Pupils should be able to identify and locate some of the world's significant mountain ranges (e.g., Himalayas, Alps, Andes, Rockies) and major volcanoes (e.g., Mount Everest, Mount Fuji, Mount Vesuvius) using maps, atlases, and globes.
Identify earthquake zones: Understand that earthquakes tend to occur in specific areas of the world, often linked to plate boundaries (e.g., the "Ring of Fire").
Understand global distribution: Recognise the patterns in where these physical features are found across the world.

Understanding of Physical Geography Processes:
Earth's structure: Begin to understand the basic layers of the Earth (crust, mantle, core) and how the Earth's crust is made of large pieces called tectonic plates.
Plate tectonics (basic understanding): Understand that the slow movement of these tectonic plates causes earthquakes, volcanoes, and the formation of mountains. While detailed scientific explanation of plate tectonics can wait for KS3, pupils should grasp the concept of plates moving and interacting.
Mountain formation: Learn about how mountains are formed, with a basic understanding of fold mountains (e.g., from plates pushing together).
Volcano formation and eruption: Understand how volcanoes are formed and why they erupt, including the concept of magma, lava, and ash. Differentiate between active, dormant, and extinct volcanoes.
Earthquake causes and effects: Understand that earthquakes are caused by the sudden movement of tectonic plates, leading to the shaking of the ground. Be aware of the immediate and some long-term effects of earthquakes.
Related phenomena: Be introduced to other related phenomena, such as tsunamis, as a consequence of underwater earthquakes.
Human and Physical Interactions:
Impact on human life: Explore the positive and negative impacts of living in areas with volcanoes, earthquakes, and mountains (e.g., fertile soil, geothermal energy, tourism benefits vs. dangers and destruction).
Adaptation and mitigation: Learn about how people adapt to and try to mitigate the risks associated with these natural hazards (e.g., earthquake-resistant buildings, monitoring volcanoes).
Reasons for settlement: Discuss why people choose to live in potentially hazardous areas.

Geographical Skills and Fieldwork (though fieldwork for this topic may be limited to local observation/simulations):
Map skills: Use maps, atlases, globes, and digital mapping to locate and describe features.
Vocabulary: Use appropriate geographical vocabulary related to mountains, volcanoes, and earthquakes (e.g., magma, lava, crater, peak, valley, epicentre, fault line, tectonic plates).
Interpreting information: Extract information from a range of geographical sources, including maps, diagrams, photographs, and simple graphs.
Communication: Present geographical information in a variety of ways (e.g., drawings, models, short reports, presentations).

Lesson Ideas

This 6-week Medium-Term Plan for Key Stage 2 Geography utilises the learning theme of **"Earthquakes, Volcanoes & Mountains"** to teach core concepts in physical and human geography. It runs concurrent learning structures for **Lower Key Stage 2** and **Upper Key Stage 2**, showing a clear progression in data interpretation, spatial analysis, and independent geographical reasoning. Across this unit, pupils build **substantive knowledge** (the layers of the Earth, tectonic plates, types of mountains, volcanic structures, seismic monitoring, and human risks) while actively sharpening their **disciplinary knowledge** (thinking like a geographer by analysing digital maps, graphing statistics, evaluating settlement risks, and interpreting environmental field data).

Unit Title: The Dynamic Earth: Tectonic Processes, Topography, and Human Settlements
Duration: 6 Weeks (Approx. 1 hour per week)
Core Resources: Student atlases, world map templates, climate data cards, cross-sectional earth diagrams, seismological dataset tables, and local topography map printouts.

Weekly Progression Scheme
Week 1: Journey to the Centre of the Earth (Structure & Tectonic Plates)
The Geographical Focus: Using maps to identify the Earth's structural layers and tectonic boundaries.
Substantive Knowledge:
LKS2: Identifying the three main layers of the Earth: **crust, mantle, and core**. Knowing that the crust is broken into massive sections called **tectonic plates**.
UKS2: Defining the *lithosphere* and *asthenosphere*. Distinguishing between **continental crust** (thick and light) and **oceanic crust** (thin and dense). Identifying the Ring of Fire.
Disciplinary Knowledge:
Map Interpretation & Border Tracking: Cross-referencing standard political boundaries with tectonic plate maps to pinpoint countries sitting directly on high-risk faults.

Learning Theme Activity: *Mapping the Fractured Crust.*
LKS2 (Y3/4): Pupils construct a labelled, color-coded diagram showing a slice through the Earth's layers. They look at a world map showing plate borders, shading countries like Iceland and Japan to show that they sit directly on the cracks between plates.
UKS2 (Y5/6): Pupils analyse a tectonic map overlay. They identify major plates (e.g., Eurasian, Pacific, African) and map out the **Ring of Fire**, writing a geographical profile explaining how the movement of oceanic plates beneath continental plates makes this region an active hazard zone.

Week 2: When Plates Collide (Types of Mountains & Fold Ridges)
The Geographical Focus: Explaining how physical forces shape different mountain landforms.
Substantive Knowledge:
LKS2: Defining a **mountain** (a landform extending significantly above the surrounding terrain, typically over 600m). Knowing that **fold mountains** form when plates push land upward.
UKS2: Categorising the three main types of mountains: **Fold Mountains** (Alps/Himalayas), **Fault-Block Mountains** (Sierra Nevada), and **Dome Mountains** (Black Hills). Identifying contour line spacing on topographic maps.
Disciplinary Knowledge:
Topographic Profile Analysis: Reading contour lines on a map to calculate slope steepness and constructing basic cross-sectional sketches of different mountain types.
Learning Theme Activity: *The Mountain Profile Directory.*
LKS2 (Y3/4): Pupils look at photos of the Himalayas. They model fold mountain creation by pushing two flat pieces of foam or cloth together until they ripple upward, discovering how tectonic pressure folds the crust. They locate the world's highest peaks using an atlas.
UKS2 (Y5/6): Pupils examine topographic maps showing mountain ranges. They learn that close contour lines mean steep cliffs and wide lines mean gentle valleys. They compare the folded ridges of the Alps with the steep blocks of a fault-block system, drawing accurate line profiles to match the map contours.

Week 3: Inside the Vent (Volcano Classification & Features)
The Geographical Focus: Locating volcanoes globally and classifying their physical structures.
Substantive Knowledge:
LKS2: Differentiating between **magma** (molten rock underground) and **lava** (molten rock on the surface). Identifying basic parts of a volcano: *magma chamber, main pipe, crater*.
UKS2: Classifying volcanoes by shape: **Shield Volcanoes** (wide and flat, like Mauna Loa) and **Composite/Stratovolcanoes** (steep and layered, like Mount Fuji). Defining active, dormant, and extinct states.
Disciplinary Knowledge:
Categorisation & Data Logging: Classifying physical shapes by analysing descriptions of lava viscosity and eruption styles, logging the data systematically.
Learning Activity: *Volcanic Structure Files.*
LKS2 (Y3/4): Pupils create a detailed cross-sectional diagram of a stratovolcano, tracing the path of magma up from the chamber to the open crater. They add text boxes defining basic volcanic terminology.
UKS2 (Y5/6): Pupils are given data sheets on global eruptions, focusing on the thickness (viscosity) of the lava. They write a comparative report explaining why thin, runny lava creates wide shield volcanoes, while thick, sticky lava leads to explosive composite volcanoes with steep, alternating layers of ash and stone.
Week 4: Tracking the Tremors (Earthquake Causes & Seismic Data)
The Geographical Focus: Using data grids to locate earthquake epicentres and interpret their intensity.
Substantive Knowledge:
LKS2: Knowing that earthquakes occur when friction causes sliding tectonic plates to get stuck, building up pressure until they suddenly slip. Defining the **epicentre**.
UKS2: Differentiating between the **focus** (point of origin underground) and the **epicentre** (point directly above on the surface). Understanding how the **Richter Scale** (magnitude) and **Mercalli Scale** (observed damage) measure impact.
Disciplinary Knowledge:
Seismic Data Analysis: Plotting raw earthquake magnitude data points onto graph grids and analysing patterns to locate high-frequency risk zones.

Learning Theme Activity: *The Seismology Lab Tracker.*
LKS2 (Y3/4): Pupils simulate an earthquake using two rough wooden blocks. They rub them together, noting how they catch and stick before snapping forward sharply, demonstrating how friction stores and releases destructive energy.
UKS2 (Y5/6): Pupils receive real seismological log data sheets detailing recent tectonic events. They plot the depth of the focus against the magnitude on a scatter graph, evaluating whether deeper earthquakes lead to more or less damage on the surface, and comparing the scientific Richter readings with historical Mercalli descriptions.

Week 5: Living on the Edge (Human Geography & Dangerous Settlements)
The Geographical Focus: Evaluating the human reasons why populations choose to live near natural hazards.
Substantive Knowledge:
LKS2: Understanding that people settle near active volcanoes due to clear human and environmental benefits, such as **fertile volcanic soil** for farming or **geothermal energy**.
UKS2: Defining **risk management, mitigation, and building adaptation** (e.g., dampeners, flexible frames). Analysing how a country's economic development level affects its ability to survive a tectonic disaster.
Disciplinary Knowledge:
Cost-Benefit Settlement Analysis: Balancing physical danger variables against economic benefits to judge the overall suitability of a settlement site.
Learning Theme Activity: *The Settlement Suitability Audit.*
LKS2 (Y3/4): Pupils match local resources to human needs in volcanic zones. They write a paragraph explaining why a farming family might choose to live near an active volcano despite the risks, highlighting the benefits of nutrient-rich ash soil and tourist income.
UKS2 (Y5/6): Pupils contrast the impacts of two similar-sized earthquakes striking two different global locations (e.g., a wealthy city with strict building codes vs. a developing nation with informal housing). They analyse data tables showing casualty rates and infrastructure damage, writing a geographical essay on how economic wealth shapes a community's resilience to disasters.

Week 6: The Fieldwork Survey – Local Topography & Synthesis
The Geographical Focus: Gathering primary field data to understand elevation changes and summarising learning.
Substantive Knowledge:
LKS2/UKS2: Recalling that all human settlements adapt their infrastructure to the shapes and limitations of their local physical landscape.
Technical Vocabulary: *Tectonic plate, crust, relief, contour line, stratovolcano, shield volcano, epicentre, focus, magnitude, mitigation.*
Disciplinary Knowledge:
Field Data Collection & Comparative Analysis: Gathering slope elevation data using simple hand tools, mapping the local landscape, and comparing local land variations with tectonic scales.
Learning Theme Activity: *The School Slope Mapping Expedition.*

Pupils step outside the classroom to map out local changes in elevation. Using simple card levels or measuring tapes, they measure the gradient changes of a sloped area on the school grounds. Back in the classroom, they turn their field measurements into a clear slope cross-section, concluding with a comparative summary: *"While our local hill was formed by gradual erosion rather than active plate subduction, its steep contour lines dictate where paths and buildings are placed, showing how human infrastructure always adapts to local physical relief."*

Assessment Matrix (Progression Indicators)

Phase	Working Towards	Expected Standard	Greater Depth
Lower Key Stage 2 *(Years 3 & 4)*	• Identifies the Earth's surface as solid, missing the concept of moving plates. • Confuses magma with lava and cannot identify the basic features of a volcano vent. • Selects a settlement site based on appearance, ignoring apparent physical hazards.	• Locates Greece, Iceland, and Japan on a map, explaining that they sit on plate boundaries. • Explains how fold mountains form when two tectonic plates push against each other. • Points out the difference between magma inside a volcano and lava on the surface. • Describes how plate friction creates earthquakes. • Outlines why volcanic ash creates fertile farming soil for nearby settlements.	• Explains how tectonic plate shifts cause long-term adjustments to global geography. • Traces the links between plate movements, deep ocean trenches, and mountain chains. • Explains how individual volcanic shapes reveal the type of eruption that built them. • Deduces why communities remain in risk zones by balancing economic benefits against dangers.
Upper Key Stage 2 *(Years 5 & 6)*	• Struggles to read coordinate or grid lines on tectonic maps. • Identifies mountains as high ground but cannot explain the specific processes that shaped them. • Misreads contour intervals, assuming wide lines mean steep cliffs.	• Pinpoints specific plate margins globally, connecting them to the Ring of Fire. • Identifies and draws profiles for fold, dome, and fault-block mountain ranges. • Intertwines lava viscosity variables with the formation of shield and composite volcanoes. • Plots seismic data graphs accurately, showing the differences between focus and epicentre locations.	• Evaluates the spatial impacts of plate movements on both human cities and physical landscapes. • Reads complex topographic maps fluidly, calculating slope gradients from contour values. • Critiques geological data to predict which volcanic shapes pose the greatest risk to populations. • Synthesises complex geographical relationships: *"Economic investment in building mitigation matters*

		• Analyses how building design choices mitigate tectonic hazards in wealthy cities. • Gathers and graphs primary elevation data during local fieldwork tasks.	*just as much as earthquake magnitude when predicting overall disaster impacts."*

Other Information, Ideas and Resources

1. Mountains: Fold, Fault, and Form
Before diving into volcanoes, it's vital for pupils to understand how the Earth's crust moves.
The "Snack Tectonics" Experiment: Use layers of soft bread or playdough to demonstrate how **Fold Mountains** (like the Himalayas) are formed. When pupils push the layers from both sides, they see the "land" buckle and rise.

The Contour Challenge: Teach pupils how to read mountain heights on a map. Have them build a mountain out of clay, then "slice" it horizontally at 2cm intervals. They can trace these slices onto paper to create their own **contour map**.
Mountain Climates: Discuss why the peak of a mountain is colder than the base. Use a simple demonstration of air pressure using a sponge to show how air "thins out" as it rises.

2. Volcanoes: The Earth's Chimneys
Move beyond just the "baking soda volcano" to show pupils the different types of eruptions and structures.

Viscosity Races: To explain why some volcanoes are steep (stratovolcanoes) and others are flat (shield volcanoes), have a "lava race." Pour water, syrup, and ketchup down a slope. The thicker the liquid (**viscosity**), the more it piles up rather than flowing away.
Structure of the Earth: Have pupils create "Earth Orbs." Use a hard-boiled egg to represent the Earth: the shell is the **Crust**, the white is the **Mantle**, and the yolk is the **Core**. Crack the shell to show how tectonic plates "float" on the mantle.
The Pompeii Story: Integrate History by looking at the AD 79 eruption of Mount Vesuvius. Use primary sources (letters or archaeological finds) to discuss the impact on human settlements.

3. Earthquakes: Shaky Foundations
This topic focuses on the power of seismic waves and how humans adapt.

Jelly Engineering: Give pupils toothpicks and marshmallows and ask them to build the tallest tower possible. The catch? They must build it on a tray of **jelly**. Gently shake the tray to simulate an earthquake and see which structures survive.
Seismograph Creation: Attach a felt-tip pen to a heavy weight suspended by a string over a piece of paper. As one pupil pulls the paper slowly, another shakes the table. The "scribbles" illustrate how we measure the intensity of tremors.
The "Ring of Fire" Mapping: Provide a world map with major plate boundaries. Have pupils plot the locations of famous historical earthquakes and volcanoes using coordinates. They will quickly see the pattern that forms the "Ring of Fire."

Key Vocabulary Table
Ensure these terms are displayed on your "Working Wall" throughout the unit:

Term	Simple Definition
Tectonic Plates	Giant puzzle pieces that make up the Earth's outer shell.
Magma	Molten rock located *underneath* the Earth's surface.
Lava	Molten rock that has broken through to the surface.
Epicentre	The point on the Earth's surface directly above an earthquake.
Dormant	A "sleeping" volcano that hasn't erupted in a long time.

Teacher Tip: Use the "Three States of Matter" science link here. Explain how rock can be solid, but when heated to extreme temperatures, it becomes a liquid (magma/lava) and releases gases.

Here is a structured sequence for a deep-dive lesson on Volcanoes.
1. The Anatomy of an Eruption
Start by looking at what's happening "under the hood." Pupils often think a volcano is just a mountain that explodes, but it's actually a complex plumbing system.
Activity: Label the Giant: Draw a large volcano cross-section on the playground in chalk. Have pupils run to different parts as you call them out: **Magma Chamber, Main Vent, Secondary Vent, Crater,** and **Ash Cloud.**
The "Balloon" Concept: **Use a balloon partially filled with air and flour. As you squeeze it, the pressure builds until the "crust" (the balloon) breaks. It's a messy but effective way to show how pressure forces magma upward.**

2. Classification: Active, Dormant, or Extinct?
Not all volcanoes are "angry." Teaching the lifecycle of a volcano helps pupils understand geological time.

The Human Timeline:
Active: A person running (erupting or likely to erupt).
Dormant: A person sleeping (hasn't erupted in 10,000 years but still could).
Extinct: A person who has moved away (unlikely to ever erupt again).
Sorting Task: Give pupils "Fact Files" of famous volcanoes (Etna, Fuji, Yr Wyddfa) and have them sort them into these three categories. *Note: Most pupils are shocked to learn that Mount Snowdon (Yr Wyddfa)in Wales was once an active volcano!*

3. The "Why" - Tectonic Plates
This is where you connect volcanoes to the Earth's movement. Focus on **Constructive** and **Destructive** plate boundaries.

The Biscuit Boundary: Use two custard cream or Oreo biscuits on a bed of whipped cream (the mantle).
Constructive: Pull the biscuits apart. The cream "magma" rises to fill the gap (forming shield volcanoes like those in Iceland).
Destructive: Push them together until one slides under the other (forming explosive stratovolcanoes like Mount St. Helens).

4. The Human Impact: Why Live There?
A key KS2 objective is understanding why people choose to live near dangerous volcanoes.
The Pros & Cons Chart:
Cons: Danger to life, ash ruining crops, lava destroying homes.
Pros: Fertile soil (volcanic ash is great for farming), **Geothermal energy** (hot water/electricity), and **Tourism** (people pay to see them!).
Roleplay: Divide the class into a "Town Council." Half want to evacuate because the volcano is "rumbling," and the other half want to stay because the soil is perfect for their vineyards.

5. The Grand Finale: The Eruption
While the classic baking soda and vinegar experiment is a staple, you can "level up" the learning:
The Gas Experiment: Instead of just a "fizz," put the vinegar/baking soda mixture in a small plastic bottle with a cork or a film canister. The build-up of **carbon dioxide** will eventually pop the lid off, simulating the explosive pressure of a real eruption.

Suggested Resource List:
Visuals: Google Earth is brilliant for "flying" into the craters of Mount Vesuvius or Mauna Loa.
Samples: If you can get your hands on a piece of **Pumice** stone, it's a great "hook"—it's the only rock that floats!
Understanding the Basics:
What are they? Begin by introducing each concept individually.
Earthquakes: Use simple analogies like a wobbly table or a sudden jolt. Explain that the Earth's ground shakes. Show short, age-appropriate video clips of earthquake effects (without being too scary).
Volcanoes: Describe them as mountains with openings where hot rock, ash, and gases can escape. Use visual aids like diagrams and pictures of different types of volcanoes. Perhaps even create a simple model volcano that erupts (baking soda and vinegar!).
Mountains: Explain that they are very high landforms, much taller than hills. Discuss how they can be formed.
Where in the world? Use a world map to locate areas prone to earthquakes (e.g., the "Ring of Fire"), volcanic activity (similar regions), and major mountain ranges (e.g., the Himalayas, the Andes, the Alps). This helps pupils see the global distribution.

Why do they happen? (Simplified) Introduce the idea of the Earth's surface being made up of large pieces (plates) that move.
Earthquakes: Explain that when these plates rub or bump against each other, it can cause the ground to shake.
Volcanoes: Explain that molten rock (magma) from inside the Earth can rise to the surface through weaknesses or cracks in the plates.
Mountains: Briefly touch upon how mountains can form when these plates collide and push upwards.

Interactive Activities:
Mapping: Provide outline maps and have pupils label earthquake zones, volcanoes, and mountain ranges. They could use different colours or symbols.

Model Making:
Earthquake simulation: Use a tray of sand or blocks to demonstrate how shaking can cause movement and damage.
Volcano model: As mentioned before, a simple chemical reaction model is always a hit. They could also build static models using clay or papier-mâché.
Mountain building: Use layers of playdough or modelling clay to show how folding and faulting can create mountains.

Role-playing:
Earthquake preparedness: Discuss what to do during an earthquake and have pupils act out "drop, cover, and hold on."
Volcano evacuation: Imagine a nearby volcano is erupting and discuss the steps people would need to take to stay safe.
Research projects: Assign different volcanoes or mountain ranges for pupils to research and present to the class. This could include their location, features, and any interesting facts or stories.
Creative writing: Encourage pupils to write stories, poems, or diary entries from the perspective of someone experiencing an earthquake, living near a volcano, or climbing a mountain.
Data handling: Provide simple data about the magnitude of earthquakes or the height of mountains and have pupils create bar charts or pictograms.

Deeper Exploration (depending on age and stage):
Types of volcanoes: Introduce shield, composite, and dome volcanoes and their different characteristics.
Effects of earthquakes and volcanoes: Discuss the positive (e.g., fertile volcanic soil) and negative (e.g., destruction, loss of life) impacts.
Mountain environments: Explore the different climates, plants, and animals found in mountain regions.
Famous examples: Focus on well-known earthquakes (e.g., the Nepal earthquake), volcanoes (e.g., Mount Vesuvius), or mountain ranges (e.g., the Rocky Mountains) to make the topics more concrete.

***Resources*:**
Books: Age-appropriate non-fiction books with clear explanations and engaging visuals.
Videos: Short documentaries or animations explaining the processes.
Websites: Educational websites designed for pupils with interactive games and information.
Maps and globes: Essential for visualising locations.
Photographs and illustrations: To bring the concepts to life.
https://teachers.thenational.academy/units/mountains-volcanoes-and-earthquakes-e02a

What are mountains?
https://www.bbc.co.uk/bitesize/topics/z849q6f/articles/zyhf3j6
Tallest mountain in the UK https://www.bbc.co.uk/bitesize/topics/zttbcmn/articles/zxbk8hv
Let's explore The Alps https://www.bbc.co.uk/bitesize/topics/z3fycdm/articles/zb3ywty
What are volcanoes?
https://www.bbc.co.uk/bitesize/topics/z849q6f/articles/zfhf3j6
What are earthquakes?
https://www.bbc.co.uk/bitesize/topics/z849q6f/articles/z7gkwnb
Mountains and Volcanoes – what are they?
https://www.thenational.academy/teachers/programmes/geography-primary-ks2/units/mountains-and-volcanoes-what-where-and-why/lessons/mountains-and-their-features#slide-deck

Considerations for Implementation

History

Substantive Knowledge

In History, the learning theme of **Earthquakes, Volcanoes & Mountains** shifts from the "how" (Science/Geography) to the "who" and "when." **Substantive knowledge** focuses on the significant historical events that changed the course of civilisations and how human interpretations of these disasters have evolved over time.

1. Significant Historical Events: Case Studies
Pupils should know about specific disasters that left a permanent mark on the historical record.
Pompeii and Herculaneum (AD 79): The most famous volcanic eruption in history.
Knowledge: The eruption of **Mount Vesuvius** and how the ash preserved a "snapshot" of Roman life, from graffiti to food.
Evidence: Understanding how archaeologists use the remains to learn about Roman social hierarchy, diet, and city planning.
The Minoan Eruption (Thera/Santorini, c. 1600 BC):
Knowledge: One of the largest volcanic events in human history, which contributed to the decline of the Minoan civilisation.
Legacy: Its potential link to the legend of the "Lost City of Atlantis."

The 1906 San Francisco Earthquake:
Knowledge: A turning point in modern history that led to the birth of seismology as a formal science and changes in urban fire safety.

2. Changing Interpretations: Myth vs. Science
A key historical skill is understanding how people in the past explained natural phenomena before modern geology existed.

Ancient Explanations: Knowledge that many cultures viewed disasters as the work of gods.
Examples: The Greek god **Poseidon** was the "Earth-Shaker"; the Romans believed **Vulcan** worked in a forge beneath Mount Etna.
Shift to Enlightenment: Knowledge of the transition from "divine punishment" theories to the 18th and 19th-century realisation that the Earth is dynamic and changing (linking to the work of early geologists like Charles Lyell).

3. History of Exploration and Mountaineering
Mountains were historically seen as barriers or sacred places. **Substantive knowledge** covers the shift toward "conquering" them.

The Golden Age of Alpinism: Knowledge of why humans began climbing mountains in the 1800s for scientific discovery and national pride.
Edmund Hillary and Tenzing Norgay (1953): The historical significance of the first confirmed ascent of **Mount Everest** and how technology (oxygen tanks, specialised gear) made it possible.

4. Evidence and Sources

Pupils should understand *how* we know about ancient disasters.

Primary Sources: Studying eyewitness accounts, such as **Pliny the Younger's** letters describing the eruption of Vesuvius (the origin of the term "Plinian eruption").
Oral Histories: Knowledge of how indigenous cultures (e.g., in the Pacific Northwest or New Zealand) passed down stories of "great shakings" or "fire mountains" through oral tradition long before written records.
Stratigraphy: Understanding that layers of volcanic ash in the ground act like a "timeline" for historians to date other events.

Historical Vocabulary

Term	Definition
Archaeology	The study of human history through the excavation of sites and analysis of artefacts.
Preservation	How volcanic ash or mud can keep objects or buildings in their original state for centuries.
Legend	A traditional story sometimes popularly regarded as historical but not authenticated.
Chronology	The arrangement of events or dates in the order of their occurrence.

Why this matters
The "big idea" is **human-environment interaction**. History shows us that while the Earth's movements are indifferent to humans, they have the power to topple empires, preserve entire cities, and inspire the world's most enduring myths.

Disciplinary Knowledge

The **disciplinary knowledge** for Key Stage 2 **History**, in relation to the learning theme **'Volcanoes, Earthquakes, and Mountains,'** focuses on understanding **how these events have shaped human societies, influenced historical change, and been recorded and interpreted across different time periods.**

🏛 **1. Investigating Historical Events and Civilisations**
This focuses on using primary and secondary sources to study how natural disasters have intersected with human history.

Case Studies in Time: Investigating specific historical events where volcanoes or earthquakes had a catastrophic impact, particularly focusing on:
The **eruption of Mount Vesuvius in AD 79** and its effect on the Roman settlements of **Pompeii and Herculaneum**. This allows pupils to study **Roman life** just before the disaster and the processes archaeologists use to understand the past.
Other significant events like the **Lisbon Earthquake of 1755** or the **Krakatoa eruption of 1883**, examining the immediate and long-term **social, economic, and political consequences** of the disaster.
Civilisation and Environment: Understanding how the formation of mountains (e.g., the Andes) or the fertile soils around volcanoes (e.g., in Italy or Indonesia) have **influenced where and why civilisations developed** and how they adapted their way of life (e.g., farming, building materials) to the landscape.

Chronology and Time Periods: Placing these events within a **historical timeline**, understanding that while geological change is slow, natural disasters can cause rapid, catastrophic changes to human history.

✍ 2. Historical Interpretation and Evidence

This is about developing critical thinking around historical sources related to the learning theme.

Evidence Analysis: Examining **historical evidence** about the events, such as:
Primary Sources: The accounts of survivors (e.g., **Pliny the Younger's** letters describing the Vesuvius eruption) or archaeological evidence (ruins, artefacts, human remains).
Secondary Sources: Later interpretations, historical drawings, and written accounts.
Changing Interpretations: Understanding that people in the past, without modern scientific knowledge, often interpreted these events through the lens of **myth, religion, or superstition** (e.g., believing an eruption was the wrath of a god). Comparing these older interpretations with modern scientific understanding.
Reliability: Considering the **reliability** of historical sources, such as whether a survivor's account is biased or how accurate a 19th-century illustration of an eruption might be.

⏳ 3. Continuity and Change

This focuses on tracking how human response and technology have evolved over time in the face of natural hazards.

Response to Disaster: Comparing how different societies (ancient vs. modern) **responded** to the same types of disasters in terms of warning, evacuation, and rebuilding.
Technology: Tracing the development of **technology** used to predict and mitigate the effects of volcanoes and earthquakes (e.g., from simple observational techniques to modern seismology and satellite monitoring), showing a progression of scientific understanding and capability.
Legacy: Understanding the **legacy** of these events—how they are remembered today through museums, historical sites, and the lasting impact on art, literature, and culture.

Learning Objectives

History **learning objectives** for KS2 pupils about **'Earthquakes, Volcanoes & Mountains',** focusing on the historical impact and understanding rather than purely scientific concepts (which would fall more under science/geography). These objectives aim to connect the physical phenomena with human history and perception. **Overarching Historical Question:** How have earthquakes, volcanoes, and mountains shaped human lives and societies throughout history?

Understand the long-term impact of geological events:
Identify and describe how ancient civilisations (e.g., Pompeii and Vesuvius, Minoan civilisation and Thera/Santorini) were affected by volcanic eruptions or earthquakes.
Explain how archaeological evidence helps us understand these past events and their consequences (e.g., preserved towns, artefacts, changes in settlement patterns).

Explore human responses to natural disasters over time:
Compare and contrast how people in different historical periods (e.g., Roman times vs. the present day) understood and responded to earthquakes and volcanic eruptions.
Give examples of how natural disasters have led to migration, rebuilding efforts, or changes in societal structures in the past.

Investigate historical perceptions and beliefs:
Research and present examples of myths, legends, or religious beliefs from different cultures that attempted to explain earthquakes, volcanoes, or the formation of mountains.
Discuss how these beliefs influenced people's actions and understanding of the world.

Recognise the role of mountains in human history:
Locate and name significant mountain ranges and discuss their historical importance (e.g., as natural barriers, trade routes, or places of spiritual significance).
Describe how mountainous environments have shaped the way people have lived and developed communities throughout history (e.g., farming, defence, isolation).

Use historical sources to learn about geological events:
Identify and interpret a range of historical sources (e.g., eyewitness accounts from ancient texts, illustrations, maps, archaeological findings) related to earthquakes, volcanoes, and mountains.
Ask questions about historical evidence and suggest what it might tell us about past events and attitudes.

Develop historical vocabulary:
Use historically specific terms such as 'archaeology', 'civilisation', 'ancient', 'mythology', 'migration', 'settlement', 'primary source', 'secondary source'.

Differentiation:
Lower KS2: Focus on one or two key historical examples (e.g., Pompeii). Provide structured information and clear prompts for historical inquiry.
Upper KS2: Encourage independent research into different historical examples. Promote critical thinking about historical evidence and different interpretations of events. Challenge pupils to make connections between geological phenomena and broader historical themes (e.g., power, belief, technology).

Lesson Ideas

This 6-week Medium-Term Plan for Key Stage 2 History uses the learning theme of **"Earthquakes, Volcanoes & Mountains"** to explore historical inquiry. By framing geological phenomena through human impact, archaeology, and shifting cultural beliefs, pupils build **substantive knowledge** (the destruction of Pompeii, early Roman socio-cultural life, changing mythic explanations, ancient primary sources, and preservation) while sharpening their **disciplinary knowledge** (thinking like a historian by analysing primary source reliability, identifying continuity and change across civilisations, mapping cause and consequence, and interpreting archaeological remains).

Unit Title: Shifting Empires: Human Responses to Tectonic Catastrophes in the Ancient World
Duration: 6 Weeks (Approx. 1 hour per week)
Core Resources: Images of Pompeii and Herculaneum excavations, translated primary excerpts (Pliny the Younger, Seneca), historical timeline templates (BCE/CE), artefact analysis worksheets, and cross-cultural myth cards.

Weekly Progression Scheme
Week 1: The Timeline of Tremors (Chronology & Eruption Intervals)
The Historical Focus: Placing significant geological events within a wider chronological framework and tracking empire timelines.
Substantive Knowledge:

LKS2: Placing the eruption of **Mount Vesuvius (79 CE)** accurately on a linear timeline. Understanding the difference between **BCE** and **CE**.
UKS2: Synchronising the Vesuvius disaster with the height of the Pax Romana under Emperor Titus. Tracking how historical periodisation anchors disasters within political eras (e.g., Minoan eruption of Santorini during the Bronze Age).
Disciplinary Knowledge:
Chronological Framework Mapping: Building comparative timelines to cross-reference tectonic disasters with the rise and fall of concurrent ancient civilisations.
Learning Theme Activity: *The Tectonic History Line.*
LKS2 (Y3/4): Pupils construct a personal timeline, plotting 79 CE alongside their existing knowledge of Roman Britain. They count forward from zero to calculate how many centuries ago the eruption occurred.
UKS2 (Y5/6): Pupils build a multi-layered imperial timeline. They map the Minoan eruption of Thera/Santorini (1600 BCE) against the New Kingdom of Egypt, analysing how sudden physical destruction can destabilise trade routes across concurrent regional empires.

Week 2: Voices from the Ash (Analysing Primary Written Sources)
The Historical Focus: Extracting historical facts from eyewitness written testaments while questioning author perspective.
Substantive Knowledge:
LKS2: Defining a **primary source** (evidence created by someone who witnessed the event first-hand). Identifying Pliny the Younger as the sole eyewitness writer of the Vesuvius eruption.
UKS2: Evaluating the difference between letters, formal historical chronicles, and secondary historical retellings. Understanding how an author's personal status shapes their account.
Disciplinary Knowledge:
Source Interrogation & Cross-Examination: Extracting factual evidence from translated ancient texts while pointing out gaps or embellishments in the author's perspective.
Learning Theme Activity: *The Letters of Pliny.*
LKS2 (Y3/4): Pupils read simplified extracts of Pliny the Younger's letters describing a cloud shaped like a "Mediterranean pine." They underline factual details showing how people tried to escape (e.g., tying pillows to their heads to guard against falling pumice).
UKS2 (Y5/6): Pupils cross-examine Pliny's letters to Tacitus. They analyse his vocabulary choices, identifying where his desire to portray his uncle (Pliny the Elder) heroically might affect the factual accuracy of the timeline. They list the strengths and limitations of relying on a single eyewitness source for a major historical event.
Week 3: Frozen in Time (Archaeological Inferences at Pompeii)
The Historical Focus: Making valid historical inferences from physical artefacts and architectural remains.
Substantive Knowledge:
LKS2: Knowing that the volcanic ash and mud preserved buildings, frescoes, and everyday objects, acting as a time capsule of Roman life.
UKS2: Understanding the archaeological methods used by Giuseppe Fiorelli in the 19th century (creating plaster casts of voids in the ash). Knowing how organic remains reveal Roman diet, trade, and social classes.
Disciplinary Knowledge:
Archaeological Inference: Analysing physical artefact remains systematically to deduce the daily habits, occupations, and wealth profiles of ancient citizens.
Learning Theme Activity: *The Curator's Artefact Audit.*

LKS2 (Y3/4): Pupils inspect photographs of preserved items (e.g., a carbonised loaf of bread, a dog's collar, carbonised carbon jars). They fill out an artefact record sheet, stating *"What I can see"* and *"What this tells me about daily life in a Roman town."*
UKS2 (Y5/6): Pupils study the spatial layouts of excavated villas (like the House of the Faun) alongside market areas. They analyse food waste found in sewers (e.g., fish bones, fig seeds) to draw evidence-based conclusions about wealth distribution, comparing the diets of wealthy elite patricians with poorer plebeian citizens.

Week 4: Wrath of the Gods (Shifting Cultural Explanations)
The Historical Focus: Exploring how ancient societies used belief systems to explain natural phenomena before modern science.
Substantive Knowledge:
LKS2: Knowing that ancient civilisations explained natural events through mythology (e.g., Mount Etna as the forge of Vulcan; Poseidon as the "Earth-Shaker" causing earthquakes).
UKS2: Tracing how classical philosophy (e.g., Aristotle's theory of trapped underground winds causing tremors) marked a transition from pure mythic explanations (*mythos*) toward proto-scientific reasoning (*logos*).
Disciplinary Knowledge:
Historical Perspective Analysis: Empathising with historical actors by evaluating their decisions based on their contemporary worldview, rather than judging them using modern scientific knowledge.
Learning Theme Activity: *The Mythic Bureau.*
LKS2 (Y3/4): Pupils read stories of Vulcan working beneath the crust. They design an ancient warning scroll warning citizens that the god is angry, using their understanding of Roman mythology to explain the smoke and tremors.
UKS2 (Y5/6): Pupils analyse Seneca the Younger's writings on the Campania earthquake of 62 CE. They write a philosophical dialogue debating whether a massive tremor is a deliberate punishment from the gods or a natural consequence of the Earth's internal air currents, showcasing the complexity of Roman thought.

Week 5: The Catastrophe at Minoan Thera (Cause & Geopolitical Consequence)
The Historical Focus: Tracing the long-term, far-reaching political consequences of a sudden physical event.
Substantive Knowledge:
LKS2: Knowing that the volcanic eruption on the island of Thera (Santorini) damaged the surrounding maritime civilisations.
UKS2: Understanding the **Minoan Eruption** as a catalyst for systemic collapse. Explaining how tsunamis, crop failures, and destroyed fleets weakened Minoan dominance, allowing Mycenaean Greeks to seize regional control.
Disciplinary Knowledge:
Cause & Consequence Analysis: Separating short-term physical effects (e.g., ash falls) from long-term political domino effects (e.g., economic collapse and military invasion).
Learning Theme Activity: *The Fall of the Sea Kings.*

LKS2 (Y3/4): Pupils map out the direct physical path of the Thera eruption. They draw arrows showing how ash clouds and massive sea waves hit coastal towns, writing a simple cause-and-effect map of the immediate crisis.
UKS2 (Y5/6): Pupils act as political advisers to a Bronze Age palace. They analyse trade logs showing a drop in copper shipping alongside evidence of crop failures. They write a historical report tracking how the physical disaster triggered economic decline, eventually inviting foreign invasion and shifting the balance of power across the Mediterranean.

Week 6: The Museum Panel – Continuity, Change & Synthesis
The Historical Focus: Summarising legacy lines and comparing ancient disaster management with the modern world.
Substantive Knowledge:
LKS2/UKS2: Recognising that while technology changes, the core human challenges of settling near hazardous mountains and rebuilding after crises remain continuous throughout history.
Technical Vocabulary: *BCE, CE, Primary Source, Secondary Source, Eyewitness, Artefact, Excavation, Inference, Geopolitics, Pax Romana.*
Disciplinary Knowledge:
Continuity and Change Evaluation: Synthesising historical evidence across different eras to isolate what changed fundamentally and what remained continuous in human behaviour.
Learning Theme Activity: *The Global Legacy Project.*
Pupils design a display panel for a history museum. They must select one core theme from their 6-week study (e.g., *How we record disasters*, *How we explain tremors*, or *How cities are preserved*).
LKS2 focuses on comparing Pliny's accounts with modern reporting tools.
UKS2 writes detailed analysis blocks comparing how ancient Rome handled the refugees of Pompeii under Emperor Titus with modern humanitarian disaster responses. They conclude the term by showcasing their panels, demonstrating their command of historical reasoning and the human story behind the changing crust.

Assessment Matrix (Progression Indicators)

Phase	Working Towards	Expected Standard	Greater Depth
Lower Key Stage 2 *(Years 3 & 4)*	• Places historical dates randomly, failing to understand that BCE counts backward. • Copies descriptions from texts word-for-word without identifying them as a primary source.	• Plots the date 79 CE correctly relative to the wider Roman era on a timeline. • Extracts simple factual details about the Vesuvius disaster from Pliny's translated text.	• Calculates long time gaps between deep historical eras accurately. • Explains why an eyewitness account is historically valuable compared to a modern textbook summary.

	• Confuses modern scientific facts with ancient mythological beliefs.	• Makes clear, basic historical inferences about Roman daily life by looking at preserved artefacts. • Explains how the ancient Greeks and Romans used gods like Vulcan or Poseidon to explain volcanic activity.	• Combines multiple pieces of artefact evidence to build a picture of ancient Roman life. • Connects changing religious ideas directly to historical adjustments in daily behaviour.
Upper Key Stage 2 *(Years 5 & 6)*	• Treats different ancient empires as isolated stories, failing to see concurrent links. • Accepts historical texts as absolute facts, ignoring potential author biases. • Outlines major structural shifts in simple terms of "luck" rather than systemic historical causes.	• Cross-references global tectonic disasters across synchronous, multi-empire timeline charts. • Interrogates primary sources systematically, outlining their strengths and limitations as evidence. • Uses complex archaeological remains to form hypotheses about ancient social status levels. • Explains the intellectual shift from mythic stories (*mythos*) to proto-scientific reasoning (*logos*). • Traces how natural disasters create economic domino effects that lead to military shifts. • Evaluates patterns of continuity and change in human responses to natural disasters across centuries.	• Critiques current periodisation systems, suggesting better ways to organise historical timelines. • Cross-examines conflicting primary sources, analysing how political status coloured the authors' views. • Reconstructs intricate historical situations from fragmented archaeological data fields. • Analyses how political systems manipulate religious beliefs during public emergencies. • Formulates sophisticated summaries: *"The Thera eruption didn't destroy the Minoans directly; it dismantled the economic trade network that kept their military power alive."*

Other Information, Ideas and Resources

Earthquakes:

Ancient Myths and Legends: Explore how different ancient civilisations explained earthquakes before scientific understanding. For example:

Greek Mythology: Poseidon, the god of the sea, was also believed to cause earthquakes when he was angry.

Japanese Mythology: The Namazu, a giant catfish, was thought to live beneath the islands of Japan, and its thrashing caused earthquakes.

Norse Mythology: Some believed that Loki, bound beneath the earth, would struggle, causing the ground to shake.

Activity Idea: Pupils can research one of these myths and create a presentation, drawing, or short play to explain the ancient belief.

Historical Accounts of Significant Earthquakes: Look at how major historical earthquakes impacted people and societies:
The Lisbon Earthquake of 1755: This devastating earthquake had a profound impact on Portugal and European thought, leading to discussions about God's role and the rise of scientific inquiry.
The San Francisco Earthquake of 1906: Discuss the destruction, the fires that followed, and the rebuilding efforts. Look at historical photographs and accounts.
Activity Idea: Pupils can create a timeline of significant historical earthquakes, noting the date, location, and major impacts. They could also write a news report from the time of one of these events.

Early Scientific Understanding: Briefly touch upon how people started to understand the science behind earthquakes, moving away from purely mythological explanations. You could mention early seismographs and the development of plate tectonics (in a simplified way).
Activity Idea: Show simple diagrams illustrating the movement of tectonic plates and explain how this can cause the ground to shake.

Volcanoes:
Ancient Roman Accounts of Mount Vesuvius: The eruption of Mount Vesuvius in 79 AD and the destruction of Pompeii and Herculaneum is a powerful historical story.
Pliny the Younger's Letters: Introduce pupils to the first-hand accounts of Pliny the Younger, who described the eruption. This can bring the event to life.
Archaeological Discoveries: Discuss how the ash preserved the cities, giving us a snapshot of Roman life. Show pictures of the ruins and artefacts.
Activity Idea: Pupils can write a diary entry as if they were a resident of Pompeii or Herculaneum during the eruption, or a letter based on Pliny the Younger's accounts.
Volcanic Activity in Different Cultures: Explore how different cultures viewed and interacted with volcanoes:
Hawaiian Mythology: Pele, the goddess of fire and volcanoes, is a central figure in Hawaiian legends.
Indigenous Perspectives: Discuss how people living near volcanoes might have understood and respected their power.
Activity Idea: Pupils can research the mythology surrounding volcanoes in different cultures and compare them.

Early Scientific Observation: Discuss early attempts to understand volcanic eruptions.
Activity Idea: Look at old illustrations or drawings of volcanoes and discuss how people might have formed their understanding based on what they could see.
Mountains:
Mountains in Ancient Civilisations: Explore the role of mountains in the development of ancient societies:
Natural Barriers: How did mountains act as borders and influence the movement of people and armies? (e.g., the Alps and the Roman Empire).
Sacred Sites: Many ancient cultures considered mountains to be sacred places, the homes of gods or spirits (e.g., Mount Olympus in Greece).
Resources: How did mountains provide resources like timber, minerals, and water?
Activity Idea: Pupils can research a mountain range and how it influenced the history of the surrounding region.

Early Exploration and Mountaineering: Discuss the history of people exploring and climbing mountains:
Early Motivations: What drove people to climb mountains in the past (scientific exploration, surveying, adventure)?
Famous Early Climbers: Introduce key figures and early expeditions (age-appropriately).
Activity Idea: Pupils can create a timeline of significant mountain ascents or research the challenges faced by early mountaineers.

Mountains and Trade Routes: Explore how mountain passes have historically been important for trade and communication (e.g., the Silk Road crossing mountain ranges).
Activity Idea: Pupils can map out historical trade routes that crossed mountains and discuss the difficulties and importance of these routes.

Connecting the Themes:
The Impact on Human Settlements: Discuss how earthquakes, volcanoes, and mountains have shaped where people live and how they build their communities.
Fear and Wonder: Explore how these natural phenomena have inspired both fear and awe throughout history.
The Development of Scientific Understanding: Trace the journey from mythological explanations to scientific understanding of these powerful forces.
Look at impact of famous volcanic eruptions and earthquakes.
https://www.usgs.gov/faqs/which-volcanic-eruptions-were-deadliest

San Andreas Fault and how it has changed overtime.

Famous Explorers who have scaled mountains like Everest & K2,

Tenzing Norgay – 1914-1986
George Mallory 1886-1924
Sir Edmund Hilary 1919-2008
Look at the history of Mountain Rescue and how that was set up. https://www.mountain.rescue.org.uk/

Earthquake Rescue – how people are found http://news.bbc.co.uk/1/hi/world/americas/8459653.stm

National Search and Rescue https://www.nsarda.org.uk/

Considerations for Implementation

Modern Foreign Languages
Substantive Knowledge
In Key Stage 2 MFL, the link to **'Earthquakes, Volcanoes & Mountains'** is primarily built through **comparative geography, weather vocabulary, and international disaster response**. Since many of the world's most famous tectonic landmarks are located in French, Spanish, or German-speaking regions, pupils use the language to describe these environments and the people who live there. **1. Geographical Landmarks and Proper Nouns** Pupils should learn to identify and locate major landforms using the target language.

Famous Sites: Knowing the names and locations of key features (e.g., *Les Alpes* in France, *Le Puy de Dôme*—a dormant volcano, or *El Popocatépetl* in Mexico).
Gender and Prepositions: Understanding how to use the correct articles for mountains (e.g., in French, *la montagne* is feminine, while *le volcan* is masculine).
Map Skills in the Target Language: Learning the points of the compass (Nord, Sud, Est, Ouest) to describe where a mountain range is located within a country.

2. Descriptive Language and Environment
Pupils expand their vocabulary by describing the physical appearance and "mood" of these landscapes.

Adjectives: Learning words for "high" (haut/alto), "dangerous" (dangereux/peligroso), "hot" (chaud/caliente), and "cold" (froid/frío).
Weather and Altitude: Describing the specific conditions found on mountains, such as "It is snowing" (*Il neige* / *Nieva*) or "It is windy" (*Il fait du vent* / *Hace viento*).
Comparison: Using "more than" or "less than" to compare heights (e.g., *Le Mont Blanc est plus haut que...*).

3. Global Perspective: The Ring of Fire
This learning theme allows pupils to look at Spanish and French-speaking territories outside of Europe.

Francophonie/Hispanophonie: Knowledge that many active volcanoes are in French-speaking islands (like *La Réunion*) or Spanish-speaking countries in Central and South America (the Andes).
Cultural Impact: Understanding that different cultures have different words for these events, sometimes influenced by indigenous languages (e.g., "Volcán" in Spanish or the influence of Quechua in the Andes).

4. Emergency Instructions and Signs
A practical application of MFL is understanding how people communicate during a natural disaster.

Imperative Verbs: Learning simple commands used in emergency drills, such as "Look!" (*Regardez!*), "Listen!" (*Écoutez!*), or "Go!" (*Allez!*).
Signage: Recognising international symbols and their labels in the target language, such as "Danger" (*Peligro*) or "Emergency Exit" (*Sortie de secours*).

Comparative Vocabulary Table

English	French	Spanish
The Mountain	La montagne	La montaña
The Volcano	Le volcan	El volcán
The Earthquake	Le tremblement de terre	El terremoto
Ash	La cendre	La ceniza

Snow	La neige	La nieve

Why this matters
The "big idea" here is **global citizenship**. By learning the language associated with these events, pupils realise that these geographical phenomena are shared global experiences that require international cooperation and communication.

Disciplinary Knowledge

The **disciplinary knowledge** for Key Stage 2 **Modern Foreign Languages (MFL)**, when linked to the learning theme **'Volcanoes, Earthquakes, and Mountains,'** focuses on using the topic as a vehicle for **developing practical communication skills, exploring different cultures, and building vocabulary** in the target language (e.g., French, Spanish, German).

1. Oracy and Communication Skills
The main focus is on practical, spoken use of the language.

Vocabulary Acquisition: Learning and practising core vocabulary related to the learning theme:
Landforms: Mountain, volcano, hill, valley, rock, river (la montagne, le volcan, la colline, la vallée, la roche, le fleuve).
Geological Terms: Earth, lava, fire, water, explosion, shaking (la terre, la lave, le feu, l'eau, l'explosion, le tremblement).
Adjectives: Big/small, hot/cold, dangerous, tall (grand/petit, chaud/froid, dangereux, haut).
Simple Sentence Structures: Using the new vocabulary within basic grammatical structures to describe the features:
Describing location: "The volcano is in France." (Le volcan est en France.)
Describing existence: "There is a mountain." (Il y a une montagne.)
Describing appearance: "The lava is red and hot." (La lave est rouge et chaude.)
Asking and Answering Questions: Developing simple question-and-answer exchanges about the topic: "Where is the volcano?" "Is it dangerous?" (Où est le volcan? Est-ce qu'il est dangereux?)
Presentation Skills: Practising presenting information about a famous volcano or earthquake case study (e.g., Mount Vesuvius) using short, prepared sentences in the target language.

2. Intercultural Understanding and Connections
MFL connects the learning theme to the culture and geography of the countries where the language is spoken.

Target Language Geography: Identifying countries where the target language is spoken and which also feature significant volcanoes, earthquakes, or mountain ranges.
Example (Spanish): Locating volcanoes/mountains in South American countries (Andes) or Central America (Popocatépetl in Mexico).
Example (French): Locating mountains (Alps) or French overseas territories with volcanoes (Reunion Island).
Cultural Context: Exploring how these natural features are referenced in the culture of the target language country:

Learning about **folktales or legends** associated with local mountains or volcanoes (e.g., Mount Fuji in Japanese culture, although Japanese is less common in KS2).
Looking at **songs, poems, or simple texts** about the natural landscape in the target language.
Language Awareness: Recognising and comparing geographical and scientific vocabulary in the target language and English (e.g., noticing the similarity between volcan and volcano).

✍ **3. Literacy and Reading Skills**
Applying the new vocabulary in simple written contexts.

Reading Comprehension: Reading and understanding short, simple paragraphs or captions about volcanoes or mountains written in the target language.
Basic Writing: Writing short descriptions, labels, or captions for diagrams related to the learning theme using the acquired vocabulary (e.g., labelling a drawing of a volcano with cratère, lave, fumée).

Learning Objectives

MFL **learning objectives** for Key Stage 2 pupils, focusing on French, Spanish, or German (you can adapt for other languages), broken down by typical MFL skill areas, with the **'Earthquakes, Volcanoes & Mountains'** learning theme woven in:

General MFL Objectives for KS2 (as per National Curriculum):
Understand and respond to spoken language.
Speak with increasing confidence, fluency and spontaneity, finding ways of communicating what they want to say, including through discussion and asking questions.
Write at varying length, for different purposes and audiences, using the variety of grammatical structures that they have learnt.
Discover and develop an appreciation of a range of writing in the language studied.

Specific MFL Objectives for Key Stage 2 (French/Spanish/German) related to 'Earthquakes, Volcanoes & Mountains':
I. Listening and Understanding (Compréhension Orale / Comprensión Oral / Hörverstehen)

Objective 1: Pupils can understand and identify key vocabulary related to geographical features (e.g., *la montagne/la montaña/der Berg*, *le volcan/el volcán/der Vulkan*, *la terre/la tierra/die Erde*, *la roche/la roca/der Stein*, *le tremblement de terre/el terremoto/das Erdbeben*) when spoken by the teacher or in simple audio clips.
***Example Activity**:* Listen to a short description of a volcano and point to a picture of it.
Objective 2: Pupils can follow simple instructions given in the target language related to drawing or labelling parts of a volcano or mountain range (e.g., "Dessine une montagne." / "Dibuja una montaña." / "Zeichne einen Berg.").
***Example Activity**:* Listen to instructions for drawing a volcano erupting and follow along.
Objective 3: Pupils can understand short, repetitive phrases and questions about natural phenomena (e.g., "Qu'est-ce que c'est?" / "¿Qué es esto?" / "Was ist das?") and simple facts (e.g., "Le volcan est grand." / "El volcán es grande." / "Der Vulkan ist groß.").
Example Activity: Listen to descriptions and identify if they are talking about an earthquake, volcano, or mountain.

II. Speaking (Expression Orale / Expresión Oral / Sprechen)

Objective 1: Pupils can correctly pronounce and use a range of vocabulary related to the topic (e.g., names of specific famous volcanoes/mountains if applicable, descriptive adjectives like *grand/grande/groß*, *petit/pequeño/klein*, *actif/activo/aktiv*, *dangereux/peligroso/gefährlich*).
Example Activity: Practice saying new vocabulary using flashcards.
Objective 2: Pupils can ask and answer simple questions about earthquakes, volcanoes, and mountains (e.g., "Où est le volcan?" / "¿Dónde está el volcán?" / "Wo ist der Vulkan?").
Example Activity: Partner work asking and answering questions about pictures of different geographical features.
Objective 3: Pupils can describe a picture or simple diagram related to the topic using short sentences (e.g., "C'est un volcan." / "Es un volcán." / "Das ist ein Vulkan. Il est rouge." / "Es rojo." / "Er ist rot.").
Example Activity: Describe a picture of a volcanic eruption using a few learned phrases.
Objective 4: Pupils can express simple opinions or preferences about natural phenomena (e.g., "J'aime les montagnes." / "Me gustan las montañas." / "Ich mag Berge.") and perhaps use a simple phrase for expressing danger (e.g., "C'est dangereux." / "Es peligroso." / "Es ist gefährlich.").
Example Activity: Discuss which natural phenomenon they find most interesting or scary.

III. Reading (Compréhension Écrite / Comprensión Escrita / Leseverstehen)

Objective 1: Pupils can recognise and read familiar words and short phrases related to earthquakes, volcanoes, and mountains.
Example Activity: Match words to pictures of different landforms.
Objective 2: Pupils can read and understand simple captions or labels on diagrams of volcanoes or mountains.
Example Activity: Label a diagram of a volcano with French/Spanish/German words.
Objective 3: Pupils can extract key information from a very short, simple text (e.g., a fact file with a few sentences) about a volcano or mountain.
Example Activity: Read a simple fact card about Mount Vesuvius and find two pieces of information (e.g., its location, if it's active).

IV. Writing (Expression Écrite / Expresión Escrita / Schreiben)
Objective 1: Pupils can write familiar words and phrases related to the topic from memory.
Example Activity: Write the names of different geographical features under pictures.
Objective 2: Pupils can write simple sentences to describe pictures or diagrams related to the topic (e.g., "Le volcan est grand et rouge." / "El volcán es grande y rojo." / "Der Vulkan ist groß und rot.").
Example Activity: Write 2-3 sentences to describe a picture of a mountain.
Objective 3: Pupils can label a simple diagram or map with appropriate vocabulary.
Example Activity: Label a world map with the names of famous mountain ranges or volcanoes in the target language.
Objective 4: Pupils can create a very short fact file using simple sentences and learned vocabulary about a chosen volcano or mountain.
Example Activity: Create a "wanted poster" for a dangerous volcano, including its name, location, and a simple warning.

V. Intercultural Understanding & Knowledge (Connaissance Culturelle / Conocimiento Cultural / Kulturverständnis)

Objective 1: Pupils can identify at least one famous mountain range or volcano in a target language-speaking country (e.g., the Alps for French/German, the Pyrenees for French/Spanish, Teide for Spanish).
Example Activity: Locate these on a map of Europe or the world.
Objective 2: Pupils can understand that natural phenomena like earthquakes and volcanoes affect different parts of the world, including some target language countries.
Example Activity: Discuss where volcanoes and earthquakes are common, linking to countries where the target language is spoken (e.g., Chile for Spanish, Italy for French/German, as influences).

Lesson Ideas

This 6-week Medium-Term Plan for Key Stage 2 MFL uses the learning theme of **"Earthquakes, Volcanoes & Mountains"** to deliver a structured language curriculum. It is designed to work seamlessly with European languages commonly taught in British primary schools (such as **French** or **Spanish**). Across this unit, pupils master **substantive knowledge** (core nouns, gender agreements, verb conjugations, adjectival positioning, and phonics patterns) while explicitly developing **disciplinary knowledge** (thinking like a linguist by spot-checking word roots, decoding unfamiliar text using context clues, manipulating sentence structures, and translating phonemes into correct accents).

Unit Title: The Language of the Landscape: Tectonic Vocabulary and Structural Grammar
Duration: 6 Weeks (Approx. 1 hour per week)
Target Language: Adaptable for French or Spanish (Examples below use French *[FR]* and Spanish *[ES]*)

Weekly Progression Scheme
Week 1: Tectonic Roots & International Cognates (Vocabulary & Reading)
The MFL Focus: Identifying word origins and utilising cognates to decode geographic meaning.
Substantive Knowledge:
LKS2: Defining a **cognate** (a word that looks and sounds similar in two languages because they share a root). Identifying international geographical words.
UKS2: Identifying **near-cognates** (words with minor spelling differences) and **false friends** (words that look similar but mean something entirely different). Tracing scientific vocabulary to Latin and Greek origins.
Disciplinary Knowledge:
Linguistic Decoding: Analysing unfamiliar foreign text to find structural root patterns and deduce literal meanings without immediate translation support.
Learning Theme Activity: *The Tectonic Codebreaker.*
LKS2 (Y3/4): Pupils sort geography vocabulary cards into English and target language columns, highlighting the identical root blocks (e.g., *FR: le volcan, la montagne / ES: el volcán, la montaña*).
UKS2 (Y5/6): Pupils read a short target-language paragraph describing tectonic plate boundaries. They highlight near-cognates (e.g., *FR: la plaque tectonique, l'éruption / ES: la placa tectónica, la erupción*) and use contextual deduction strategies to translate the overall sentence meaning into English.

Week 2: Mapping the Giant Peaks (Nouns, Gender & Definite Articles)
The MFL Focus: Classifying landscape nouns by grammatical gender and selecting matching determiners.
Substantive Knowledge:
LKS2: Knowing that every noun in French/Spanish has a grammatical gender: **masculine** or **feminine**. Identifying singular definite articles (*FR: le/la / ES: el/la*).
UKS2: Understanding plural definite articles (*FR: les / ES: los/las*). Recognising how landscape features (rivers, ranges, mountains) take specific article weights based on grammar constraints.
Disciplinary Knowledge:

Grammatical Categorisation: Categorising nouns by linguistic features and implementing proper determiner adjustments based on target rules.
Learning Theme Activity: *Sorting the World Map.*
LKS2 (Y3/4): Pupils label a dynamic landscape chart. They sort geography nouns into separate blue (masculine) and red (feminine) camps, matching them with their correct singular articles (e.g., *FR: le tremblement de terre, la montagne / ES: el terremoto, la montaña*).
UKS2 (Y5/6): Pupils expand their maps into plural regional chains (e.g., *FR: les volcans actifs / ES: las montañas altas*). They practice shifting statements smoothly from singular to plural forms while maintaining perfect gender categories.

Week 3: The Danger Zone (Adjectives, Word Order & Agreement)
The MFL Focus: Changing adjective endings to agree with noun gender and number, and applying correct word order rules.
Substantive Knowledge:
LKS2: Knowing that in the target language, descriptive adjectives usually go **after** the noun they modify. Learning high-frequency geography descriptors (*hot, dangerous, high, active*).
UKS2: Mastering the rules of **adjectival agreement** across plural strings (e.g., adding *-e, -s, -es* in French, or *-o, -a, -os, -as* in Spanish to match the noun exactly).
Disciplinary Knowledge:
Structural Modification: Tweaking word endings deliberately to satisfy complex grammatical agreement rules within a descriptive phrase.
Learning Theme Activity: *The Threat Level Inventory.*
LKS2 (Y3/4): Pupils write basic noun-adjective pairs to profile landscapes, ensuring the descriptor sits behind the noun core (e.g., *FR: un volcan actif / ES: un volcán activo*).
UKS2 (Y5/6): Pupils write an extensive safety brief detailing multiple natural threats. They must dynamically mutate the adjective endings based on the exact grammatical profile of the hazard:
FR: La montagne est dangereuse. (Feminine Singular)
FR: Les volcans sont dangereux. (Masculine Plural)
They document their spelling logic inside a structural grid framework.

Week 4: The Earth Shifts! (High-Frequency Verbs & Action Conjugation)
The MFL Focus: Conjugating high-frequency verbs in the present tense to express actions and changes.
Substantive Knowledge:
LKS2: Defining an **infinitive** (the raw form of a verb). Learning the first-person singular ("I") and third-person singular ("It") of action verbs (*to erupt, to shake, to fall, to grow*).
UKS2: Mastering full present-tense paradigms for core regular and high-frequency irregular verbs (*FR: tomber, grossir, être / ES: caer, crecer, ser*).
Disciplinary Knowledge:
Verb Substitution Processing: Selecting and substituting pronoun starters and corresponding verb endings to alter the subject of an action sequence smoothly.
Learning Theme Activity: *The Seismograph Commentary.*
LKS2 (Y3/4): Pupils build basic action profiles for live events: *FR: "La terre tremble" / ES: "La tierra tiembla"* ("The earth shakes"). They match verb transitions directly against landscape flashcards.
UKS2 (Y5/6): Pupils script an emergency news flash transcript tracking a volcanic eruption. They must conjugate the verbs accurately as the perspective shifts from local observations to systemic changes: *ES: "Yo caigo"* → *"Las piedras caen"* ("I fall" → "The rocks fall"), swapping endings smoothly to project narrative pace.

Week 5: Emergency Responses (Prepositions, Directives & Imperatives)
The MFL Focus: Constructing action directives and navigating locations using correct prepositions.
Substantive Knowledge:
LKS2: Learning directional prepositions (*in, on, under, near*). Learning high-frequency safety instructions (*Stop, Look, Go*).
UKS2: Formulating the **imperative mood** (command form) for group directives. Mastering contracted preposition states when dealing with movement directions (e.g., *FR: au / à la / aux* or *ES: al / a la*).
Disciplinary Knowledge:
Syntax Mapping: Assembling logical command strings using correct imperative word structures.
Learning Theme Activity: *The Rescue Mission Briefing.*
LKS2 (Y3/4): Pupils give simple vocal directions to navigate a toy rescue car across a terrain grid map, using clear prepositional phrases: *FR: "Près de la montagne" / ES: "Cerca de la montaña"* ("Near the mountain").
UKS2 (Y5/6): Pupils design an official evacuation instructional poster for a high-risk mountain town. They build commands using formal plural imperatives to direct citizens safely: *FR: "Allez aux refuges !" / ES: "¡Vayan a los refugios!"* ("Go to the shelters!"), choosing correct contracted prepositions depending on the grammatical profile of the safety zones.

Week 6: The Tectonic Broadcast (Phonics, Accent & Performance)
The MFL Focus: Applying target language phonics rules to perform script work with accurate pronunciation.
Substantive Knowledge:
LKS2/UKS2: Identifying key **grapheme-phoneme correspondences (GPCs)**—how specific letter groups sound in the target language (e.g., French *'ch'*, *'an/en'*, or silent final markers; Spanish *'ch'*, *'j'*, or *'v'* sounded as *'b'*).
Disciplinary Knowledge:
Phonological Articulation: Applying non-English sound rules systematically when reading an unfamiliar script out loud to perform with fluent expression and correct pronunciation.
Learning Theme Activity: *The Emergency Weather Broadcast.*
Pupils are handed an emergency broadcast news script written in the target language, reporting on a fictional eruption or earthquake. They work in production pairs, scanning the text to highlight specific phonics triggers they have studied. Pupils then step in front of the class to deliver a live "television report", focusing on crisp pronunciation, accurate emphasis on vowels, and proper rhythm to celebrate their language development at the end of the term.

Assessment Matrix (Progression Indicators)

Phase	Working Towards	Expected Standard	Greater Depth
Lower Key Stage 2 *(Years 3 & 4)*	• Translates words literally without noticing that cognates share underlying roots. • Randomly matches articles (*le/la*) to nouns, ignoring gender properties.	• Identifies common geographical cognates to decode noun meanings independently. • Sorts tectonic nouns into masculine and feminine groups, choosing correct articles.	• Explains *why* a word is a cognate by tracing its root spelling patterns. • Predicts noun genders accurately by spotting common word ending clues.

	• Places adjectives in front of nouns, mimicking English word patterns.	• Positions basic adjectives behind nouns accurately (*un volcan dangereux*). • Uses third-person singular verbs correctly within descriptive tasks.	• Builds short descriptive phrases independently without relying on writing frames. • Switches vocabulary items in a sentence template while keeping the correct grammar structure.
Upper Key Stage 2 *(Years 5 & 6)*	• Forgets to alter adjective endings, leaving all descriptors in the masculine form. • Confuses verb infinitives with conjugated endings when writing sentence tasks. • Pronounces foreign text using English phonetic rules, resulting in inaccurate accents.	• Decodes target text by separating near-cognates from surrounding language frames. • Adjusts adjective spelling endings to agree with the gender and number of plural nouns. • Conjugates present-tense verbs accurately across changing structural perspectives. • Selects and applies contracted prepositions correctly based on destination variables. • Pronounces target language phonics rules smoothly during oral reading performances.	• Deconstructs unfamiliar sentence layouts, isolating root verbs and modifiers easily. • Employs multi-layered adjectival agreements smoothly across complex written paragraphs. • Navigates variable verb conjugations fluidly during fast-paced, interactive conversations. • Identifies and corrects intentional grammatical errors inside complex target language text. • Reads aloud with natural expression, rhythm, and clear accent control.

Other Information, Ideas and Resources

General Approaches (Adaptable to Various Languages):

Vocabulary Building:

Introduce key vocabulary related to earthquakes, volcanoes, and mountains in your chosen language(s). This could include words like:

Earthquake: *tremblement de terre* (French), *Erdbeben* (German), *terremoto* (Spanish), *sisma* (Italian)
Volcano: *volcan* (French, Spanish), *Vulkan* (German), *vulcano* (Italian)
Mountain: *montagne* (French), *Berg* (German), *montaña* (Spanish), *montagna* (Italian)
Erupt: *entrer en éruption* (French), *ausbrechen* (German), *erupcionar* (Spanish), *eruttare* (Italian)
Magma/Lava: *magma/lave* (French), *Magma/Lava* (German), *magma/lava* (Spanish, Italian)
Crater: *cratère* (French), *Krater* (German), *cráter* (Spanish), *cratere* (Italian)
Plate tectonics: *tectonique des plaques* (French), *Plattentektonik* (German), *tectónica de placas* (Spanish), *tettonica delle placche* (Italian)
Summit: *sommet* (French), *Gipfel* (German), *cima* (Spanish, Italian)
Valley: *vallée* (French), *Tal* (German), *valle* (Spanish, Italian)

Use flashcards, picture dictionaries, and interactive games (like matching pairs or bingo) to help pupils learn and remember the vocabulary.

Songs and Chants:
Create simple songs or chants in the target language related to the topic. For example, a repetitive chant about a volcano erupting or the shaking of an earthquake. These are great for memorisation and pronunciation practice.

Labelling Activities:
Provide diagrams of volcanoes or mountains and have pupils label the different parts in the target language.

Simple Sentence Structures:
Teach simple sentence structures to describe the phenomena, such as:
"The volcano is big." - *Le volcan est grand.* (French), *Der Vulkan ist groß.* (German), *El volcán es grande.* (Spanish), *Il vulcano è grande.* (Italian)
"The mountain is tall." - *La montagne est haute.* (French), *Der Berg ist hoch.* (German), *La montaña es alta.* (Spanish), *La montagna è alta.* (Italian)
"The earth shakes." - *La terre tremble.* (French), *Die Erde bebt.* (German), *La tierra tiembla.* (Spanish), *La terra trema.* (Italian)

Cultural Connections:
Explore famous mountains or volcanoes in countries where the target language is spoken. For example:
French: Mont Blanc (Alps), volcanoes in French overseas territories (e.g., Piton de la Fournaise in Réunion).
German: The Alps, the Zugspitze (Germany's highest peak).
Spanish: The Andes Mountains, Mount Teide (Tenerife), Popocatépetl (Mexico).
Italian: Mount Etna and Mount Vesuvius.
Discuss any myths, legends, or cultural significance associated with these geographical features in the respective cultures.

Language-Specific Ideas:
French:
"Le Volcan en Colère" (The Angry Volcano) Story: Create a simple story about a volcano that gets angry and erupts, using basic French vocabulary and actions. Pupils can act out the story.
French Mountain Ranges: Learn the names of major French mountain ranges and locate them on a map.
"Où est la montagne?" (Where is the mountain?) Game: A simple hide-and-seek game with a picture of a mountain, asking "Où est la montagne?" and responding with prepositions like "sur" (on), "sous" (under), "à côté de" (next to).
German:
"Der Berg ruft!" (The mountain calls!) Activity: Discuss the allure of mountains in German culture (hiking, skiing). Learn simple phrases related to these activities.
"Was ist das?" (What is that?) with Geographical Features: Show pictures of earthquakes, volcanoes, and mountains, and ask "Was ist das?" Pupils respond with the German vocabulary.
German Folk Tales: Explore any German folk tales or legends that feature mountains or natural events.
Spanish:
"Los Andes Cantan" (The Andes Sing) Project: Explore the Andes Mountains and the cultures that live there. Learn simple Spanish phrases related to the landscape and people.
"El Monstruo del Volcán" (The Volcano Monster) Craft: Pupils create a model of a volcano and learn Spanish words to describe its features and the "monster" inside.
Spanish Songs about Nature: Find simple Spanish songs that mention mountains or natural phenomena.

Italian:
"I Vulcani Famosi" (Famous Volcanoes) Presentation: Pupils research and present (in simple Italian) on Mount Etna or Mount Vesuvius.
"La Montagna Magica" (The Magic Mountain) Role-Play: Create a simple role-play scenario where pupils are exploring a "magic mountain" and encounter different geographical features, describing them in Italian.
Italian Proverbs about Nature: Introduce simple Italian proverbs related to mountains or natural events.

Activities to Combine Language and Science:
Create Bilingual Fact Files: Pupils research earthquakes, volcanoes, or mountains and create fact files with information in both English and the target language.
Conduct Simple Experiments and Describe Them: If you do any safe, simple experiments related to volcanoes (e.g., baking soda and vinegar), have pupils describe what is happening in the target language.
Interactive Whiteboard Games: Utilise interactive whiteboard resources that allow pupils to match pictures to words in the target language or complete simple drag-and-drop activities related to the topic.
Pen Pals: If possible, connect with a school in a country where the target language is spoken and have pupils exchange simple letters or drawings about earthquakes, volcanoes, or mountains in their respective languages.

Considerations for Implementation

Visuals are Key: Use lots of pictures, diagrams, and maps.
Songs and Chants: Create simple songs or chants with the new vocabulary.
Total Physical Response (TPR): Use actions to reinforce words (e.g., "shake" for earthquake).
Games: Play matching games, memory games, or "I spy" with the new vocabulary.
Authentic Resources (simplified): Look for very simple videos or books in the target language about these topics.
Cross-Curricular Links: Continuously reinforce the links to their geography and science learning.
Repetition is Key: Repeat vocabulary and simple phrases regularly.
Visual Aids: Use plenty of pictures, diagrams, and realia (if possible).
Contextualise Learning: Link the language learning to the science topic to make it more meaningful.
Celebrate Progress: Acknowledge and celebrate pupils' efforts and achievements in learning the new language.

Music

See also Charanga Schemes of work

Substantive Knowledge

In KS2 Music, the learning theme of '**Earthquakes, Volcanoes & Mountains'** focuses on the use of **Dynamics, Tempo, and Texture** to represent the raw power and scale of the Earth's movements.
Substantive knowledge centres on how musical elements can be manipulated to create "programmatic music" (music that tells a specific story or depicts a scene).

1. Expressive Use of Dynamics and Pitch
Pupils should understand how to use the "extremes" of sound to represent geographical features.

Crescendo and Diminuendo: Knowledge of how to use a gradual increase in volume (crescendo) to build the tension of a looming volcanic eruption or a sudden decrease (diminuendo) to represent the settling of ash.

Pitch and Scale: Using low-pitched instruments (like drums or bass) to mimic the "rumble" of tectonic plates and high-pitched instruments (like triangles or glockenspiels) to represent falling ice or light rain on a mountain peak.
Fortissimo (ff): Understanding the use of sudden, very loud sounds to represent the "shock" of an earthquake's primary wave.

2. Tempo and Rhythm: Seismic Energy
The speed and pattern of music are used to depict the "energy" of the Earth.

Accelerando: Gradually increasing the speed (tempo) to represent the flow of lava speeding down a slope or the frantic energy of an earthquake.
Irregular Rhythms: Knowledge of how to use "syncopation" or broken rhythms to represent the unpredictable, jerky movements of the ground during a seismic event.
Ostinato: Using a repeating rhythmic pattern to represent the steady, unstoppable movement of a glacier or the constant "heartbeat" of a dormant volcano.

3. Texture and Timbre: The "Sound" of Rock
Pupils learn to select instruments based on their "timbre" (the quality of the sound) to represent physical materials.

Layering (Texture): Understanding how to build a "thick" musical texture (many instruments playing at once) to represent a massive mountain range, versus a "thin" texture for a single lonely peak.
Instrument Choice:
Percussion: Using wooden instruments for "earthy" sounds and metallic instruments for "icy" mountain sounds.
Synthesisers/Digital Sound: Using technology to create "low-frequency" drones that mimic the subsonic sounds of the Earth's mantle.

4. Appraisal: Listening to the Earth
Pupils should study how professional composers have tackled this theme to understand musical "storytelling."

"In the Hall of the Mountain King" (Grieg): Analysing how the piece uses accelerando and crescendo to build a sense of a mountain "closing in."
"The Rite of Spring" (Stravinsky): Exploring how "dissonance" (clashing notes) can represent the violent, unpredictable forces of nature.
Environmental Soundscapes: Knowledge of how modern composers use field recordings of actual earthquakes or volcanic rumbles as a "pulse" for musical compositions.

Musical Vocabulary for the Learning Theme

Term	Definition
Programmatic Music	Music intended to convey an image or tell a story.
Timbre	The character or quality of a musical sound (e.g., "gritty," "sharp," "smooth").

Dissonance	A lack of harmony among musical notes; used to create tension or "chaos."
Graphic Score	Using symbols and shapes rather than traditional notes to plan a "disaster" soundscape.

Why this matters
The "big idea" is **Aesthetic Representation**. Music allows pupils to move beyond the data of a Richter scale and explore the *feeling* of a natural disaster, helping them understand that art is a tool for expressing human awe and fear of the natural world.

Disciplinary Knowledge

The **disciplinary knowledge** for the Key Stage 2 learning theme **'Earthquakes, Volcanoes and Mountains'** in relation to **Music** focuses on using the **elements of music** to represent, interpret, and communicate the physical characteristics, processes, and emotional impact of these geological phenomena.

Key Musical Elements and Geological Links
The core **disciplinary knowledge** involves connecting specific musical concepts to the features and events of earthquakes, volcanoes, and mountains.

Geological Concept	Musical Element	Disciplinary Knowledge (What the pupil learns)
Earthquake Shaking/Ground Movement	**Rhythm and Tempo**	Using **irregular rhythms** (e.g., syncopation) and **rapid tempo** to represent the sudden, erratic, and fast nature of an earthquake's tremor and the release of energy.
Volcanic Eruption (Explosion)	**Dynamics** and **Timbre**	Using a sudden, loud **crescendo** or **Sforzando** (sudden strong accent) followed by a **fortissimo** to represent the explosive force. Using harsh, dissonant **timbres** (sounds) from un-tuned percussion or electronic effects to convey the destructive, violent nature of the blast.
Magma Rising/Lava Flow	**Tempo** and **Pitch**	Using a slow, steady **Adagio** or **Largo** tempo with a gradual **rising pitch** to represent the slow build-up and rise of magma before an eruption, or a slow, sustained texture to represent flowing lava.
Mountain Size/Height	**Pitch**	Using **high pitch** notes and registers (e.g., on a recorder, glockenspiel, or voice) to represent the massive height and towering nature of mountains.
Tectonic Plates Colliding (Orogeny)	**Texture** and **Harmony**	Using two or more distinct instrumental parts (melodic lines/textures) that gradually get closer, clash, and create **dissonance** or a sudden change

		in **harmony** to represent the slow, powerful collision that forms mountains.
Destruction/Chaos	**Structure** and **Instrumentation**	Experimenting with an **A-B-A structure** where a calm 'A' section is interrupted by a chaotic 'B' section. Using **un-tuned percussion** (e.g., drums, shakers, cymbals) and layered, contrasting sounds (**texture**) to represent chaos and destruction.

✍ **Composition and Performance Skills**

This **disciplinary knowledge** is typically applied through **composition** and **improvisation** tasks where pupils are challenged to create a "soundscape" or short musical piece.

Responding to Stimuli: Pupils learn to select and manipulate the elements of music to effectively communicate the geological concept. For example, they might be asked to compose music that tells the story of **Mount Vesuvius's eruption** or the slow, peaceful formation of the **Himalayas**.

Notation: They apply their understanding of **pitch and rhythm notation** (traditional or graphic) to record the structure of their piece, using symbols to indicate sudden changes in dynamics or tempo to match the event.

Performance: They develop their **performance technique** on classroom instruments (tuned and un-tuned percussion) to accurately reproduce the dynamic and rhythmic features chosen to represent the geological event.

Learning Objectives

Music **learning objectives** for a Key Stage 2 pupil about **'Earthquakes, Volcanoes & Mountains',** broken down by musical element, with a focus on creative exploration and understanding: **Overall Aim:** Pupils will explore how music can represent and evoke the natural phenomena of earthquakes, volcanoes, and mountains, developing their musical vocabulary and creative expression.

Performing & Listening:

Objective (Pitch/Melody): Pupils can use a variety of pitched instruments (e.g., glockenspiels, xylophones, keyboards, voices) to create melodies and soundscapes that depict the rising and falling of mountains, the rumbling of an earthquake, or the eruption of a volcano (e.g., ascending/descending scales, sustained notes, short bursts).

Differentiation:

Y3/Y4*:* Focus on exploring high and low sounds, and simple two-note patterns.

Y5/Y6: Experiment with chromaticism, whole-tone scales, or specific melodic contours to represent geological features.

Objective (Dynamics): Pupils can use a range of dynamics (e.g., *p*, *mp*, *mf*, *f*, *ff*, crescendos, diminuendos) to represent the varying intensity of an earthquake (from gentle tremor to violent shaking), the build-up and release of a volcanic eruption, or the imposing presence of a mountain.

Differentiation:

Y3/Y4*:* Focus on identifying and performing loud/quiet.

Y5/Y6*:* Incorporate more nuanced dynamic changes and understand their expressive impact.

Objective (Tempo): Pupils can explore different tempos (e.g., *largo*, *andante*, *allegro*, *presto*) to depict the slow, gradual formation of mountains, the sudden, rapid impact of an earthquake, or the explosive nature of a volcanic eruption.
Differentiation:
Y3/Y4*:* Focus on identifying and performing fast/slow.
Y5/Y6*:* Experiment with subtle tempo changes and rubato to enhance expression.
Objective (Timbre/Instrumentation): Pupils can choose and use a variety of instruments and vocal sounds (e.g., percussion for rumbling/shaking, wind instruments for whistling winds on mountains, voices for screams/roars) to create specific sound effects that represent aspects of earthquakes, volcanoes, and mountains.
Differentiation:
Y3/Y4*:* Explore a limited range of readily available classroom instruments.
Y5/Y6*:* Experiment with extended techniques on instruments or vocal sound effects.
Objective (Texture): Pupils can create simple musical textures (e.g., a single melodic line for a gentle tremor, layered sounds for a building eruption, sustained chords for a mountain's stability) to represent the complexity of these natural phenomena.
Differentiation:
Y3/Y4*:* Focus on unison or simple call-and-response.
Y5/Y6: Explore creating drones, ostinatos, or simple counter-melodies.
Objective (Structure/Form): Pupils can devise simple musical structures (e.g., ABA form to represent a build-up, climax, and aftermath of an eruption; theme and variations to depict different stages of mountain formation) to create a musical narrative.
Differentiation*:*
Y3/Y4*::* Focus on clear beginnings, middles, and ends.
Y5/Y6: Experiment with more complex forms or improvisational structures.

Composing & Improvising:
Objective (Creative Soundscapes): Pupils can compose and improvise short musical pieces or soundscapes that effectively evoke the feeling or characteristics of an earthquake (e.g., sudden percussive sounds, descending rumbling), a volcano (e.g., building dynamics, explosive bursts), or a mountain (e.g., slow, sustained notes, majestic melodies).
Objective (Graphic Notation): Pupils can use simple graphic notation (e.g., lines for pitch, size of symbols for dynamics, density of symbols for texture) to represent their musical ideas related to earthquakes, volcanoes, and mountains.
Objective (Responding to Stimuli): Pupils can respond musically to visual stimuli (e.g., images of volcanoes, videos of earthquakes) or written descriptions, translating their understanding of the natural world into sound.
Objective (Collaborative Composition): Pupils can work collaboratively to create a longer musical piece that tells a story or explores different aspects of earthquakes, volcanoes, and mountains, demonstrating an understanding of how individual musical contributions fit into a larger whole.

Musical Understanding & Knowledge:
Objective (Musical Vocabulary): Pupils can use appropriate musical terminology (e.g., pitch, tempo, dynamics, timbre, texture, structure) when discussing their own compositions and performances, as well as when listening to and analysing music related to the topic.

Objective (Connecting Music to the World): Pupils can articulate how musical elements can be used to represent real-world phenomena, specifically relating musical choices to the characteristics of earthquakes, volcanoes, and mountains.
Objective (Expressive Qualities): Pupils can identify and discuss the expressive qualities of music that relate to the emotional impact or physical sensation of earthquakes, volcanoes, and mountains (e.g., fear, power, awe, stability).

Lesson Ideas

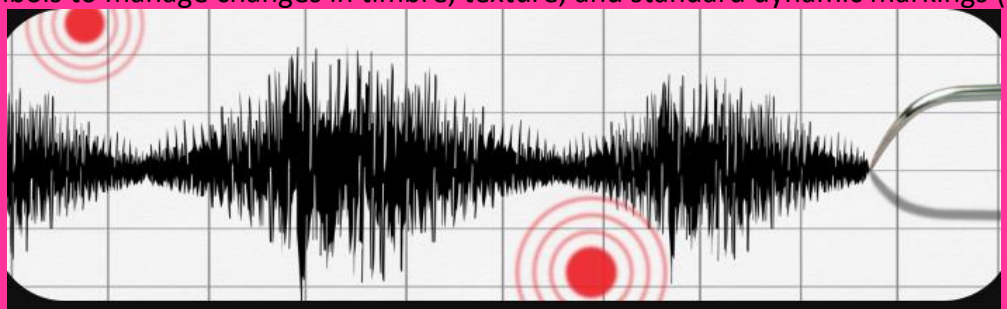
This 6-week Medium-Term Plan for Key Stage 2 Music uses the learning theme of **"Earthquakes, Volcanoes & Mountains"** to develop pupils' composition, performance, and analytical listening skills. It runs parallel tracks for **Lower Key Stage 2** and **Upper Key Stage 2**, showing clear progression in rhythmic complexity, texturing, and performance independence. Across this unit, pupils build **substantive knowledge** (the inter-related dimensions of music: pitch, duration, dynamics, tempo, timbre, texture, and structure; traditional volcanic instruments like Gamelan; and rhythmic value structures) while sharpening their **disciplinary knowledge** (thinking like a musician by improvising motifs, interpreting graphic and standard notation, maintaining an independent ensemble part, and critiquing compositions).

Unit Title: Tectonic Soundscapes: Dynamics, Structure, and Resonance
Duration: 6 Weeks (Approx. 1 hour per week)
Core Resources: Tuned percussion (glockenspiels, xylophones), untuned percussion (bass drums, shakers, cymbals, woodblocks, guiros), audio recordings (e.g., Stravinsky's *The Rite of Spring*, traditional Indonesian Gamelan), large paper rolls, and markers.

Weekly Progression Scheme
Week 1: Listening & Appraising – The Voices of the Peaks
The Musical Focus: Identifying how the dimensions of music are manipulated to represent natural structures.
Substantive Knowledge:
LKS2: Defining **pitch** (high/low sounds) and **timbre** (the specific quality or character of a sound). Identifying which instruments sound "mountainous" or "volcanic".
UKS2: Defining **texture** (how layers of sound are combined) and **structure** (how a piece is organised into sections). Identifying orchestral representations of physical chaos.
Disciplinary Knowledge:
Aural Analysis: Deconstructing complex orchestral music to isolate how specific instruments and dynamic changes are used to convey geological scale and tension.
Learning Theme Activity: *Auditing the Avalanche.*
LKS2 (Y3/4): Pupils listen to mountain-themed program music (e.g., Grieg's *In the Hall of the Mountain King*). They use flashcards to track the changing **tempo** (speeding up) and **dynamics** (getting louder / *crescendo*), describing how the pitch line climbs.
UKS2 (Y5/6): Pupils appraise Stravinsky's *The Rite of Spring* (Sacrificial Dance). They map the piece's complex texture, noting how sudden, unpredictable accents and clashing, dissonant pitches evoke explosive volcanic destruction. They record their observations using a dimensional grid matrix.

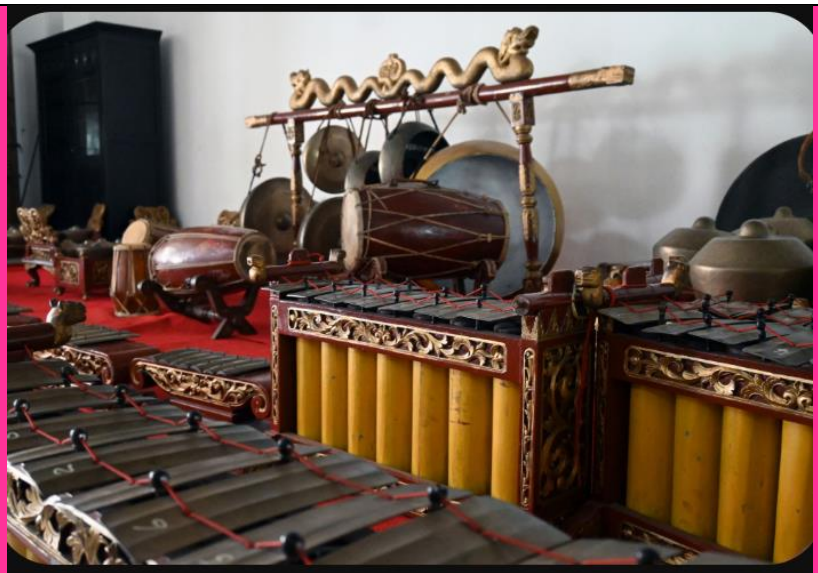
Week 2: Seismograph Scores (Dynamics & Alternative Notation)
The Musical Focus: Translating physical movements into graphic scores and reading visual symbols accurately.
Substantive Knowledge:

LKS2/UKS2: Defining **graphic notation** (using visual symbols, lines, and shapes instead of standard staff lines to represent musical parameters). Knowing that the horizontal axis tracks time and the vertical axis tracks pitch or intensity.
Disciplinary Knowledge:
Translating Symbols into Sound: Translating abstract visual patterns into controlled instrumental sound textures, and conducting an ensemble using visual cues.
Learning Theme Activity: *Performing the Tremor Chart.*
LKS2 (Y3/4): Pupils draw continuous zigzag lines on mini-whiteboards to look like real seismograph readouts. They interpret their drawings using untuned percussion: smooth waves become soft shakers (*piano*), while sharp spikes trigger sudden, heavy drum hits (*forte*).
UKS2 (Y5/6):In groups, pupils create a large-scale graphic score charting a three-stage tectonic event: 1. Underground pressure (rumbles), 2. Main earthquake (shocks), 3. Aftershocks (fading echoes). They invent a clear key of symbols to manage changes in timbre, texture, and standard dynamic markings (p, mp, f, ff).



LKS2 pupils use seismograph lines as a custom graphic score to track sudden shifts in dynamic volume.. Source: Makhbubakhon Ismatova / Getty Images

Week 3: Volcanic Rings – Layers & Polyrhythms (Duration & Texture)
The Musical Focus: Maintaining a steady internal pulse while performing overlapping rhythm patterns.
Substantive Knowledge:
LKS2: Defining **pulse** (the steady heartbeat of a piece) and **rhythm** (patterns of long and short notes layered over the pulse). Reading crotchets (1 beat) and paired quavers (½ beat each).
UKS2: Understanding **polyrhythms** (two or more different rhythms performed at the same time). Knowing the role of percussion in traditional Indonesian **Gamelan** music located near volcanic rings.
Disciplinary Knowledge:
Rhythmic Interlocking: Holding an independent rhythmic pattern steady while other layers play competing beats around you.
Learning Theme Activity: *The Tectonic Drum Circle.*
LKS2 (Y3/4): Pupils practice word-rhythm loops based on geological terms (e.g., *"Vol-ca-no"* = crotchet, paired quavers). Group A holds a solid, steady pulse on low drums while Group B layers the word rhythms on woodblocks.
UKS2 (Y5/6): Pupils listen to traditional Gamelan music played near Indonesia's active peaks. They build a rhythmic texture inspired by this style: Layer 1 strikes a deep gong pulse every 4 beats; Layer 2 loops a steady crotchet tracking line; Layer 3 interlocks a syncopated quaver rhythm on metal glockenspiels, keeping the polyrhythmic grid aligned.



UKS2 pupils investigate Gamelan ensembles to learn how overlapping percussion layers create dense, cyclic musical textures.. Source: Nea Hartono / Getty Images

Week 4: The Sound of Strata (Pitch & Melodic Motifs)
The Musical Focus: Composing short melodic fragments (*motifs*) using specific scale steps.
Substantive Knowledge:
LKS2: Defining **melody** (a sequence of notes that forms a tune) and identifying stepwise pitch changes on a glockenspiel.
UKS2: Defining a **motif** (a short, recurring musical idea that represents a character or place) and an **ostinato** (a continually repeated musical phrase or rhythm).
Disciplinary Knowledge:
Melodic Composition: Selecting and patterns notes intentionally within a set pitch framework to capture a specific physical mood or landscape.
Learning Theme Activity: *The Mountain Ridge Melody.*
LKS2 (Y3/4): Pupils map out the horizontal rock layers (*strata*) of a mountain onto a tuned percussion keyboard. They compose a rising 4-note melody that steps up to represent climbing a ridge, and a falling step pattern to show a valley.
UKS2 (Y5/6): Pupils create a melodic profile for an active volcano. They compose a low, repeating 3-note melodic *ostinato* on bass xylophones to represent the heavy base of the mountain. Above this, they layer an explosive, leaping glockenspiel motif that mimics lava bursting out, ensuring the two layers fit together beautifully.

Week 5: The Eruption Suite – Structure & Composition (Synthesis)
The Musical Focus: Bringing together rhythm, melody, and dynamic textures into a structured group piece.
Substantive Knowledge:
LKS2: Understanding **ternary structure** (**A-B-A**: a piece split into three distinct sections, where the third section repeats the first).
UKS2: Understanding **rondo structure** (**A-B-A-C-A**: a main theme that keeps returning between contrasting musical sections).
Disciplinary Knowledge:
Structural Arranging: Organising group sound ideas into a clear, rehearsed musical arrangement that features transitions between contrasting movements.
Learning Theme Activity: *The Tectonic Symphony.*

LKS2 (Y3/4): Pupils compose a Ternary (A-B-A) piece called *The Volcano Sleeps and Wakes*. Section A is quiet, featuring a steady ticking pulse (sleeping mountain); Section B is loud and energetic, filled with fast rhythms and rising glockenspiel notes (eruption); Section A returns exactly as before, showing the mountain returning to a calm sleep.
UKS2 (Y5/6): Pupils arrange a Rondo (A-B-A-C-A) performance tracking an earthquake crisis. Section A is the main "Tectonic Pulse" loop played in unison. Section B is a graphic score improvisation representing tremors. Section C is a polyrhythmic Gamelan-style sequence. They practice transitioning between these movements cleanly under a student conductor.

Week 6: The Amphitheatre Showcase – Performance & Critique
The Musical Focus: Performing as a cohesive ensemble with expressive control, and delivering constructive peer reviews.
Substantive Knowledge:
LKS2/UKS2: Understanding the role of a conductor in communicating changes in tempo and dynamics using hand gestures.
Technical Vocabulary: *Pitch, timbre, texture, pulse, rhythm, graphic notation, crescendo, ostinato, ternary structure, rondo structure.*
Disciplinary Knowledge:
Ensemble Performance & Critique: Performing complex, multi-layered music in front of an audience with precise dynamic control, and critiquing compositions using accurate musical terms.
Learning Theme Activity: *The Festival of the Earth.*
The classroom turns into a performance space. Small groups take turns presenting their finished Week 5 compositions from the centre of the room. Pupils act as a critical audience, filling out feedback cards to evaluate how well each group managed their dynamics and kept their rhythms steady. They provide technical praise and tips: *"The crescendo in your eruption section built up a lot of tension, but the low xylophone ostinato drifted out of time when the cymbals crashed."*

Assessment Matrix (Progression Indicators)

Phase	Working Towards	Expected Standard	Greater Depth
Lower Key Stage 2 *(Years 3 & 4)*	• Pulse is unsteady, speeding up or slowing down drastically when playing instruments. • Plays tuned percussion randomly without checking if pitch steps up or down. • Graphic scores look like doodles that don't match the volume or timing of the music.	• Maintains a rock-solid steady pulse on an untuned percussion instrument. • Performs crotchet and paired quaver rhythms accurately inside group tasks. • Improvises simple melodies that step smoothly up and down a 5-note scale. • Translates graphic seismograph symbols into controlled sound textures. • Identifies changes in tempo and dynamics when	• Leads an ensemble performance independently, keeping peers perfectly in time. • Explains composition choices clearly: *"I used sharp staccato woodblock hits to represent cracking rocks."* • Controls smooth dynamic changes (*crescendo/ diminuendo*) perfectly without losing the beat.

		listening to orchestral music.	
Upper Key Stage 2 *(Years 5 & 6)*	• Drops out of rhythm loops during complex syncopated or multi-layered group parts. • Plays notes outside the designated key framework, breaking the mood of the piece. • Group compositions lack layout structure, combining all sound elements into a messy clutter.	• Performs syncopated rhythmic patterns while maintaining an independent counter-pulse. • Composes a melodic motif that fits over a repeating bass line *ostinato* pattern. • Coordinates a multi-part group composition using a clear Ternary or Rondo structure. • Integrates standard dynamic symbols (p, f, cresc.) to sculpt expressive tension arcs. • Evaluates performances objectively using precise musical terminology.	• Improvises complex melodic variations that interact fluidly with shifting backing ostinatos. • Conducts a layered group graphic score using clear, expressive physical cues. • Formulates advanced appraisals: *"The polyphonic texture in the rondo section captured the chaos of the earthquake beautifully by setting the two rhythms against each other."*

Other Information, Ideas and Resources

Earthquakes:

Rhythm and Body Percussion:

The First Tremor: Start with a very quiet, slow, and irregular pulse using finger clicks or gentle taps on the floor. Gradually increase the speed and intensity, perhaps adding hand claps and foot stomps to represent the growing shaking.

The Main Shock: A sudden burst of loud and chaotic sounds using all available body percussion – chest slaps, thigh pats, stamping. Explore syncopation and irregular rhythms to create a sense of unease and unpredictability.

Aftershocks: Gradually decrease the intensity and speed, returning to quieter, more sporadic sounds, representing the fading tremors.

Musical Instruments: Use untuned percussion like shakers, tambourines, and wood blocks to create rattling and clattering sounds. Low-pitched instruments like drums can represent the rumbling of the earth.

Melody and Pitch:

Sliding Sounds: Use glissandos on instruments like xylophones, glockenspiels, or even voices (making "oooh" sounds that slide up and down) to represent the ground shifting and moving.

Short, Sharp Sounds: Play short, staccato notes on pitched instruments to represent sudden jolts and cracks.

Descending Patterns: Use descending melodic lines to create a feeling of the ground sinking or collapsing.

Dynamics and Tempo: This is crucial for portraying the intensity of an earthquake. Start quietly (pianissimo), build to very loud (fortissimo), and then gradually decrease. The tempo can start slowly (adagio), speed up during the main shock (allegro), and then slow down again (lento).
Improvisation: Allow pupils to improvise sounds and rhythms that they associate with an earthquake. This encourages creative expression and helps them connect with the topic.

Volcanoes:
Building Tension:
Low Drones: Use sustained low notes on instruments like recorders (low register), keyboards, or even voices humming to create a sense of the deep, underlying power of the volcano.
Gradual Crescendo: Slowly increase the volume of the drone or add layers of sound as the pressure builds within the volcano.
Repeating Rhythms: Introduce a slow, repetitive rhythmic pattern that gradually gets faster and more intense, like the build-up to an eruption.

The Eruption:
Explosive Sounds: Use sudden, loud sounds on drums, cymbals, and other percussion instruments to represent the eruption.
Rising Pitches: Use ascending melodic lines and glissandos to depict the lava and ash shooting upwards.
Contrast: Contrast the low, rumbling sounds with high-pitched, sharp sounds to represent different elements of the eruption.

Flowing Lava:
Smooth, Sustained Notes: Use longer, legato notes on melodic instruments to represent the flowing lava.
Warm Sounds: Encourage the use of instruments with warmer timbres, like xylophones or metallophones, to evoke the heat of the lava.
Gradual Changes in Pitch and Dynamics: Slowly change the pitch and volume to represent the movement and intensity of the lava flow.
Soundscapes: Create a soundscape using a variety of instruments and vocal sounds to depict the different stages of a volcanic eruption – the quiet before, the rumbling, the explosion, the flowing lava, and the cooling aftermath.

Mountains:
Majestic and Still:
Long, Sustained Notes: Use long, sustained notes on instruments like recorders, flutes, or stringed instruments (if available) to create a sense of stillness and grandeur.
Slow Tempos: Use slow tempos (adagio, largo) to reflect the vastness and timelessness of mountains.
Open Intervals: Explore the use of open musical intervals (like perfect fifths and octaves) to create a spacious and resonant sound.

Climbing and Movement:
Ascending Melodies: Use stepwise ascending melodic lines to represent the act of climbing.
Changing Dynamics: Gradually increase the dynamics as the climbers ascend, perhaps reaching a loud point at the summit and then decreasing as they descend.
Varying Rhythms: Introduce more rhythmic and energetic patterns to represent the effort of climbing, perhaps using walking or marching rhythms.

The Wind:
Breath Sounds: Explore using breath sounds (gentle blowing) or wind instruments like recorders or whistles to represent the wind blowing across the mountains.
Sustained, Shimmering Sounds: Use instruments like glockenspiels or triangles played with a soft beater to create a shimmering effect like sunlight on the peaks or the sound of wind chimes.
Layering Sounds: Create musical textures by layering different sounds to represent the different aspects of a mountain range – the solid rock, the wind, the distant sounds of nature.

Bringing it all Together:
Narrative Through Music: Encourage pupils to create a musical narrative that tells a story about an earthquake, a volcanic eruption, or a journey through the mountains.
Combining Elements: Explore how these natural phenomena can be linked. For example, an earthquake might trigger a landslide on a mountain, or volcanic activity can create new mountains.
Visual Aids: Use pictures, videos, or even drawings to inspire the pupils' musical ideas.
Cross-Curricular Links: Connect this music work with science lessons about geology and geography, and with literacy through creative writing about these powerful forces of nature.
Volcano song *https://www.youtube.com/watch?v=bwTkTzdkVS4*
Dancing on the edge of a volcano – London Symphony Orchestra
https://wwwyoutube.com/watch?v=NLismjNrX_o
Epic Dark Music – Volcano Kingdom
https://www.youtube.com/watch?v=lzVO4cC_0QA

Considerations for Implementation

Physical Education

Substantive Knowledge

In PE, the **'Earthquakes, Volcanoes & Mountains'** learning theme is excellent for **Outdoor Adventurous Activities (OAA)** and **Dance**. The **substantive knowledge** focuses on the physical skills required to navigate vertical terrain, the co-operation needed for rescue simulations, and the use of the body to represent geological movements.

1. Outdoor Adventurous Activities (OAA): Climbing and Traversing
Mountains provide the context for developing vertical and lateral movement skills.

Three Points of Contact: The fundamental safety rule for climbing. Knowledge that to remain stable, three out of four limbs (two hands and one foot, or two feet and one hand) should be in contact with the "mountain" (climbing wall or apparatus) at all times.
Traversing: Learning to move sideways across a surface, focusing on weight transfer and balance rather than just height.
Centre of Gravity: Understanding that keeping the body close to the climbing surface increases stability and reduces the strain on muscles.

2. Teamwork and Problem Solving: Disaster Response

Earthquakes and volcanoes serve as the "scenario" for developing communication and leadership.

Rescue Logistics: Knowledge of how to move an "injured" teammate or "vital supplies" across a "lava flow" (defined area) using limited equipment like planks, hoops, or ropes.
Non-Verbal Communication: Developing signals to communicate in "noisy" environments (simulating the roar of a volcano or earthquake) where speech is impossible.
Risk Assessment: Learning to identify "hazards" in a designated environment and making quick, collective decisions to ensure group safety.

3. Dance and Creative Movement: Tectonic Expression
Pupils use their bodies to represent the physical processes of the Earth.

Levels and Dynamics:
Low Levels: Using floor work to represent the shifting of tectonic plates.
High Levels: Using lifts or extensions to represent the growth of a mountain.
Sudden Dynamics: Sharp, explosive movements to represent an earthquake's "shockwave" or a volcanic "eruption."
Canon and Unison:
Unison: Everyone moving at once to show a massive, singular shift (like a whole plate moving).
Canon: Movements following one after another to represent a "domino effect" or a chain of mountain peaks.
Stasis vs. Kinesis: Understanding how to hold a "statue-like" pose to represent a dormant mountain, contrasting with the fluid movement of a lava flow.

4. Health and Fitness: High-Altitude Preparation
Mountains provide a context for discussing how the body adapts to extreme environments.

Stamina and Endurance: Knowledge that climbing a mountain requires "aerobic" fitness (the ability of the heart and lungs to supply oxygen to muscles over a long time).
Warm-up and Cool-down: Understanding that in "cold" mountain environments, warming up is essential to prevent muscle injury, and cooling down helps remove lactic acid after a "strenuous climb."

PE Vocabulary

Term	Definition
Balance	The ability to maintain the body's centre of mass over its base of support.
Coordination	The ability to move different parts of the body together smoothly and efficiently.
Sequence	A series of movements (in dance or climbing) that follow a logical order.
Dynamics	How a movement is performed (e.g., heavily, lightly, sharply, or smoothly).

Why this matters
The "big idea" here is **Physical Literacy in Context**. PE allows pupils to move from "learning about" a mountain to "experiencing" the physical challenges of one. It builds the resilience and motor skills necessary to interact with the world's most challenging landscapes.

Disciplinary Knowledge

The **disciplinary knowledge** for the Key Stage 2 learning theme **'Earthquakes, Volcanoes and Mountains'** in relation to **PE** focuses on the **interpretation and communication of movement**, specifically exploring concepts of **force, balance, tension, and change in speed/level** through Dance and Gymnastics. This knowledge allows pupils to act like choreographers or performers, purposefully choosing and manipulating movement elements to represent geological processes.

Disciplinary Knowledge in Action
The core **disciplinary knowledge** in PE for this learning theme involves selecting and applying specific movement skills to represent the characteristics of the Earth's dramatic forces.

1. Movement and Dynamics (The "How" of Movement)

Geological Concept	PE Disciplinary Knowledge	Application (The Movement)
Tectonic Plate Movement	**Force and Direction:** Understanding how to use opposing *pushing* and *pulling* forces (tension and release) to represent the plates.	**Slow, Controlled Movement:** Travelling on different planes (e.g., floor, standing) using strong, deliberate pushing actions (like a crab or bear walk) that meet and stop abruptly (collision).
Volcanic Eruption	**Change in Dynamic and Level:** Deliberately changing speed, force, and height to represent the build-up and explosive release of pressure.	**Explosive Action:** Starting low and slow (magma build-up) using a **curled** body shape, then accelerating suddenly into a **high, stretched** jump or leap, landing safely with control (ash cloud/explosion).
Earthquake Tremor/Wave	**Rhythm and Irregularity:** Understanding how to apply **irregular, fast, or sharp movements** to represent uncontrolled shaking.	**Erratic Movement:** Performing quick, sharp changes of direction or level (e.g., shaking, vibrating, zig-zagging) to represent the erratic movement of seismic waves.

2. Composition and Sequencing (The "Structure" of Performance)
Sequencing and Flow: Pupils learn how to structure a movement sequence to tell a geological story (e.g., *Mountain Formation*). They must understand the need for a **beginning** (calm plates), a **middle** (the powerful collision/uplift), and an **end** (a final balanced shape).

Balance and Stability: Pupils use different **bases of support** (one foot, two hands and a foot, whole body) to represent mountains, understanding that a wider base creates **greater stability**. They learn to hold a balanced shape to show the **immovable size** of a mountain or the **stasis** of a dormant volcano.
Creating Shapes: They experiment with different body shapes, using **curled** and **low** shapes for magma/molten rock, and **long, vertical, and stretched** shapes for towering mountain peaks.
Collaboration: Working with a partner or group to create a movement sequence that physically demonstrates plate boundaries (convergent, divergent, transform) using synchronised or counter-balanced movements.

3. Evaluation and Health (The "Why" and "Review" of PE)
Evaluation: Pupils develop the skill of **observing and giving feedback** on how effectively a partner or group has used **force, speed, and shape** to communicate the geological idea. They use **correct PE vocabulary** (e.g., 'low level,' 'strong tension,' 'controlled landing') to suggest improvements to technique and expression.
Health and Safety: Understanding the importance of a **warm-up** to prepare muscles for the sudden, dynamic movements required (like jumps and leaps for an eruption) and executing **safe take-offs and controlled landings** to prevent injury, especially when representing high-impact events like explosions or tremors.

Learning Objectives

PE **learning objectives** typically focus on physical skills, fitness, and healthy living, while the **'Earthquakes, Volcanoes & Mountains'** learning theme is from the science or geography curriculum.

Option 1: Learning Theme Link (most likely and practical)
This approach would use the **'Earthquakes, Volcanoes & Mountains'** learning theme as a context for typical PE activities. For example, imagining being on shaky ground, climbing a mountain, or erupting like a volcano.

Developing Agility and Balance (Earthquakes):
To be able to move with control and change direction quickly, as if avoiding obstacles during an earthquake simulation.
To be able to maintain balance in various stances and movements, simulating unstable ground.

Developing Strength and Coordination (Mountains):
To be able to use their bodies effectively to push, pull, and climb, simulating ascending a mountain.
To be able to coordinate their movements for sustained physical activity, like a mountain trek.

Expressive Movement and Control (Volcanoes):
To be able to express different phases of a volcano's activity (dormant, rumbling, erupting) through controlled and dynamic movements.
To be able to perform movements with varying levels of energy and force, mimicking volcanic action.

Teamwork and Problem-Solving (All Themes):
To be able to work collaboratively with peers to navigate a "mountain rescue" or "earthquake escape" scenario.
To be able to communicate effectively and make decisions as a team during themed physical challenges.

Understanding Spatial Awareness (All Themes):
To be able to navigate a designated space safely and effectively, imagining it as a challenging landscape.

To be able to understand and respond to signals and instructions within a themed activity.

Developing Stamina and Endurance (All Themes):
To be able to participate in physical activities for sustained periods, building their cardiovascular fitness.

Option 2: Cross-Curricular Project (more involved)
Project Title: "Surviving the Dynamic Earth"
Overall Aim: To understand the forces that shape our planet and how humans respond to them.
PE Component: Design and participate in a "disaster preparedness" obstacle course, focusing on agility, speed, and teamwork.
In this scenario, the PE objectives would be more specific to the "disaster preparedness" aspect, e.g., "To demonstrate effective strategies for navigating an uneven terrain course safely."

Lesson Ideas

This 6-week Medium-Term Plan for Key Stage 2 PE uses the learning theme of **"Earthquakes, Volcanoes & Mountains"** to develop pupils' physical literacy through creative movement, dance, and gymnastics. It runs parallel progression pathways for **Lower Key Stage 2** and **Upper Key Stage 2**, showing a clear development from basic balance and core expansion to advanced group counter-balances, flight patterns, and choreographic synchronisation. Across this unit, pupils build **substantive knowledge** (fundamental movement patterns, balance mechanics, counter-tension, levels, paths of travel, flight vectors, and physiological vocabulary) while actively sharpening their **disciplinary knowledge** (thinking like a choreographer and athlete by evaluating composition aesthetics, managing momentum safely, designing choreographic motifs, and applying peer critique to refine routines).

Unit Title: Tectonic Dynamics: Balance, Eruption, and Elevation
Duration: 6 Weeks (Approx. 1 hour per week)
Core Resources: Large gymnastics floor mats, vaults or stable staging blocks, ribbons or coloured fabrics, visual movement cards, stopwatches, and rhythmic backing tracks.

Weekly Progression Scheme
Week 1: Tectonic Stability – The Rock Foundations (Gymnastic Balances)
The PE Focus: Exploring centre of mass to master stable individual and partner balances.
Substantive Knowledge:
LKS2: Knowing that a wide **base of support** (e.g., using points close to the floor like knees or hands) increases stability. Identifying 1, 2, 3, and 4-point balances.
UKS2: Understanding **counter-balance** (pushing against a partner to stay stable) and **counter-tension** (pulling away from a partner). Knowing that tightening core muscles stabilises high-altitude shapes.
Disciplinary Knowledge:
Body Mechanics Control: Analysing balance points to adjust alignment, correcting wobbles by shifting centre of mass deliberately.
Learning Theme Activity: *Sculpting the Ridge Line.*
LKS2 (Y3/4): Pupils explore individual "mountain" balances on mats. They hold a series of 3-point and 2-point shapes, experimenting with making their base of support wide and low to represent flat plateaus, or narrow and tall to look like sharp peaks. They must hold each shape rock-steady for 5 seconds.
UKS2 (Y5/6): Pupils work in pairs to build interlocking "fault-line ridges." They learn counter-balance by pressing hands together and leaning inward, and counter-tension by gripping wrists and leaning outward, ensuring they squeeze their core muscles to hold the tension safely.

Week 2: Tremor Sequences – Shockwaves & Trajectories (Dynamic Movement)
The PE Focus: Linking explosive movements together smoothly with controlled direction shifts.
Substantive Knowledge:
LKS2: Defining **pathways** in movement (the floor patterns made when travelling, such as straight, curved, or zigzag paths).
UKS2: Understanding **isolation** (moving one specific body part independently) and **canon** (dancers performing the exact same movement one after another).
Disciplinary Knowledge:
Choreographic Fluency: Combining sudden, sharp movements with smooth rolls to communicate geological energy safely through the body.
Learning Theme Activity: *The Seismograph Runway.*
LKS2 (Y3/4): Pupils travel along a zigzag path across floor mats, mimicking a tracking needle during a tremor. They combine fast, sharp footwork with sudden low rolls and frozen balance points, ensuring they change direction quickly but safely.
UKS2 (Y5/6): Pupils work in groups of 4 to create a rolling shockwave sequence. They use a **canon** structure: Dancer 1 drops to a low roll, followed by Dancer 2, 3, and 4 in quick succession, creating a rippling wave effect that travels across the room.
Week 3: Magma Elevation – Levels & Extensions (Dance Expression)
The PE Focus: Using contrasting high and low space levels to express environmental shifts.
Substantive Knowledge:
LKS2: Defining **levels** in dance: *low* (close to the ground), *medium* (standing up normally), and *high* (reaching up, jumping, stretching high).
UKS2: Defining **extension** (extending limbs out fully to create clean lines) and **dynamics** (how a movement is performed, such as heavy, light, sharp, or fluidly).
Disciplinary Knowledge:
Expressive Spatial Projection: Exaggerating physical extensions and altering performance speed to show contrast between low pressure and high explosion.
Learning Theme Activity: *The Eruption Motif.*
LKS2 (Y3/4): Pupils start coiled tightly on the floor at a *low level* (magma chamber). They slowly move up through a medium level with turning motions, and finish with a sudden burst up to a *high level* with a star jump, stretching their fingers out to represent ash clouds.
UKS2 (Y5/6): Pupils develop a layered dance sequence about lava flow. They use fluid, heavy dynamics to stay close to the floor, extending their arms and legs to show a slow, creeping flow, before shifting to sharp, explosive jumps that demonstrate a sudden gas blowout.

Week 4: Volcanic Flight – Airborne Tectonics (Gymnastic Jumps & Landings)
The PE Focus: Mastering safe jump mechanics and body shapes in the air using equipment.
Substantive Knowledge:
LKS2: Knowing the 4 parts of a safe jump: *preparation, take-off, flight shape, and landing*. Knowing that bending knees on landing absorbs impact shock safely.
UKS2: Defining **flight vectors** (the height and angle of a jump path). Knowing how to generate upward power using arms and explosive leg drive off a spring board or solid vault block.
Disciplinary Knowledge:
Kinetic Impact Absorption: Judging landing heights accurately and adjusting body tension to execute a safe, stuck landing every single time.
Learning Theme Activity: *The Caldera Launch.*

LKS2 (Y3/4): Pupils launch themselves off small benches or mats. They practice holding clean shapes mid-air (tuck, pike, star) to represent volcanic rocks being thrown out, focusing on landing softly on two feet with bent knees and arms held out for balance.
UKS2 (Y5/6): Pupils sprint toward a springboard and elevated vaulting block. They focus on turning horizontal speed into upward lift, executing a high star or tuck jump over a mat, and sticking their landing safely without stepping forward.

Week 5: The Mountain Expedition – Speed, Agility & Stamina (Circuit Fitness)
The PE Focus: Improving cardiovascular fitness and explosive power through an agility obstacle circuit.
Substantive Knowledge:
LKS2: Knowing that exercise makes the heart beat faster to pump oxygen to working muscles. Identifying **agility** as the ability to change direction quickly while maintaining balance.
UKS2: Understanding the difference between **aerobic** exercise (longer, steady pacing) and **anaerobic** exercise (short, explosive power bursts). Knowing how oxygen debt causes heavy breathing.
Disciplinary Knowledge:
Pacing & Strategy: Setting a steady movement pace during a tough circuit to manage energy and prevent injury over an extended physical task.
Learning Theme Activity: *The Alpine Summit Assault.*
LKS2 (Y3/4): Pupils complete an indoor mountain circuit: agility hurdle hops over cones (rock hopping), low army crawls under cargo nets (cave squeezing), and fast step-ups on benches (summit climbing), tracking their time and effort logs.
UKS2 (Y5/6): Pupils run an advanced tectonic challenge station matrix. They shift between steady aerobic mountain climbers and intense anaerobic burst plyometric box jumps, checking their pulse rates before and after the circuit to analyse how their cardiovascular systems respond.

Week 6: The Tectonic Showcase – Performance, Critique & Review
The PE Focus: Assembling movements into a polished group performance and conducting detailed peer evaluations.
Substantive Knowledge:
LKS2/UKS2: Recalling core performance metrics: *synchronisation, extensions, dynamic contrast, balance holds, and landing control*.
Technical Vocabulary: *Base of support, centre of mass, counter-balance, counter-tension, pathway, level, extension, canon, agility, anaerobic.*
Disciplinary Knowledge:
Choreographic Appraisal & Refinement: Evaluating a group composition objectively, singling out weak transitions or loose shapes, and providing clear physical instructions to polish the routine.
Learning Theme Activity: *The Forces of Nature Performance Gala.*
The sports hall turns into a performance stage. Groups combine their balances, shockwave canons, eruption dances, and vaulted jumps into a finished 2-minute routine called *The Earth Awakes*.
Groups take turns performing for the class. The audience uses evaluation clipboards to score the routines, providing immediate, helpful peer critiques: *"Your group counter-balances looked incredibly strong, but your volcano jump landing looked a bit messy because you didn't bend your knees to freeze the shape."*

Assessment Matrix (Progression Indicators)

Phase	Working Towards	Expected Standard	Greater Depth
Lower Key Stage 2 *(Years 3 & 4)*	• Balances are shaky, dropping down before hitting a full 3-second hold. • Movement pathways are disorganised, frequently bumping into peers. • Landings are stiff and straight-legged, causing pupils to stumble forward.	• Holds distinct individual mountain balances cleanly for 5 seconds. • Moves along clear straight and zigzag pathways while maintaining great spatial awareness. • Moves smoothly through low, medium, and high levels within a dance motif. • Lands safely from low vaults by bending knees to absorb the impact. • Explains that physical exercise makes the heart beat faster.	• Adjusts body weight instantly to correct wobbles and keep balances rock-steady. • Creates expressive movement ideas independently, using high extensions to show volcanic heat. • Links jumps and rolls together smoothly without awkward pauses. • Points out technical strengths and improvements when reviewing a peer's performance.
Upper Key Stage 2 *(Years 5 & 6)*	• Relies on partners to support all weight during balances, missing independent control. • Loses timing rhythm during group canon sequences, breaking the group pattern. • Loses body control mid-air, leading to clumsy, un-stuck landings on the mat.	• Engineers stable group counter-balances using proper counter-tension holds. • Performs a group rolling sequence in perfect canon timing. • Uses strong, heavy dynamics and clear physical lines to represent lava flows. • Transforms horizontal speed into impressive vertical height off springboards. • Keeps feet glued to the floor for a safe, stuck landing from high equipment vaults. • Measures heart rate changes to outline the difference between aerobic and anaerobic fitness.	• Leads partner balance setups confidently, adjusting angles to support different weights. • Designs highly original choreographic motifs that mix fluid and explosive elements perfectly. • Controls body position completely mid-air, holding clean, crisp shapes at the peak of flight paths. • Delivers professional-standard movement peer reviews using advanced vocabulary: *"Lean further back into the counter-tension line to anchor the balance shape."*
Other Information, Ideas and Resources			
Earthquake Activities: **The Shaky Ground:**			

Activity: Pupils spread out in a designated area. On the command "Earthquake!", they must find a partner and hold hands for stability. You can vary the intensity by calling out "Small tremor!" (gentle sway), "Moderate shake!" (bigger jiggles), or "Major quake!" (moving feet while holding hands).
Learning Link: Introduces the idea of ground shaking and the need for stability during an earthquake.

Drop, Cover, and Hold On Relay:
Activity: Divide the class into teams. Set up cones at intervals. On "Earthquake!", the first child in each team runs to the first cone, performs the "drop, cover, and hold on" position for a few seconds, gets up, runs to the next cone, and so on. The first team to have all members complete the relay wins.
Learning Link: Reinforces the crucial safety procedure during an earthquake in a fun, active way.

Fault Line Tag:
Activity: Designate two parallel lines as "fault lines." One or two pupils are "tectonic plates" and try to tag the other pupils (the "buildings") as they move within the playing area. When tagged, a "building" must freeze until another "building" tags them to "repair" the damage.
Learning Link: Introduces the concept of tectonic plates moving and causing stress that leads to earthquakes.

Volcano Activities:
Eruption Run:
Activity: Designate a central point as the "volcano." Pupils start around the volcano. When you shout "Eruption!", they run away from the volcano in different directions to avoid the "lava" (represented by you gently tagging them or using soft balls). Once the "eruption" subsides, they return to the base.
Learning Link: Helps visualise the force and spread of a volcanic eruption.

Lava Flow Obstacle Course:
Activity: Set up an obstacle course using mats, cones, ropes, and other equipment to represent a lava flow. Pupils must navigate the course by jumping, crawling, and stepping carefully, imagining they are avoiding hot lava.
Learning Link: Encourages problem-solving and coordination while thinking about the dangers of lava flows.
Ash Cloud Dodgeball:
Activity: Play a modified version of dodgeball using soft foam balls as "ash." Pupils try to avoid being hit by the "ash cloud" (the balls).
Learning Link: Introduces the idea of ashfall during a volcanic eruption and the need to avoid it.

Mountain Activities:
Mountain Goat Traverse:
Activity: Set up a series of low balance beams, benches, or even lines on the floor to represent narrow mountain paths. Pupils must traverse these paths carefully, like mountain goats. You can add challenges like carrying a beanbag "backpack."
Learning Link: Develops balance and coordination while imagining navigating mountainous terrain.

Climbing the Peaks:
Activity: Use climbing frames, ropes (under supervision), or even create "peaks" with large mats or gym equipment. Pupils can practice different climbing techniques to reach the "summit."
Learning Link: Encourages upper body strength and problem-solving, relating to the physical challenge of climbing mountains.

Avalanche Awareness:
Activity: Divide the class into small groups. One group pretends to be skiers/hikers on a "mountain" (a designated area). The other group has soft balls representing "snow." On a signal, the "snow" group gently throws the balls towards the "hikers," who must try to avoid being hit by the "avalanche."
Learning Link: Introduces the concept of avalanches and the dangers they pose in mountainous regions.

Combining Themes:
Tectonic Plate Push: Divide the class into two large groups, each standing on opposite sides of a central line. They try to "push" the other group over the line, representing the immense forces of tectonic plates colliding to form mountains or cause earthquakes.
Volcanic Mountain Climb: Set up a climbing activity leading to the top of a "volcano" (a raised platform or mat). Once at the top, pupils can perform a celebratory jump or movement.
Other Ideas:
Look at mountain climbing.
Visit climbing wall/bouldering wall in Norwich ?

Considerations for Implementation

Safety First: Ensure all activities are conducted in a safe environment with appropriate supervision.
Scaffolding: Adapt activities to suit the different abilities and needs of the pupils.
Integration: Link these PE activities to classroom learning about earthquakes, volcanoes, and mountains to reinforce understanding.

Science

Substantive Knowledge

In KS2 Science, the study of '**Earthquakes, Volcanoes & Mountains'** focuses on the physical properties of the Earth's materials and the energy transfers that drive geological change. It provides a real-world application for the study of **Rocks, States of Matter, and Forces**.

1. Rocks and Soils (Geology)
The Earth's crust is the "laboratory" for this unit. Pupils must understand the types of rock created by tectonic activity:

Igneous Rock: Knowledge that these are "fire rocks" formed from the cooling of magma or lava.
Extrusive: Lava cooling quickly on the surface (e.g., **Basalt** or **Obsidian**—small crystals).
Intrusive: Magma cooling slowly underground (e.g., **Granite**—large crystals).
Metamorphic Rock: Understanding how mountains are formed when existing rocks are subjected to intense **heat and pressure** without melting, changing their chemical structure (e.g., Limestone turning into **Marble**).
The Rock Cycle: Knowledge that rocks are constantly being recycled; mountains are weathered into sand, which settles as sedimentary rock, which may eventually be pushed underground to melt and become igneous rock again.

2. States of Matter and Thermal Energy
Volcanoes are a perfect case study for how temperature affects the state of materials.

Melting and Solidifying: Understanding that rock is a solid that can turn into a liquid (magma) when its temperature reaches roughly 700°C to 1,300°C.
Viscosity: Knowledge that the "runniness" of lava depends on its temperature and chemical makeup. Runny lava flows further; thick (viscous) lava builds up pressure, leading to more explosive eruptions.
Gases and Pressure: Recognising that volcanic eruptions are often driven by trapped gases (like water vapor and carbon dioxide) expanding rapidly as they reach the surface, similar to a shaken bottle of carbonated soda.

3. Forces and Motion
Earthquakes are an exploration of "Elastic Potential Energy" and friction.

Friction and Resistance: Knowledge that tectonic plates do not slide smoothly. They get "stuck" due to friction. When the force pushing the plates overcomes the friction, the energy is released suddenly.
Shockwaves (Vibrations): Understanding that sound and seismic energy both travel as **vibrations** through a medium (the Earth).
Gravity: Its role in "Mass Movement," such as landslides on mountains or the flow of lahars (mudflows) down a volcanic slope.

4. Evolution and Inheritance (Fossils)
Mountains often provide the evidence for Earth's ancient history.

Marine Fossils on Summits: The scientific "puzzle" of why shells and fish fossils are found at the top of the Himalayas.
Substantive Knowledge: These mountains were once at the bottom of the sea; tectonic plates pushed the seabed upwards over millions of years (Folding).

Scientific Vocabulary for the Learning Theme

Term	Definition
Crystallisation	The process where liquid rock cools and hardens into solid crystals.
Convection Current	The movement of heat within the Mantle that causes tectonic plates to move.
Seismic Energy	Energy that travels through the Earth's layers as a result of an earthquake.
Permeability	How easily water can pass through a rock (important for mountain ecosystems).

Why this matters
The "big idea" is **Cause and Effect**. Science teaches pupils that these massive, terrifying events are not random; they are the result of specific physical laws regarding heat, pressure, and the properties of materials.

Disciplinary Knowledge

The **disciplinary knowledge** for the Key Stage 2 learning theme **'Earthquakes, Volcanoes and Mountains'** in relation to **Science** focuses on the methods scientists use to generate, test, and revise explanations for these geological events. This is typically achieved through **modelling, observing patterns, and collecting/analysing data** to develop an understanding of the structure and internal processes of the Earth. **Disciplinary knowledge**, often referred to as **'Working Scientifically'**, is taught in the context of the **substantive knowledge** (the facts and concepts) of Earth Science.

🔬 Working Scientifically (Disciplinary Knowledge)

The key **disciplinary** skills and knowledge developed in this unit are:

1. Developing Explanations using Models

Pupils learn that scientists often use **models** to represent large-scale, slow, or unseen phenomena, and they use these models to test hypotheses and explain mechanisms.

Modelling the Earth's Structure: Using physical or edible models (e.g., layers of fruit or playdough) to represent the **four main layers of the Earth** (Inner Core, Outer Core, Mantle, and Crust). This helps them understand the **scale, composition, and relative state** of matter (solid/liquid) in each layer.
Modelling Plate Tectonics: Using objects (like biscuits on cream or foam pieces on water) to **model the movement of tectonic plates** and simulate the three main boundary types:
Convergent (Collision): Pushing two pieces of crust together to model how **Fold Mountains** (like the Himalayas) are formed.
Divergent (Separating): Pulling pieces apart to show how **rifts** and new crust form.
Conservative/Transform (Sliding): Sliding pieces past each other to model the cause of **earthquakes**.
Modelling Forces: Using simple apparatus to model the effects of **pressure** and **force** build-up (e.g., pumping air into a container to show pressure before an eruption, or using weights to demonstrate the force needed to cause a break/fault).

2. Observing and Interpreting Patterns (Data Analysis)

Pupils learn that a key scientific practice is to look for **patterns and correlations** in data to establish links and develop theories (like Plate Tectonics).

Pattern Seeking: Using world maps showing the global distribution of **earthquakes and volcanoes** to observe that they do not occur randomly but are clustered along narrow bands (**plate boundaries**).
Data Representation: Creating simple **data visualisations** (e.g., bar charts or scatter graphs, though mainly observational in KS2) to compare the **frequency** or **magnitude** (size) of earthquakes in different regions, or to track the speed of lava flow during a simulated eruption.
Formulating Hypotheses: Using the observed pattern (e.g., "Volcanoes are found near coasts/plate boundaries") to form a simple **hypothesis** that links the pattern to the underlying process (plate movement).

3. Investigation and Scientific Vocabulary

Pupils apply investigation skills in the context of the unit's concepts.

Fair Testing: Designing and carrying out a **comparative or fair test** related to geological forces, such as: Investigating which **building material** or **structure design** (controlling variables like height and base size) is most **earthquake-resistant** using a shake-table model.

Investigating the effect of **viscosity** (a property of the 'lava') on the **rate of flow** down a slope (time taken).
Using Scientific Vocabulary: Accurately using the correct, precise terminology when describing the structure and processes:
Structure: *Crust, Mantle, Core, Plate Tectonics, Magma, Lava*.
Processes: *Eruption, Tremor, Seismic Wave, Subduction, Collision, Fault, Pressure*.
Specialists: Knowing that experts like **Seismologists** study earthquakes and **Volcanologists** study volcanoes.

Learning Objectives

General Understanding of the Earth's Structure:
To know that the Earth is made up of different layers: pupils should be able to name and identify the core, mantle, and crust.
To understand that the Earth's crust is broken into large pieces called tectonic plates: pupils should grasp the concept of these plates fitting together like a jigsaw.

Mountains:
To know that mountains are large landforms that rise above surrounding land.
To understand that some mountains are formed by the movement of tectonic plates: (e.g., when plates collide and force land upwards, creating fold mountains).
To be able to identify examples of major mountain ranges around the world.

Volcanoes:
To know that a volcano is an opening in the Earth's crust: pupils should understand that magma, hot ash, and gases can escape from it.
To understand how volcanoes are formed: linking their formation to the movement of tectonic plates (e.g., at plate boundaries or hot spots).
To be able to describe what happens during a volcanic eruption: including the release of lava, ash, and gases.
To identify different types of volcanoes (e.g., composite and shield volcanoes) and their characteristics.
To be able to locate major volcanoes on a world map.
To explore the reasons why people might live near volcanoes.

Earthquakes:
To know that an earthquake is a sudden shaking of the Earth's surface.
To understand that earthquakes are caused by the movement of tectonic plates: specifically, when plates get stuck and then suddenly release energy.
To be able to explain where earthquakes are most likely to occur: i.e., along plate boundaries.
To understand that the strength of an earthquake can be measured (e.g., using the Richter scale) and that they can have different effects.
To know about tsunamis as a potential consequence of undersea earthquakes.
To explore ways in which people and cities try to protect against earthquakes.

Skills and Enquiry:
To use maps, atlases, globes, and digital mapping to locate features related to earthquakes, volcanoes, and mountains.
To collect, analyse, and communicate information about these phenomena.
To ask geographical questions and seek answers from various sources.
To understand that scientists (e.g., geologists, seismologists, volcanologists) study these events to understand them better.

Lesson Ideas
This 6-week Medium-Term Plan for Key Stage 2 Science uses the learning theme of **"Earthquakes, Volcanoes & Mountains"** to explore rock formation, states of matter under extreme heat, forces within the crust, and tectonic ecosystems. It maps out concurrent pathways for **Lower Key Stage 2** and **Upper Key Stage 2**, shifting from hands-on observation and rock grouping to complex variable testing and modelling. Across this piece of learning, pupils build **substantive knowledge** (the rock cycle, fossilization, mechanical characteristics of igneous/metamorphic/sedimentary rocks, viscous behaviours, tectonic pressure states, and volcanic soil biodiversity) while sharpening their **disciplinary knowledge** (thinking like a geologist and volcanologist by conducting fair tests, scratching for hardness, mapping viscosities, charting cooling crystal sizes, and recording environmental data). **Unit Title:** The Lithosphere Lab: Rocks, Vents, and Crustal Forces **Duration:** 6 Weeks (Approx. 1.5 – 2 hours per week) **Core Resources:** Hand lenses, rock specimen kits (granite, pumice, slate, limestone, chalk), pipettes, dilute vinegar or lemon juice, stopwatches, thermometers, corn syrup/treacle, baking soda, safety goggles, sand, and digital scales. **Weekly Progression Scheme** **Week 1: Strata & Stones – Classifying the Crust (Earth Science: Rocks)** **The Scientific Focus:** Observing, testing, and grouping rock specimens based on physical properties. **Substantive Knowledge:** **LKS2:** Knowing that rocks are grouped into three main categories based on how they are made: **igneous** (cooled magma/lava), **sedimentary** (layered particles), and **metamorphic** (changed by heat/pressure). **UKS2:** Understanding that the Earth's crust is composed of different mineral profiles. Knowing that igneous rocks vary depending on whether they are intrusive (cooled slowly underground with large crystals) or extrusive (cooled quickly on the surface with tiny crystals). **Disciplinary Knowledge:** **Comparative Grouping & Hardness Testing:** Setting up a systematic testing matrix using scratch tests (Mohs scale principles) and acid reactions to identify rock classifications. **Learning Theme Enquiry Activity:** *The Rock Strata Audit.* **LKS2 (Y3/4):** Pupils examine specimen rocks using hand lenses. They perform scratch tests with coins or fingernails to test hardness, and drip water with a pipette to check if the rock is permeable (absorbs water), sorting them into sedimentary, metamorphic, or igneous groups. **UKS2 (Y5/6):** Pupils test differences between volcanic rocks. They compare the crystal profiles of granite (intrusive) and pumice or basalt (extrusive). They use digital scales to calculate mass-to-volume relationships, explaining how gas pockets trapped during quick cooling give pumice its unique low density. **Week 2: Preserved in the Ash (Biology: Fossils & Soil Nutrition)** **The Scientific Focus:** Explaining how fossils form in sedimentary layers and investigating soil profiles. **Substantive Knowledge:** **LKS2:** Knowing how fossils are formed when animals or plants die, become trapped in sedimentary layers, and mineralise over millions of years. **UKS2:** Understanding how volcanic soils (*andosols*) become enriched with essential minerals (potassium, phosphorus) over time, and explaining how these mineral profiles support rich biodiversity despite the nearby hazard.

Disciplinary Knowledge:
Sequence Modelling & Environmental Sampling: Creating accurate sequence diagrams of mineralisation and testing soil filtration rates to draw conclusions about nutrient storage.
Learning Theme Enquiry Activity: *The Fossil Capsule Simulation.*
LKS2 (Y3/4): Pupils create step-by-step cartoon strips showing how a prehistoric creature near an ancient volcanic lake became trapped in ash layers, decayed, and left an empty space that mineralised into a stone fossil copy over millions of years.
UKS2 (Y5/6): Pupils test volcanic soil variants. They set up filter funnels containing sand, garden soil, and crushed basalt rock powder. They measure water drainage speeds and test pH levels, documenting how mineral compounds leach into water networks to feed local plant life.

Week 3: Magma Mechanics – Viscosity Experiments (Chemistry: States of Matter)
The Scientific Focus: Investigating how temperature and fluid thickness (*viscosity*) change how a material flows.
Substantive Knowledge:
LKS2: Recalling that heating solids turns them into liquids (melting) and cooling liquids turns them back into solids (freezing). Knowing that lava behaves as a moving liquid before freezing into hard stone.
UKS2: Defining **viscosity** as a liquid's internal resistance to flowing. Understanding that magma viscosity depends directly on silica content and temperature, which dictates whether a volcano has a gentle or highly explosive eruption.
Disciplinary Knowledge:
Isolating Variables & Pacing Measurement: Managing independent variables within a fluid flow test and logging flow velocities accurately using a stopwatch.
Learning Theme Enquiry Activity: *The Great Lava Run.*
LKS2 (Y3/4): Pupils melt chocolate chunks or wax blocks under controlled water bath temperatures. They record the exact temperature using thermometers, tracking how solid blocks turn into a fluid liquid stream before cooling back into hard decorative shapes.
UKS2 (Y5/6): Pupils investigate viscosity by setting up a fair test. They tilt boards at a fixed angle and race identical drops of fluids (water, corn syrup, treacle) down the slope, timing their speed over a 20cm line. They repeat the test with chilled and heated syrup to prove how high temperatures reduce viscosity, linking their data back to different global eruption styles.

Week 4: Chamber Pressure – Gas Inclusions (Physics: Gas Expansion & Reactions)
The Scientific Focus: Investigating how chemical gas production builds up pressure inside closed spaces.
Substantive Knowledge:
LKS2: Knowing that gases have no fixed shape and fill whatever space they are in. Understanding that gas bubbles trapped inside cooling lava form unique, hole-filled rock textures.
UKS2: Understanding that chemical reactions can release hidden gas volumes rapidly. Explaining how trapped gas pressure inside a volcano's main pipe eventually blows the top off composite mountains.
Disciplinary Knowledge:
Quantitative Volumetric Tracking: Measuring chemical reaction indicators accurately (e.g., tracking foam heights or gas volume escape rates) while managing material amounts systematically.
Learning Theme Enquiry Activity: *The Vent Pressure Test.*
LKS2 (Y3/4): Pupils combine baking soda and vinegar inside open clay volcano containers, observing the instant release of carbon dioxide gas bubbles. They track how the resulting foam behaves like real lava bubbles, recording how the mixture spills over the sides.

UKS2 (Y5/6): Pupils test chamber pressures by sealing a baking soda and vinegar reaction inside zip-lock bags or rubber-topped cylinders. They vary the chemical amounts systematically, measuring how fast the expanding gas volume pushes the seal open, and graphing their chemical ratios against the resulting blowout speeds.

Week 5: Crushing the Crust – Tectonic Stress (Physics: Forces)
The Scientific Focus: Investigating friction, compression forces, and mechanical resistance.
Substantive Knowledge:
LKS2: Defining **friction** as a resistive force created when two moving surfaces rub against each other. Knowing that friction can cause moving surfaces to catch and get stuck.
UKS2: Understanding **compression** and **shear stress** within tectonic plates. Explaining how rock layers store elastic potential energy when stuck by friction, releasing it instantly as kinetic shockwaves during an earthquake.
Disciplinary Knowledge:
Quantitative Force Capture: Using Newton meters systematically to measure moving friction thresholds and tracking elastic energy limits before mechanical release.
Learning Theme Enquiry Activity: *The Fault Line Friction Grid.*
LKS2 (Y3/4): Pupils test sliding friction by pulling rough stone blocks across wooden benches using Newton meters, recording the peak force (N) needed to make the block start moving. They compare how adding smooth sand or water layers reduces the required pull force.
UKS2 (Y5/6): Pupils build an earthquake fault simulator. They hook an elastic band to a heavy sandbag block sitting on a high-friction surface, pulling the band slowly using a Newton meter. They record how the band stretches (storing potential energy) while the block stays stuck by friction, until it suddenly leaps forward violently (kinetic release), mapping their force logs onto line charts.

Week 6: The Summit Seminar – Data Review & Appraisal
The Scientific Focus: Reviewing primary data collections and evaluating the reliability of scientific test setups.
Substantive Knowledge:
LKS2/UKS2: Recalling core material rules: *mineral hardness scales, crystal variations based on cooling speeds, chemical gas expansion, viscosity metrics, and tectonic friction values*.
Technical Vocabulary: *Igneous, sedimentary, metamorphic, mineral, viscosity, friction, compression force, intrusive, extrusive, elastic potential energy.*
Disciplinary Knowledge:
Critical Enquiry Evaluation: Finding potential errors or anomalies inside test data logs, explaining unexpected results, and suggesting improvements to make investigations fairer.
Learning Theme Enquiry Activity: *The Geocentric Research Congress.*
The classroom becomes a scientific research meeting. Pupils organise their test charts from the past 5 weeks (rock tests, viscosity line graphs, friction logs) onto display board panels.
LKS2 summarises rock traits, using correct grouping terms to explain specimen features.
UKS2 evaluates the fairness of their experiments, identifying potential sources of measurement error: *"Our syrup viscosity tests had some anomalies because the liquid cooled down while we were pouring it, which made it run slower. Next time, we should use insulated flask containers to keep the temperatures steady."*

Assessment Matrix (Progression Indicators)

Phase	Working Towards	Expected Standard	Greater Depth
Lower Key Stage 2 *(Years 3 & 4)*	• Groups rocks based on unhelpful superficial traits like colour or shape instead of clear tests. • Confuses melting with dissolving, thinking a rock dissolves when it gets hot. • Logs measurements erratically, missing unit markers on tools.	• Identifies and groups sedimentary, igneous, and metamorphic rocks using hardness and permeability traits. • Explains that fossils form over millions of years within layered sedimentary deposits. • Measures temperature values accurately in degrees Celsius (°C) using a thermometer. • Explains that light shadows change because an opaque object blocks straight light lines. • Measures sliding forces accurately in Newtons (N) using a standard force meter.	• Spots flaws in simple keys and adjusts sorting questions to improve identification accuracy. • Explains fossil creation by tracking individual mineralisation phases. • Predicts how temperature drops affect the thickness and flow style of melted materials. • Connects changing shadow shapes directly to the sun's apparent path across the sky. • Explains that friction forces can cause moving rock blocks to catch and get stuck.
Upper Key Stage 2 *(Years 5 & 6)*	• Fails to isolate test parameters, accidentally altering multiple variables at the same time. • Confuses density with mass, assuming large objects are automatically denser than small ones. • Constructs messy graphs with uneven scale counts or missing axis titles.	• Designs a fair test independently by isolating variables and keeping constants identical. • Links cooling speeds directly to whether volcanic rocks grow large or small crystals. • Plots viscosity flow travel times onto dual-axis line charts accurately. • Replicates gas pressure blowouts by managing chemical volume values systematically. • Uses Newton meters to measure how friction changes elastic potential energy storage points. • Evaluates scientific data sheets to spot clear patterns and trends.	• Evaluates data anomalies critically, pointing out exactly where measurement errors happened. • Explains rock density by calculating the volume of irregular pieces using fluid displacement. • Connects fluid viscosity changes directly to volcanic eruption shape styles. • Predicts gas expansion volumes mathematically by analysing chemical input ratios. • Explains earthquake shockwaves by analysing how potential energy converts into kinetic forces.

			• Suggests clear, structured upgrades to test setups to maximise overall reliability.

Other Information, Ideas and Resources

Earthquakes:

What are they?

Analogy: Use two corrugated cardboard pieces to represent tectonic plates. Show how they slide past each other smoothly sometimes, but can also get stuck and then suddenly jolt, causing a "shake."

Demonstration: Have pupils stack blocks and then gently shake the table to see how the blocks fall. This illustrates the ground shaking during an earthquake.

Activity: Build simple structures with different materials (e.g., Lego, straws and marshmallows) and test their stability on a shaking tray (a baking tray on marbles or small balls). Discuss which structures are more earthquake-resistant.

Why do they happen? (Keep it simple!)

Explain that the Earth's surface is made of big pieces (like giant jigsaw pieces) that are always slowly moving. Sometimes they bump into each other or slide past each other, causing the ground to shake.

Measuring Earthquakes:

Introduce the idea that scientists use special instruments to measure how strong an earthquake is. You could show pictures of a seismograph.

Activity: Create a simple "shake detector" using a hanging weight and paper. When the paper moves, it indicates a "shake." This isn't a real seismograph, but it helps them understand the concept of detecting movement.

Staying Safe:

Discuss what to do during an earthquake (drop, cover, and hold on). Practice this as a class.

Volcanoes:

What are they?

Analogy: Compare a volcano to a tube connected to a hot, bubbly mixture inside the Earth. When the pressure builds up, the mixture (magma/lava) erupts out.

Demonstration: The classic baking soda and vinegar volcano is always a hit! Add some red food colouring to the vinegar to represent lava. Explain that the gas produced by the reaction is like the pressure inside a real volcano.

Activity: Layer different colours of playdough or clay to represent the layers of a volcano. Cut it open to show the magma chamber and the vent.

What comes out of a volcano?

Discuss lava (molten rock), ash, and gases.

Activity: Create "volcanic ash" by crumbling dark-coloured paper or using cocoa powder.

Different types of volcanoes:

Show pictures of different shaped volcanoes (cone-shaped, shield volcanoes) and briefly explain that their shape depends on the type of eruptions they have.

Where are volcanoes found?

Use a world map to show areas where volcanoes are common (e.g., the "Ring of Fire" around the Pacific Ocean).

Mountains:
How are they formed?
Analogy 1 (Folding): Use a rug or a piece of cloth and push the ends towards each other to create folds. Explain that when tectonic plates collide, the land can fold and buckle, forming mountains.
Analogy 2 (Volcanic): Remind them of the volcano model. Explain that some mountains are formed when volcanoes erupt and the lava cools and builds up over time.
Analogy 3 (Faulting): Use blocks to show how the Earth's crust can crack and move up or down along a fault line, creating mountains.

Different types of mountains:
Show pictures of folded mountains (like the Alps), volcanic mountains (like Mount Fuji), and block mountains.
What are mountains made of?
Discuss rocks and the slow process of weathering and erosion that shapes mountains over millions of years. You could bring in different types of rocks to observe.

Why are mountains important?
Discuss habitats for animals and plants, sources of rivers, and their impact on weather patterns.

Cross-Curricular Links:
Geography: Locate earthquake and volcano hotspots on a map, study different mountain ranges.
History: Research historical volcanic eruptions or earthquakes and their impact.
Literacy: Write stories or poems about these natural phenomena.
Art: Create artwork inspired by volcanoes, mountains, or the power of earthquakes.

Changing Materials – Creating volcanoes
Look at different types of rock formed from volcanoes.
Rocks & soils – igneous, metamorphic & sedimentary rock forms.
Permeable, Semi-permeable and impermeable rocks and soils.
Rock Cycle
Fossils (link to Stone Age to Iron Age)
Link to local geography –soil and rock types found in the local area (West Runton Cliffs)
Erosion, incl. coastal erosion.
Changing state – water cycle (interchangeable process seeing it in action with mountains and volcanoes)

Considerations for Implementation

Use lots of visuals (pictures, videos).
Keep explanations clear and simple.
Encourage questions and discussions.
Make it interactive and hands-on.
Relate it to real-world events they might have heard about.

English

Book/Text Ideas

https://livingmontessorinow.com/free-volcano-and-earthquake-songs-and-educational-videos/
https://www.booksfortopics.com/booklists/topics/geography/mountains-and-volcanoes/

To truly bring the "Earth's drama" to life for Key Stage 2 pupils, it's best to provide a mix of **non-fiction** (for technical diagrams and facts) and **fiction** (to build empathy and understand the human impact).

1. Top Non-Fiction (Best for Facts & Diagrams)
"National Geographic Kids: Everything Volcanoes and Earthquakes" by Kathy Furgang
Best for: High-quality photography and "bite-sized" facts. It includes maps of the Ring of Fire and clear cross-sections of the Earth.
"Horrible Geography: Violent Volcanoes" by Anita Ganeri
Best for: Engaging reluctant readers. It uses humour and "gross" facts (like the smell of sulphur) to teach the science of eruptions.
"Volcano Atlas" by Tom Jackson & Maggie Li
Best for: Visual learners. This book uses a "map-first" approach to show where the world's most famous volcanoes are located and why they are there.
"DKfindout! Volcanoes" or **"DK Eyewitness: Volcano & Earthquake"**
Best for: Reference. DK books are the "gold standard" for clear, labelled diagrams of tectonic plate boundaries and volcanic structures.

2. Captivating Fiction (Best for Literacy & Human Impact)
"Escape from Pompeii" by Christina Balit
The Story: A beautifully illustrated story of two children fleeing the AD 79 eruption of Vesuvius.
Lesson Link: Perfect for describing the "ash cloud" and the suddenness of a volcanic event.
"The Firework-Maker's Daughter" by Philip Pullman
The Story: Lila must journey to the Grotto of the Fire-Fiend inside a volcano to prove she is a master firework-maker.
Lesson Link: While fantasy, it's great for descriptive writing and imagining the heat and intensity of a crater.
"When the Mountains Roared" by Jess Butterworth
The Story: Set in the mountains of India, it follows a girl named Maggie.
Lesson Link: Excellent for discussing mountain habitats, climates, and the physical challenges of high-altitude living.

3. Specialist & Niche Books
"The Pebble in My Pocket" by Meredith Hooper
Best for: Explaining the **Rock Cycle**. It tracks a single pebble through millions of years, including its time as molten magma.
"Everest: The Remarkable Story of Edmund Hillary and Tenzing Norgay" by Alexandra Stewart
Best for: The "Mountains" part of your topic. It's a gripping narrative of the first successful ascent, focusing on equipment and geography.
"Earth Verse: Explore our Planet through Poetry and Art" by Sally M. Walker
Best for: Cross-curricular links. It uses Haiku poems to explain geological concepts like tectonic plates and fossils.

Teacher Tip: The "Hook" Book
If you want to start the topic with a bang use **"Pop-Up Volcano!"** by Fleur Daugey. It has 3D pop-up models of eruptions that help pupils visualise the 3D nature of a cone, which is much harder to grasp from a flat 2D drawing.

Other Fiction:
When the Mountains Roared by Jess Butterworth Chapter book
The Abominables by Eva Ibbotson & Jamie Littler Chapter book
King of the Cloud Forests by Michael Morpurgo Chapter book
Bigfoot Mountain by Roderick O'Grady Chapter book
Into the Volcano by Jess Butterworth Chapter book
The Brockenspectre by Linda Newbery Chapter book
The Mountain Rescue Dog by Juliette Forrest Chapter book
Ratty's Big Adventure by Lara Hawthorne Picture book
Escape from Pompeii by Christina Balit Picture book

Other Non-Fiction:
Everest by David Long & Stefano Tambellini Dyslexia-friendly
Secrets of the Mountain by Libby Walden & Richard Jones Picture book
Pop-Up Volcano by Tom Vaillant
Highest Mountain, Deepest Ocean by Kate Baker & Page Tsou
Fact Planet: Volcanoes by Izzy Howell
Majestic Mountains: Discover Earth's Mighty Peaks by Mia Cassany & Marcos Navarro
Himalaya by Soledad Romero Marino & Maria Beorlegi
Earth's Incredible Places: Everest by Sangma Francis & Lisk Feng

Substantive Knowledge

In Key Stage 2 English, the learning theme of '**Earthquakes, Volcanoes & Mountains'** provides a dramatic backdrop for mastering non-fiction structures, atmospheric narrative writing, and persuasive Oracy. The **substantive knowledge** focuses on the move from "general" description to technical precision and emotional impact.

1. Reading: Non-Fiction and Survival Narratives
Pupils learn to navigate complex informational texts and "high-stakes" literature.

Explaining the "How": Identifying the structural features of **Explanation Texts** (e.g., how a volcano erupts). This includes cause-and-effect connectors (e.g., *consequently, as a result, due to*).
Technical Vocabulary in Context: Developing the ability to use "context clues" to understand specialised terms like *magma, epicentre,* or *aftershock* without needing a dictionary for every word.
Atmospheric Fiction: Analysing how authors use "Personification" to make the Earth seem alive (e.g., *"the mountain grumbled," "the earth shivered"*).
Survival Genre: Reading first-hand accounts or historical diaries (like Pliny the Younger) to identify how writers convey "peril" and "tension."

2. Writing: Precision and Power
The goal is to match the writing style to the scale of the subject matter.

Non-Chronological Reports: Learning to organise vast amounts of data (e.g., "Mountains of the World") into sub-headings, bullet points, and introductory overviews.
Setting Descriptions: Using the "Five Senses" to build an immersive environment. Instead of "it was hot," using precise nouns and verbs: *"The sulphurous air choked the lungs as the incandescent lava crept toward the village."*
Poetry (Haiku and Kennings): Using restricted forms to capture the stillness of a mountain or the suddenness of a quake.
Example of a Mountain Kenning: Cloud-toucher, Sky-reacher, Earth-anchor.
Reportage: Writing "Breaking News" reports, focusing on the "5 Ws" (Who, What, Where, When, Why) and using formal, objective language to report on a disaster.

3. Oracy: Explanation and Persuasion
Pupils use their voices to clarify complex ideas and argue for safety.

The "Elevator Pitch" Explanation: The ability to explain a complex process (like plate tectonics) clearly and concisely to an audience who knows nothing about it.
Persuasive Speech: Taking on the role of a "Civil Engineer" or "Volcanologist" to persuade a city council to invest in earthquake-proof buildings or evacuation plans.
Rhetorical Devices: Using "The Rule of Three" (*"Run, hide, survive"*) and "Rhetorical Questions" (*"Can we afford to wait for the next eruption?"*) to add weight to their arguments.
Debate: Arguing the pros and cons of living near a volcano (e.g., the danger of eruptions vs. the benefits of fertile volcanic soil for farming).

4. Vocabulary of English/Oracy
Many of the terms used to describe writing and speech in this unit have roots in physical geography:

Term	Geographical Link	Meaning in English
Climax	The "peak" of a mountain.	The most intense or exciting part of a story.
Impact	The "strike" of a tectonic plate.	The effect or influence one thing has on another.
Chronological	The "order" of layers in a rock.	Organising events in the order they happened.
Tension	The "stretch" before a fault line snaps.	A feeling of nervousness or excitement in a text.

Why this matters
The "big idea" is **Communication under Pressure**. This learning theme teaches pupils that language isn't just for stories; it is a tool used to save lives, explain the impossible, and capture the awesome power of a changing planet.

Disciplinary Knowledge

The **disciplinary knowledge** for the Key Stage 2 learning theme **'Earthquakes, Volcanoes and Mountains'** in relation to **English** focuses on selecting, adapting, and applying specific linguistic and literary techniques to communicate geographical information effectively across different modes: **Reading, Writing, and Oracy.**

This involves understanding *how* language works to inform, persuade, and evoke emotion, specifically in a scientific and geographical context.

Reading: Deconstructing Text
Disciplinary reading knowledge centres on understanding the **structure, purpose, and language features** of informational and narrative texts related to the learning theme.

Non-Fiction Text Features: Pupils learn to identify and analyse features of **explanation texts** and **non-chronological reports** (e.g., headings, sub-headings, glossary, captions, diagrams, bold words) to quickly locate and extract key geographical or scientific information (e.g., the difference between magma and lava).
Vocabulary Acquisition: Developing strategies (e.g., using context clues, prefixes, suffixes) to understand and apply **subject-specific vocabulary** (e.g., *tectonic, seismic, eruption, dormant, epicentre, viscosity*).
Identifying Purpose and Audience: Distinguishing between texts written **to inform** (e.g., a report on a recent earthquake), **to persuade** (e.g., an article arguing for better disaster preparation), or **to entertain/describe** (e.g., a myth about a volcano or a descriptive poem).

Writing: Constructing Meaning
Disciplinary writing knowledge involves making deliberate linguistic choices to ensure accuracy and impact in various forms.

1. Informative/Explanatory Writing
Cohesion and Sequence: Using **connectives of cause and effect** (*because, therefore, consequently*) and **temporal connectives** (*first, next, subsequently*) to clearly explain the sequential processes of plate movement, mountain formation (orogeny), or a volcanic eruption.
Precision: Employing **technical vocabulary** accurately and ensuring **subject-verb agreement** when writing formal definitions or descriptions of scientific processes.
Paragraph Structure: Structuring non-fiction texts (e.g., a leaflet or report) using a **topic sentence** that clearly states the main idea (e.g., "The Earth is structured in four distinct layers") followed by supporting details and evidence.

2. Descriptive/Narrative Writing
Figurative Language: Using **similes, metaphors, and personification** to vividly describe the power and scale of the geological phenomena (e.g., "The mountain stood like a sleeping giant," "The lava snaked down the hillside").
Sensory Language: Selecting **adjectives and strong verbs** to appeal to the reader's senses, creating an immersive experience of a disaster or a landscape (e.g., *rumbling, acrid, molten, towering, tremor*).

Oracy: Communicating and Discussing
Disciplinary oracy knowledge focuses on delivering clear, confident, and well-structured spoken communication, and engaging in respectful, focused discussion.

Presentational Skills: Learning to **modulate voice** (e.g., volume, pace, tone) to convey the scale and seriousness of the subject matter. This includes using a slower, deliberate pace when explaining complex processes, and a louder, dramatic tone when describing an eruption.
Explanation and Justification: Clearly explaining a complex geographical process (e.g., the ring of fire) to an audience, ensuring the use of **precise terminology** and **visual aids** (e.g., diagrams, maps) to support the spoken explanation.

Active Listening and Questioning: Engaging in group discussions about disaster preparedness or the impact of a geological event, by **paraphrasing** others' points and asking **focused, evaluative questions** (e.g., "How does the evidence you presented support the theory of continental drift?").

Learning Objectives

Overall Aim: To develop pupils' reading, writing, speaking, and listening skills through the exploration of **'Earthquakes, Volcanoes & Mountains'**, enabling them to comprehend, communicate, and create texts related to the learning theme. These **learning objectives** can be adapted and differentiated based on the specific year group within Key Stage 2 and the prior knowledge and abilities of the pupils. The key is to integrate the scientific learning with meaningful and purposeful English activities.

1. Reading Objectives

To develop pupils' ability to understand and interpret texts about Earthquakes, Volcanoes & Mountains:

1.1 Comprehension & Retrieval:

To retrieve and record information from non-fiction texts (e.g., information books, websites, diagrams) about the causes, effects, and features of earthquakes, volcanoes, and mountains.

To identify the main ideas and key details within paragraphs and sections explaining geological processes.

To explain the meaning of key vocabulary related to the topic (e.g., magma, lava, fault line, plate tectonics, eruption, crater, summit, seismic, tremor).

To answer questions about what they have read, referring to the text to support their answers.

1.2 Inference & Interpretation:

To infer information or make predictions based on text and images (e.g., what might happen if a volcano erupts, the impact of an earthquake).

To identify the purpose and audience of different non-fiction texts (e.g., a factual report, a news article, a warning sign near a volcano).

To explain how information is organised in non-fiction texts (e.g., headings, subheadings, captions, glossaries, indexes).

1.3 Structure & Language:

To identify and explain how non-fiction features (e.g., bold text, diagrams, labels, bullet points) contribute to understanding the topic.

To recognise and comment on the use of technical vocabulary and precise language within scientific texts.

To compare information from different sources about the same aspect of the topic (e.g., two different descriptions of a volcanic eruption).

2. Writing Objectives

To enable pupils to write clearly, accurately, and coherently about Earthquakes, Volcanoes & Mountains for a range of purposes:

2.1 Planning & Drafting:

To plan and organise ideas for non-fiction texts (e.g., information reports, explanatory texts, news articles) about geological phenomena, using features such as topic sentences, paragraphs, and clear organisation.

To use appropriate vocabulary, including scientific and technical terms, to accurately describe earthquakes, volcanoes, and mountains.

To draft well-structured sentences and paragraphs, ensuring clarity and coherence.

2.2 Composing & Text Types:

Information Report: To write an information report about a specific earthquake, volcano, or mountain range, including facts, descriptions, and explanations.
Explanatory Text: To write an explanation of how earthquakes occur, how volcanoes are formed, or how mountains are created, using cause-and-effect language.
Descriptive Writing: To write a descriptive piece about a volcanic landscape or the aftermath of an earthquake, using vivid vocabulary and figurative language (e.g., similes, metaphors).
News Report/Account: To write a news report or an eyewitness account of a simulated or historical earthquake or volcanic eruption, using appropriate journalistic conventions.
Diagrams & Labels: To create and label diagrams of volcanic structures or fault lines, accurately using scientific terminology.

2.3 Grammar, Punctuation & Spelling:
To use a range of sentence structures, including complex sentences, to convey detailed information.
To accurately use commas, apostrophes for possession and contraction, and other punctuation (e.g., colons for lists, hyphens for compound adjectives) in their writing.
To accurately spell key vocabulary related to the topic and apply spelling rules.
To use paragraphs to organise their writing, with clear topic sentences.

2.4 Editing & Evaluating:
To proofread and edit their own writing for spelling, punctuation, and grammatical errors.
To evaluate the effectiveness of their writing in conveying information and engaging the reader.
To refine their vocabulary choices to enhance clarity and precision.

3. Speaking & Listening Objectives
To develop pupils' ability to communicate effectively and participate in discussions about Earthquakes, Volcanoes & Mountains:

3.1 Presenting & Explaining:
To present factual information about earthquakes, volcanoes, or mountains clearly and confidently to an audience.
To explain complex geological processes in a way that is easy for others to understand, using appropriate vocabulary.
To use visual aids (e.g., posters, digital presentations, models) effectively to support their explanations.

3.2 Participating in Discussions:
To ask and answer questions about the topic, offering relevant details and explanations.
To contribute actively to group discussions, respecting different viewpoints and building on others' ideas.
To articulate their own opinions and ideas about the impact or significance of geological events.
To listen attentively to others' presentations and contributions, demonstrating understanding through appropriate responses.

3.3 Role-Play & Debate:
To participate in role-play scenarios related to the topic (e.g., a scientist reporting on an eruption, a news reporter interviewing survivors).
To engage in a simple debate or discussion about a relevant issue (e.g., "Should people live near volcanoes?", "How can we best prepare for earthquakes?").

Lesson Ideas
This 6-week Medium-Term Plan for Key Stage 2 English integrates **Oracy, Reading, and Writing** around the learning theme of **"Earthquakes, Volcanoes & Mountains."** It runs concurrent, progressive pathways for **Lower Key Stage 2** and **Upper Key Stage 2**. Across this unit, pupils build **substantive knowledge** (non-chronological report structures, survival narrative plot arcs, journalistic conventions, descriptive figurative frameworks, tier-2/3 vocabulary, and grammar mechanics) while developing **disciplinary knowledge** (thinking like a writer by tailoring style for specific audiences, analysing textual nuance, evaluating primary source testimonies, and editing drafts for structural pace). **Unit Title:** Eruptions and Evacuations: Writing the Changing Earth **Duration:** 6 Weeks (Approx. 5–6 hours per week) **Core Stimuli:** *Escape from Pompeii* by Christina Balit, volcanic survival accounts, photographic spreads of tectonic ridges, disaster eyewitness transcripts, and volcano safety survival manuals. **Weekly Progression Scheme** **Week 1: Strata of the Earth – The Informational Report (Reading & Non-Fiction)** **The Literacy Focus:** Deconstructing technical layouts and writing clear informational texts. **Substantive Knowledge:** **LKS2:** Identifying the layout features of a **non-chronological report** (title, introduction, subheadings, bullet points, captions). Using coordinating conjunctions (*and, but, so*) to link technical facts. **UKS2:** Mastering structural devices to organise non-fiction text (subheadings, columns, introductory summaries). Integrating **parenthesis** using brackets, dashes, or commas to inject complex geological details. **Disciplinary Knowledge:** **Textual Synthesis & Layout Mapping:** Scanning informational source texts to extract key evidence, sorting facts logically under distinct functional subheadings. **Learning Theme Activities:** **LKS2 (Y3/4) – *The Mountain Profile Guide*:** Pupils read multiple short geographic fact sheets. They compile a clean non-chronological report detailing how fold mountains are made, using fronted adverbials (*"Deep beneath the crust, tectonic plates collide..."*) to guide the reader through the structural phases. **UKS2 (Y5/6) – *The Tectonic Encyclopaedia entry*:** Pupils analyse professional encyclopaedia articles. They compose an in-depth non-chronological report mapping out the *Ring of Fire*, using complex parenthesis arrays to expand on tectonic boundaries *(e.g., "The Pacific Plate—which is an oceanic plate composed of high-density rock—subducts underneath adjacent continental margins.")*. **Week 2: Tremor Shockwaves – Descriptive Survival Openings (Narrative Writing)** **The Literacy Focus:** Creating atmospheric setting descriptions and building tension through word choice. **Substantive Knowledge:** **LKS2:** Using **adjectives and expanded noun phrases** to create a vivid image of a setting (*"the jagged, snow-capped peak", "a low, rumbling vibration"*). Using adverbs of time and place to establish sequence. **UKS2:** Utilising **pathetic fallacy** (mirroring character tension through environmental shifts) to foreshadow an earthquake. Varying sentence structures (combining long, descriptive clauses with short, single-word sentences) to alter narrative pace. **Disciplinary Knowledge:** **Sensory Transference:** Selecting sensory words intentionally to immerse the reader in an emergency situation, steering the reader's focus toward subtle warning clues. **Learning Theme Activities:**

LKS2 (Y3/4) – *The Mountain Path Crisis*: Pupils read descriptions of travellers caught in sudden mountain storms. They draft a narrative opening paragraph tracking a character walking up a high ridge, using expanded noun phrases and sensory language to capture the dropping temperatures and crumbling paths.
UKS2 (Y5/6) – *The Pre-Shockwave Suspense*: Pupils analyse the opening chapters of survival narratives. They compose a high-tension opening scene set in a town seconds before a major earthquake strikes, using *pathetic fallacy* (e.g., nesting birds suddenly fleeing, an eerie stillness in the hot air) and manipulating sentence lengths to mirror rising panic.

Week 3: Eyewitness Broadcasts – The Interview Room (Oracy & Dialogue)
The Literacy Focus: Punctuating direct speech accurately and adopting vocal roles to explore character perspectives.
Substantive Knowledge:
LKS2: Knowing the basic rules for **direct speech**: speech marks around spoken words, capital letters at the start of speech, and a punctuation mark inside the closing quote.
UKS2: Using dialogue to reveal a character's internal thoughts and move the plot forward without relying on boring speech labels (like *said*). Managing complex reporting clauses.
Disciplinary Knowledge:
Oratorical Role Implication & Transcript Transformation: Adapting vocal pacing, pitch variations, and tone to convey shock during an oral interview, and transforming spoken testimony into punctuated prose.
Learning Theme Activities:
LKS2 (Y3/4) – *Interviewing the Survivor*: Working in pairs, one pupil acts as a volcanologist while the other plays an eyewitness who escaped a sudden lava flow. They draft and record an interview, with the writer transforming the conversation into a dialogue scene that follows speech punctuation rules perfectly.
UKS2 (Y5/6) – *The Post-Disaster Press Briefing*: Pupils analyse transcripts of emergency service broadcasts. They script a tense discussion between a local governor and a seismology expert during an evacuation crisis, using descriptive action tags instead of simple speech markers to hint at the growing exhaustion of the characters *("Grab the maps!" the captain ordered, his hand trembling as the floor shook once more.)*.

Week 4: Breaking News – The Disaster Chronicle (Journalistic Writing)
The Literacy Focus: Formatting written work to follow journalistic style rules.
Substantive Knowledge:
LKS2: Identifying the structural components of a **newspaper report**: masthead, headline (using alliteration or puns), orientation paragraph (answering *Who, What, Where, When*), and photographic captions.
UKS2: Incorporating a mix of **direct and indirect speech** within a news frame. Using the **passive voice** to project a formal, objective journalistic tone (*"The village was completely consumed by the advancing lava flow"*, rather than *"Lava consumed the village"*).
Disciplinary Knowledge:
Journalistic Objectivity Evaluation: Assessing the structural tone of news columns and selecting specific grammatical structures to write an impartial account of a chaotic event.
Learning Theme Activities:
LKS2 (Y3/4) – *The Day the Mountain Shook*: Pupils draft a newspaper report detailing a sudden local landslide. They write a bold headline, construct a punchy lead paragraph answering the 4 'W's, and summarise the event sequentially.
UKS2 (Y5/6) – *The Eruption Dispatch*: Pupils look at archive news articles tracking major global eruptions. They write a front-page newspaper report covering the disaster, integrating eyewitness interviews via direct quotes, summarising structural damage using the *passive voice*, and creating a formal, authoritative style.

Week 5: Warnings for the Citadel – Survival Directives (Instructional Writing)
The Literacy Focus: Writing clear, concise instructional layouts designed to direct human actions during a crisis.
Substantive Knowledge:
LKS2: Using **imperative verbs** (bossy verbs like *stop, drop, run, hold*) and numbering systems to outline clear steps.
UKS2: Writing complex conditional clauses (*"If the ash cloud expands, immediately seal all ventilation channels..."*). Selecting precise modal verbs (*must, should, could*) to indicate urgency levels.
Disciplinary Knowledge:
Procedural Clarity Optimisation: Editing instructional scripts to strip away confusing wording, ensuring steps follow a logical sequence where doing steps out of order could cause failure.
Learning Theme Activities:
LKS2 (Y3/4) – *The Earthquake Safety Guide*: Pupils design a basic survival flyer for school classrooms. They write a numbered sequence of actions to take during an earthquake, using clear imperative verbs (*"Drop beneath a sturdy desk. Hold onto the frame leg rigidly."*).
UKS2 (Y5/6) – *The Volcanic Evacuation Protocol*: Pupils compose an official emergency handbook for a city located near an active stratovolcano. They organise their text using clear headings and write precise instructions that combine imperative structures with *modal verbs* and conditional rules to outline specific zones and alert levels.

Week 6: The Tectonic Anthology – Editing & Presentation
The Literacy Focus: Evaluating drafts critically against success criteria, editing for impact, and publishing a finished anthology.
Substantive Knowledge:
LKS2/UKS2: Mastering standard editing strategies: *checking for spelling patterns, correcting tense slips, verifying punctuation bounds, and replacing weak word choices with high-impact vocabulary*.
Technical Vocabulary: *Non-chronological, expanded noun phrase, pathetic fallacy, direct speech, indirect speech, passive voice, imperative verb, modal verb, parenthesis, cadence.*
Disciplinary Knowledge:
Critical Self-Appraisal & Peer Editorial Response: Critiquing structural pace and clarity within a text draft, and making adjustments to maximise reading engagement.

Learning Theme Activities:
The Publishing House of the Peaks: Pupils assemble their informational entries, narrative openings, interview transcripts, news reports, and survival guides into a completed personal collection titled *The Tectonic Anthology*. They use coloured pens to audit their work systematically.
LKS2 focuses on verifying direct speech punctuation boundaries and upgrading mundane adjectives.
UKS2 uses an editing checklist to refine their passive voice structures, ensure their *pathetic fallacy* links feel smooth, and confirm their paragraph brackets are used correctly. The unit concludes with a class reading circle where pupils read excerpts aloud, tracking how their peers react to variations in pace and word selection.

Assessment Matrix (Progression Indicators)

Phase	Working Towards	Expected Standard	Greater Depth
Lower Key Stage 2 *(Years 3 & 4)*	• Non-fiction texts are unorganised, lacking clear subheadings or introduction blocks. • Forgets quote marks or places them erratically around spoken clauses. • Relies on repetitive instructions without using distinct imperative verbs.	• Organises information logically using clear titles, subheadings, and bullet points. • Uses expanded noun phrases to paint a vivid picture of a landscape setting. • Punctuates direct speech accurately with quotes around the spoken text. • Drafts news reports featuring a clear headline and initial summary sentence. • Employs imperative verbs consistently within numbered safety instructions.	• Chooses descriptive words carefully to build a strong sense of danger in narrative settings. • Uses dialogue effectively to show a character's fear or shock during an interview. • Varies sentence lengths intentionally to control the pace of a descriptive passage. • Adapts spoken tone and volume dynamically when delivering oral presentations.
Upper Key Stage 2 *(Years 5 & 6)*	• Relies on boring dialogue hooks like "said", making characters sound flat. • News articles lack formal tone, relying on casual descriptions instead of the passive voice. • Survival instructions are messy, confusing the sequence of vital safety steps.	• Uses complex structural features like columns and parenthesis to organise non-fiction text. • Integrates *pathetic fallacy* smoothly to hint at future plot dangers. • Uses complex dialogue choices to reveal relationships and drive action forward. • Writes news articles using the *passive voice* to establish an objective, journalistic tone. • Employs modal verbs and conditional clauses to create clear emergency rules. • Reviews and edits drafts systematically to maximise writing clarity.	• Coordinates multi-layered narratives that weave together action, dialogue, and underlying tension. • Delivers persuasive oratory that alters volume and pacing to captivate listeners. • Employs the passive voice masterfully to capture a distinct professional reporting tone. • Critiques and refines prose rhythms independently to ensure long passages flow beautifully. • Provides constructive feedback: *"Your news report captures a brilliant formal tone, but adding*

			parenthesis in paragraph three would let you inject more technical detail."

Other Information, Ideas and Resources

Creative Writing & Storytelling:

The Day the Earth Shook: Encourage pupils to write a narrative from the perspective of someone experiencing an earthquake. This could be a child, an animal, or even an inanimate object like a building or a tree. Focus on sensory details – what did they see, hear, feel?

Volcano's Diary: Imagine a volcano that can write! What would its thoughts and feelings be before, during, and after an eruption? This allows for exploring personification and emotional language.

The Mountain's Secret: Write a myth or legend explaining the creation of a specific mountain range. Who were the characters involved? What magical events took place?

Escape from Pompeii: Inspired by historical events, pupils can write a story about someone trying to escape the eruption of Mount Vesuvius. This encourages research and descriptive writing.

A Journey to the Summit: Pupils can write an adventure story about a group of explorers attempting to climb a very tall and challenging mountain. What obstacles do they face? What discoveries do they make?

Informative Texts & Research:

Earthquake Fact Files: Pupils can research different aspects of earthquakes (causes, effects, measuring scales) and create fact files, posters, or presentations. This focuses on clear, concise writing and the use of headings and subheadings.

Volcano Reports: Similar to earthquake fact files, pupils can research different types of volcanoes, their locations, and famous eruptions, presenting their findings in a report format.

How Mountains are Made: Explore the different ways mountains are formed (folding, faulting, volcanic activity) and write explanatory texts with diagrams.

Comparing and Contrasting: Pupils can write comparison pieces focusing on the similarities and differences between earthquakes and volcanic eruptions, or different types of mountains.

News Reports: Stage a mock news broadcast about a recent earthquake or volcanic eruption. Pupils can take on roles as reporters, eyewitnesses, and scientists, writing scripts and delivering information.

Poetry:

Earthquake Haiku: The short, structured form of haiku (5-7-5 syllables) is perfect for capturing a fleeting moment or feeling during an earthquake.

Volcanic Imagery Poems: Encourage pupils to use vivid imagery and metaphors to describe the power and beauty (and danger) of a volcanic eruption.

Mountain Shape Poems: Pupils can write poems about mountains, shaping their writing to resemble the outline of a mountain.

Acrostic Poems: Use the words EARTHQUAKE, VOLCANO, or MOUNTAIN as the starting letters for acrostic poems.

Free Verse Exploration: Allow pupils to explore their feelings and thoughts about these natural phenomena through free verse poetry.

Drama & Role-Playing:

Earthquake Drill Skits: Pupils can create and perform short skits demonstrating what to do during an earthquake.

Volcano Debate: Stage a debate about the pros and cons of living near a volcano (e.g., fertile soil vs. risk of eruption).
Mountain Rescue Team: Pupils can role-play a mountain rescue team, writing dialogue and action sequences for a rescue mission.
Interview with a Geologist: One child can take on the role of a geologist, and others can interview them about earthquakes, volcanoes, and mountains.
Hot Seating: Pupils can take on the persona of a famous volcano (like Mount Vesuvius) or a significant mountain range (like the Himalayas) and answer questions from the class.

Considerations for Implementation

Cross-Curricular Links:
Geography: Naturally, these topics link strongly to geography, providing context and information for their English work.
Science: Understanding the scientific processes behind these phenomena will enrich their writing.
History: Exploring historical events like the eruption of Pompeii can inspire narratives.

Maths

We use the White Rose Maths Scheme. The information below is for enhanced provision purposes and do not replace the WRM lessons.

Substantive Knowledge

While there are opportunities to incorporate mathematical skills within the learning theme of **'Earthquakes, Volcanoes, and Mountains'**, the core objectives for the topic itself would not be mathematical. However, here are some examples of how mathematical skills and concepts could be applied when teaching about **Earthquakes, Volcanoes, and Mountains** to Key Stage 2 pupils. This would involve using data, measurements, and problem-solving relevant to the topic. In Key Stage 2 Maths, the learning theme of **'Earthquakes, Volcanoes & Mountains'** acts as a powerful real-world application for **Statistics, Measurement, and Ratio**. Pupils move from abstract numbers to using data to quantify the scale and impact of the Earth's forces.

1. Statistics: Interpreting Seismic Data
This is the most direct link to the learning theme, focusing on how we "read" the Earth's movements.

Line Graphs: Understanding how to plot and interpret a **Seismogram**. Pupils learn that the x-axis usually represents time and the y-axis represents the amplitude (strength) of the vibration.
The Richter Scale (Logarithmic Thinking): While KS2 pupils don't need to calculate logs, the **substantive knowledge** is that the scale is not linear. A magnitude 5 earthquake is **10 times stronger** than a magnitude 4.
Data Sets: Calculating the **mean, median, and mode** of eruption frequencies or earthquake depths over a century to identify patterns in "active" zones.

2. Measurement: Altitude and Depth
Mountains provide a vertical dimension to the study of length and height.

Conversion: Converting between units of measure—calculating a mountain's height in metres (m) and kilometres (km) (e.g., Mount Everest is 8,848m or 8.848km).
Negative Numbers: Using the "Sea Level" as zero (0) to understand elevation. Mountains have positive altitudes, while the "Focus" of an earthquake or the depth of a tectonic trench (like the Mariana Trench) are represented by negative integers.

Temperature Gradient: Calculating the drop in temperature as altitude increases (typically a 1°C drop for every 150mof ascent).

3. Geometry: Angles and Shapes
The physical form of volcanoes and mountains is rooted in geometric principles.

Angles of Elevation: Understanding the "steepness" of a volcano's slope. Comparing a **Shield Volcano** (wide, shallow angles) with a **Composite Volcano** (steep, acute angles).
3D Shapes: Identifying the **Cone** as the primary shape of most volcanoes and the **Pyramid** or **Prism** shapes often found in mountain peaks.
Symmetry: Investigating the "near-symmetry" of volcanic cones like Mount Fuji and why erosion or tectonic shifts break that symmetry over time.

4. Scale and Ratio: Mapping the Earth
Pupils use maths to shrink the massive scale of the Earth down to a page.

Scale Drawings: Using ratios (e.g., 1cm = 10km) to draw tectonic plates or mountain ranges accurately on a map.
Volume: Estimating the volume of a volcanic "ash cloud" or the amount of lava displaced during an eruption by treating the flow as a series of 3D prisms.
Probability: Discussing the likelihood of an event occurring (e.g., "There is a 1 in 10 chance of an eruption this decade") and representing this as a fraction, decimal, or percentage.

Mathematical Vocabulary for the Learning Theme

Term	Definition
Magnitude	A number that characterises the relative size of an earthquake.
Altitude	The vertical height of an object above a fixed reference point (usually sea level).
Gradient	A measure of how steep a slope is.
Amplitude	The maximum extent of a vibration or oscillation, measured from the equilibrium.

Why this matters
The "big idea" here is **Quantification**. By applying maths to Earth Sciences, pupils learn that the world isn't just a series of random events; it is a measurable system where patterns can be identified, and future risks can be calculated.

Disciplinary Knowledge

The **disciplinary knowledge** for the Key Stage 2 learning theme **'Earthquakes, Volcanoes and Mountains'** in relation to **Mathematics** focuses on applying numerical skills to interpret, represent, and solve problems related to the **measurement, scale, data, and magnitude** of these real-world geographical phenomena. This knowledge bridges the abstract world of mathematics with the concrete study of the Earth.

Key Disciplinary Knowledge Areas

1. Measurement and Scale
Pupils apply their understanding of measurement and proportion to deal with the vast sizes and distances involved in Earth science.

Understanding and Converting Units: Working with different units of length to describe geographical features, such as:
Converting between **metres (m) and kilometres (km)** when discussing the height of mountains (e.g., Mount Everest is 8,848m, which is 8.848km).
Converting between **centimetres (cm) and kilometres (km)** when using map scales to calculate real-life distances.

Scale and Ratio: Interpreting and using **scale** as a form of ratio to understand the true size of features that are represented on a map or in a model:
Calculating actual distances using a **linear scale** or a **ratio scale** (e.g., 1:100,000, meaning 1cm on the map equals 100,000cm or 1km in real life).
Applying **scaling factors** to create models, such as using a scale factor to represent the relative thickness of the Earth's layers (crust, mantle, core).

2. Data Handling and Representation
Pupils use mathematical tools to analyse and communicate quantitative information about events and features.

Collecting and Organising Data: Collecting data on the height of various mountains or the frequency/magnitude of earthquakes/volcanic eruptions in a region, and organising this data into **tables** (e.g., ranking mountain heights).
Representing Data: Creating and interpreting **bar charts** or **pictograms** to compare mountain heights, the number of eruptions per century, or the primary/secondary effects of a disaster.
Averages and Range: Calculating the **range** (difference between the tallest and shortest, or the highest and lowest magnitude) to describe the variability of the data. For more able pupils, calculating the **mean** (average) height or magnitude across a set of data.

3. Magnitude and Numerical Systems
Pupils engage with the specific numerical systems geologists use to quantify the power of these events.

The Richter Scale: Understanding that the Richter scale (or the moment magnitude scale) is **logarithmic** (though they only need to grasp the concept of exponential increase, not the maths of logarithms).
Interpreting that an earthquake of magnitude 6.0 is **ten times more powerful** than one of magnitude 5.0, connecting numerical increase to real-world force.
Time and Speed: Calculating the **speed** (distance ÷ time) of processes:
Calculating the approximate speed of tectonic plate movement (e.g., 5cm per year x 1,000,000years) to understand that geological processes are extremely slow.
Calculating the speed of lava flow or tsunami waves over a short time period.

4. Geometry and Space
Pupils use spatial reasoning and coordinates to locate and describe features.

Coordinates: Using **four- and six-figure grid references** (if using Ordnance Survey maps) or **latitude and longitude** (for world maps) to accurately locate the **epicentre** of an earthquake or the summit of a volcano.
3D Shape: Identifying the 3D shapes of volcanoes (**cone**) and mountain ranges, and using terminology like **perimeter** and **area** in the context of land features.

Learning Objectives

These are some examples of **mathematical applications** and opportunities within the learning theme **'Earthquakes, Volcanoes & Mountains'**:

Number and Place Value:
Reading and interpreting large numbers: Understanding magnitudes of earthquakes (e.g., on the Richter scale), heights of mountains (e.g., Mount Everest is 8,848m), depths of trenches.
Ordering and comparing numbers: Comparing the heights of different mountains, the magnitudes of different earthquakes.
Rounding: Rounding earthquake magnitudes or mountain heights to the nearest whole number, ten, hundred, etc.

Addition, Subtraction, Multiplication, and Division:
Calculating differences: Finding the difference in height between two mountains, or the difference in magnitude between two earthquakes.
Problem-solving: If a volcano erupts X times in Y years, how many times does it erupt per year (on average)?
Scaling: Understanding how a model volcano might be scaled down from a real one.

Fractions, Decimals, and Percentages:
Fractions of a whole: If a certain percentage of the Earth's volcanoes are in the "Ring of Fire," what fraction is that?
Reading and interpreting decimal numbers: Earthquake magnitudes are often given as decimals.

Measurement:
Length/Height: Measuring and comparing heights of model mountains, understanding the scale of real mountains.
Time: Calculating the duration of volcanic eruptions, or the time between seismic waves arriving.
Temperature: Understanding temperature scales related to molten rock (lava).

Statistics:
Collecting and recording data: Creating simple charts or tables to show earthquake occurrences over time, or types of volcanoes in different regions.
Interpreting data: Reading and interpreting bar charts, pictograms, or line graphs showing seismic activity, volcanic eruptions, or the distribution of landforms.
Averages: Calculating the average number of earthquakes in a year for a particular region.

Geometry - Properties of Shapes:
Identifying 2D and 3D shapes: Recognising the cone shape of stratovolcanoes, or the triangular shape of mountain peaks.
Angles: Exploring angles of slopes on mountains or volcanoes.

Ratio and Proportion:
Scale drawings/models: Understanding the concept of scale when looking at maps of tectonic plates or models of geological features.

Example "Mathematical Objectives" derived from the topic (rather than core curriculum):
To be able to read, write and compare numbers up to 10,000,000 when describing the height of mountains or the depth of ocean trenches.
To be able to interpret data from a bar chart showing the number of earthquakes in different countries over a year.
To be able to calculate the difference in magnitude between two earthquakes given their Richter scale values (to one decimal place).
To be able to create a pictogram to represent the frequency of volcanic eruptions in a given period.
To be able to use appropriate units of measurement (e.g., metres, kilometres) when discussing the dimensions of geological features.

Lesson Ideas

This 6-week Medium-Term Plan for Key Stage 2 Maths uses the architectural and geological dynamics of **"Earthquakes, Volcanoes & Mountains"** to explore abstract mathematical concepts. It runs concurrent learning structures for **Lower Key Stage 2** and **Upper Key Stage 2,** showing a clear development from arithmetic fluency and metric conversions to coordinate navigation, structural angles, and ratios. Across this unit, pupils master **substantive knowledge** (place value, large numbers, standard metric measurements, 2D/3D shapes, coordinate geometry, angles, statistics, and ratio calculations) while actively sharpening their **disciplinary knowledge** (thinking like a mathematician by forming conjectures, identifying spatial patterns, optimising calculations, and proving spatial hypotheses).

Unit Title: Tectonic Figures: Scale, Angles, and Data in a Volatile Landscape
Duration: 6 Weeks (Approx. 5 hours per week)
Core Resources: Protractors, 30cm rulers, coordinate grid templates, compasses, metric balances, graduated jugs, stopwatches, and bar model grids.

Weekly Progression Scheme
Week 1: Measuring Massive Peaks (Place Value & Large Numbers)
The Mathematical Focus: Mastering column place value limits and ordering extreme numbers.
Substantive Knowledge:
LKS2: Reading, writing, partitioning, and ordering numbers up to 10,000 (thousands, hundreds, tens, ones). Finding 10, 100, or 1000 more or less than a given mountain height indicator.
UKS2: Reading, writing, ordering, and partitioning numbers up to 1,000,000. Rounding any volcanic elevation score or population risk count to the nearest 10, 100, 1000, 10,000, or 100,000.
Disciplinary Knowledge:
Mathematical Conjecturing: Testing hypotheses about column shifts and using place value column logic to sort wide data pools efficiently.
Learning Theme Activity: *The Global Summit Database.*
LKS2 (Y3/4): Pupils look at actual mountain elevation statistics (e.g., Mount Olympus: 2,917m). They partition these measurements into component columns on a place value mat and use comparative symbols (>, <, =) to rank the heights of local peaks.

UKS2 (Y5/6): Pupils handle massive population data logs tracking cities built near high-risk active faults. Given a regional threat count (e.g., 843,512 citizens), they practice rounding this figure to the nearest thousand, ten-thousand, and hundred-thousand to allocate emergency medical supplies strategically.

Week 2: Lava Flow Extensions (Metric Measurements & Conversions)
The Mathematical Focus: Converting metric tracking values fluidly across decimal bounds.
Substantive Knowledge:
LKS2: Measuring, comparing, adding, and subtracting lengths (m/cm/mm), mass (kg/g), and volume/capacity (l/ml).
UKS2: Converting between different units of metric measurement (e.g., kilometre and metre; centimetre and meter; gram and kilogram; litre and millilitre). Using decimal notation up to three places.

Disciplinary Knowledge:
Scalar Conversion Auditing: Tracking shifts across base-10 metrics systematically to adjust data inputs accurately during laboratory setups.
Learning Theme Activity: *The Volcanology Lab Log.*
LKS2 (Y3/4): Pupils measure liquid capacities to model magma volumes inside test tubes. They convert mixed readouts (e.g., 1l 250ml = 1250ml) and apply column addition to find the total volume released across multiple smaller vents.
UKS2 (Y5/6): Pupils analyse deep lava flow tracking charts. They take crude flow lengths recorded in meters (e.g., 4,750m) and convert them into kilometres (4.75km). They track weight changes in cooling volcanic ash blocks, converting kilograms to grams across three decimal places (1.425kg = 1425g).

Week 3: Slope Geometry – Ascents & Structural Angles (Geometry: Angles)
The Mathematical Focus: Measuring and calculating unknown angles along points or lines.
Substantive Knowledge:
LKS2: Identifying **acute, obtuse, and right angles**. Knowing that a right angle turns exactly 90°. Sorting shapes based on symmetric line properties.
UKS2: Measuring and drawing angles accurately using a protractor in degrees (°). Calculating missing angles on a straight line (180°), around a point (360°), and within a triangle (180°).
Disciplinary Knowledge:
Geometric Deduction: Using known angle constants logically to solve missing angle spaces without using a mechanical measuring tool.
Learning Theme Activity: *The Structural Profile Grid.*
LKS2 (Y3/4): Pupils look at cross-sections of different volcanic mountains. They identify the wide obtuse angles of flat shield volcanoes and compare them with the steep acute roofs of composite stratovolcanoes, sorting them systematically by angle types.
UKS2 (Y5/6): Pupils calculate structural angles within cross-sections of fold mountain ridges. Given only one base slope angle inside a triangular rock cross-section (35°), they apply interior triangle laws (180° - (35° x 2) = 110°) to find the apex angle, proving their work using calculation proofs.

Week 4: Mapping Fault Lines (Coordinates & Translation)
The Mathematical Focus: Plotting positions and drawing tracking vectors across coordinate axes.
Substantive Knowledge:
LKS2: Describing positions on a 2D grid as coordinates within the **first quadrant** (e.g., (X, Y)). Moving a point left/right and up/down (**translation**).

UKS2: Describing positions across all **four quadrants** (including negative coordinates). Executing clean shape reflections and translations across axis lines.
Disciplinary Knowledge:
Coordinate Vector Mapping: Calculating the exact final coordinate positions of a shifted shape mathematically before physically drawing the translation on a tracking grid.
Learning Theme Activity: *The Seismology Grid Radar.*
LKS2 (Y3/4): Pupils treat a coordinate grid as a seismic monitoring chart. A sensor node sits at (3, 5). If an earthquake fault translates the sensor 4units right and 3 units down, pupils calculate and log the node's new position at (7, 2).
UKS2 (Y5/6): Pupils manage an extensive four-quadrant hazard map. Epicentres are plotted across positive and negative coordinate coordinates (e.g., Epicentre A at (-3, 4), Monitoring Hub at (2, -5)). They calculate distance vectors between plots and map disaster zones by reflecting shape boundaries across the central X or Y axis mirror lines.

Week 5: Proportions of the Crust (Fractions, Decimals & Ratio)
The Mathematical Focus: Sharing volumes into unequal portions using rigid ratio scales.
Substantive Knowledge:
LKS2: Finding fractions of a set of items (e.g., finding ¼ or ⅔ of a group of objects). Recognising equivalent fractions.
UKS2: Understanding the concept of **ratio** and using the colon notation symbol (a:b). Linking ratios directly to scaling fractions and scaling factors.
Disciplinary Knowledge:
Proportional Reasoning: Scaling numbers up or down systematically while maintaining identical mathematical relationships between variables.
Learning Theme Activity: *The Core Rock Composition.*
LKS2 (Y3/4): A geologist gathers a sample of 36 rocks from a volcanic valley. ¾ of the sample is categorised as igneous basalt, and the remaining ¼ is metamorphic slate. Pupils calculate the exact quantity of each rock type using division and multiplication steps (Basalt = 27, Slate = 9).
UKS2 (Y5/6): Pupils analyse concrete mix designs used to build earthquake-resistant foundations. The compound requires gravel, sand, and cement mixed in a strict ratio of 4:3:1. Given a total material volume of 240kg, they use bar modelling to calculate the exact mass required for each ingredient (Gravel = 120kg, Sand = 90kg, Cement = 30kg).

Week 6: Seismograph Logs (Statistics & Word Problems)
The Mathematical Focus: Interpreting data tracking charts and solving multi-step calculations.
Substantive Knowledge:
LKS2/UKS2: Interpreting and presenting data using bar charts, pictograms, tables, and line graphs. Solving multi-step calculation problems using all four operations.
Technical Vocabulary: *Place value, metric conversion, acute, obtuse, coordinate, quadrant, translation, reflection, ratio, proportion, line graph.*
Disciplinary Knowledge:
Multi-Step Mathematical Modelling: Extracting numbers from a word problem narrative, setting up a clear calculation path, and checking results systematically.
Learning Theme Activity: *The Seismology Station Audit.*
Pupils read data tracking sheets to analyse changing hazard trends over time.

LKS2 focuses on bar data and time intervals: They read bar charts tracking weekly tremors. They extract values to solve multi-step addition word problems, mapping out how many total tremors occurred over a three-month phase.
UKS2 tackles line graphs and word problems: Pupils interpret a detailed line graph showing tremor frequencies rising over 24 hours. They solve multi-step problems based on this data: *"If tremor frequency increases by 15% every hour from a base rate of 40 shocks, calculate the total shock rate after three hours."* They use bar models to structure their calculations and verify their results.

Assessment Matrix (Progression Indicators)

Phase	Working Towards	Expected Standard	Greater Depth
Lower Key Stage 2 *(Years 3 & 4)*	• Confuses column place values, ordering numbers like 2,045 as smaller than 245. • Mixes up metric measurement markers, adding centimetres directly to millimetres without converting. • Labelling slanted geometric lines as acute angles without checking their relationship to 90°.	• Partitions and orders any four-digit number accurately on a place value chart. • Measures and calculates metric capacities fluidly using column addition tools. • Identifies right, acute, and obtuse angles, and locates simple lines of symmetry. • Plots and reads coordinates accurately in the first quadrant. • Calculates fractions of a quantity (¾ of 24 = 18) using a division-first strategy.	• Explains place value column logic: *"Adding 100 to 2,950 forces the thousands digit to change because ten hundreds make a thousand."* • Solves multi-step word problems involving conversions between meters and centimetres. • Predicts coordinate endpoints mathematically without manually drawing every tracking grid shift.
Upper Key Stage 2 *(Years 5 & 6)*	• Relies on drawing lines or finger-counting to solve missing angle calculation tasks. • Confuses coordinate axis directions, plotting negative numbers in positive fields. • Writes ratios backwards, reversing the order of	• Rounds large numbers up to 1,000,000 to the nearest specified column boundary. • Converts metric length and mass readings fluidly across decimal bounds up to three places. • Calculates missing angles on straight lines, around points, and inside triangles without measuring tools.	• Identifies pattern errors in massive datasets by cross-referencing place value columns. • Justifies metric choices: *"I used kilometres to map the lava flow because meters would create numbers too large to manage easily."* • Formulates multi-layered geometric proofs: *"I know*

	tracked items (3:1 instead of 1:3).	• Navigates all four quadrants, executing clean reflections and translations. • Solves unequal sharing problems using multi-step ratio scaling methods. • Extracts and interprets data values accurately from complex multi-line tracking graphs.	*angle X must be 55° because the straight line constant is 180°, and the remaining two angles are equal."* • Solves complex ratio and scaling problems where the total group volume changes fluidly.

Other Information, Ideas and Resources

Earthquakes:

Magnitude Scales:

Comparing Magnitudes: Introduce the Richter scale (or moment magnitude scale). Provide examples of earthquake magnitudes and ask pupils to compare them using inequality symbols (>,<,=). Discuss the logarithmic nature informally – that a jump of one whole number represents a tenfold increase in amplitude.

Ordering Earthquakes: Give a list of historical earthquakes with their magnitudes and ask pupils to order them from weakest to strongest.

Calculating Differences: Present two earthquake magnitudes and ask pupils to find the difference between them. For an extra challenge, ask them to explain roughly how much stronger one earthquake was compared to the other (e.g., a magnitude 7 is roughly 10 times stronger than a magnitude 6).

Data Handling - Earthquake Frequency:

Tally Charts and Bar Graphs: Provide data on the number of earthquakes of different magnitudes recorded in a region over a period. Ask pupils to create tally charts and then represent this data using bar graphs.

Interpreting Data: Ask questions about the bar graphs, such as: "Which magnitude of earthquake is most common?", "How many earthquakes were recorded in total?", "What is the difference in the number of magnitude 3 and magnitude 5 earthquakes?"

Time and Duration:

Calculating Time Differences: Present the times of earthquake events (start and end times) and ask pupils to calculate the duration of each earthquake.

Sequencing Events: Give a timeline of events during an earthquake (e.g., initial tremor, main shock, aftershocks) with specific times and ask pupils to order them chronologically.

Volcanoes:

Measurement - Eruption Height and Distance:

Estimating and Measuring: Show pictures or videos of volcanic eruptions. Ask pupils to estimate the height of the ash cloud or the distance lava flows might travel. Discuss units of measurement (metres, kilometres).

Scale Drawings: Introduce the concept of scale. Provide a scale (e.g., 1 cm represents 1 km) and ask pupils to calculate actual distances based on measurements on a map or diagram.

Data Handling - Types of Eruptions:

Pie Charts: Provide data on the percentage of different types of volcanic eruptions (e.g., explosive, effusive, mixed) and ask pupils to represent this data using a pie chart (or interpret a given pie chart).

Geometry - Cone Shapes:
Properties of 3D Shapes: Discuss the cone shape of many volcanoes. Explore its properties: one circular face, one curved surface, one vertex.
Nets of Cones: For more advanced pupils, explore the net of a cone and discuss the relationship between the radius of the circular base and the sector of the circle that forms the curved surface.

Problem Solving - Evacuation Zones:
Calculating Area: Imagine a circular evacuation zone around a volcano. Given the radius, ask pupils to calculate the area of the evacuation zone using the formula for the area of a circle (introduce $\pi \approx 3.14$).
Distance and Speed: If people need to evacuate a certain distance at a given speed, ask pupils to calculate how long it will take them.

Mountains:
Measurement - Height and Elevation:
Comparing Heights: Provide the heights of different mountains (in metres or feet) and ask pupils to compare them and find the difference in height.
Ordering Heights: Give a list of mountain heights and ask pupils to order them from tallest to shortest.

Data Handling - Mountain Ranges:
Line Graphs: Provide data on the average height of a mountain range over geological time periods and ask pupils to create a line graph to show how the average height has changed.
Interpreting Graphs: Ask questions about the line graphs, such as: "When was the average height of the mountain range at its peak?", "How much did the average height increase or decrease between two specific time periods?"

Geometry - Angles and Slopes:
Types of Angles: Discuss the different angles found on a mountain (steep slopes have larger angles). Introduce acute, obtuse, and right angles.
Estimating Angles: Show pictures of mountains and ask pupils to estimate the angles of their slopes.

Problem Solving - Hiking Distances and Time:
Calculating Distance: Use maps with scales to calculate the actual distance of a hiking trail on a mountain.
Time Calculations: If a hiker travels at a certain speed, calculate how long it will take them to complete a trail of a given distance, considering breaks.

Considerations for Implementation

Real-World Data: Use real data about earthquakes, volcanoes, and mountains from reputable sources (e.g., the USGS, BGS)
Visual Aids: Incorporate maps, diagrams, photographs, and videos to make the topics more engaging.
Cross-Curricular Links: Connect these maths activities with science lessons on plate tectonics, natural disasters, and geography lessons on different landforms.
Problem-Solving Scenarios: Create engaging word problems that require pupils to apply their mathematical skills in the context of these natural phenomena.

Interactive Activities: Use online simulations or create hands-on activities (e.g., building model volcanoes to explore scale).

It's crucial to remember that these are applications of mathematical skills *within* the learning theme, not core mathematical objectives *of* the learning theme itself. The primary **learning objectives** for **'Earthquakes, Volcanoes & Mountains'** would be geographical and scientific, such as:
Science: To describe the structure of the Earth, explain how volcanoes erupt, identify different types of rocks.
Geography: To locate major mountain ranges and volcanic regions, understand the concept of tectonic plates, describe the impact of natural disasters.

Courageous Advocacy

Ideas around the learning theme '**Volcanoes, Earthquakes and Mountains'**, blending understanding with action:

Focusing on Earthquake Preparedness & Safety:
"Earthquake-Ready School" Campaign:
Understanding: Research and present information on what causes earthquakes, where they are most likely to occur, and the immediate dangers.
Advocacy: Audit the school's earthquake preparedness (do they have drills? emergency kits? clear procedures?). Create a presentation or proposal for the school leadership outlining areas for improvement. This could involve suggesting the purchase of emergency supplies or advocating for regular "drop, cover, and hold on" drills.
Courage: It takes courage to respectfully challenge existing procedures and propose changes to authority figures.

"Home Earthquake Safety Heroes":
Understanding: Learn about how to make homes safer during an earthquake (securing furniture, knowing where to shelter).
Advocacy: Design informative posters, leaflets, or even short videos for families, sharing practical Considerations for earthquake preparedness at home. These could be shared with the school community or even local libraries.
Courage: Sharing information with family and encouraging them to take action requires confidence and clear communication.

Focusing on Supporting Communities Affected by Earthquakes & Volcanoes:
"Disaster Relief Fundraisers":
Understanding: Research the devastating impact of earthquakes and volcanic eruptions on communities (loss of homes, injuries, displacement).
Advocacy: Organise a school fundraising event (bake sale, sponsored activity, non-uniform day) to raise money for a reputable disaster relief organisation that supports victims of these natural disasters. Present the impact of the funds raised to the school.
Courage: Taking the initiative to organise and promote a fundraising event requires leadership and a commitment to a cause.

"Pen Pals for Resilience":
Understanding: Learn about the emotional and social challenges faced by pupils who have experienced earthquakes or volcanic eruptions.
Advocacy: If possible, connect with a school in a region prone to these events (perhaps through a charity or online platform). Write letters or create artwork to offer support and solidarity. This fosters empathy and a sense of global citizenship.
Courage: Reaching out to those in different circumstances and expressing heartfelt support can be emotionally brave.

Focusing on Environmental Responsibility & Mountain Conservation:
"Mountain Protectors":
Understanding: Explore the formation of mountains, their unique ecosystems, and the threats they face (deforestation, tourism impact, climate change).
Advocacy: Create an awareness campaign within the school about the importance of mountain conservation. This could involve posters, presentations, or even a "mountain-themed" assembly. They could advocate for responsible tourism practices or support organisations working to protect mountain environments.
Courage: Speaking up for environmental issues and challenging potentially harmful practices requires conviction.

"Sustainable Mountain Tourism Guides":
Understanding: Research the impact of tourism on mountain regions, both positive and negative.
Advocacy: Design a "guide" (leaflet, presentation) suggesting ways to be a responsible tourist in mountain areas, focusing on respecting the environment and local communities. This could be shared with the school or even local tourism boards (if appropriate).
Courage: Offering constructive suggestions to established industries requires thoughtful communication and confidence.

General Considerations for Empowering Courageous Advocacy:
Start with Empathy: Encourage pupils to imagine themselves in the shoes of those affected by these events or the importance of preserving natural landscapes.
Focus on Local Connections (Where Possible): Are there any local connections to these issues (e.g., a local geologist, someone who has volunteered in a disaster zone, a mountain rescue team)? Hearing from real people can be very impactful.
Provide Platforms: Offer opportunities for pupils to share their ideas and advocate for their chosen cause (school assemblies, class presentations, displays, writing letters, creating petitions).

Celebrate Action: Acknowledge and celebrate the pupils' efforts, regardless of the scale of their impact. The act of courageous advocacy is itself a valuable learning experience.

Other Ideas:
Search and Rescue organisations:
Mountain Rescue
Earthquake Rescue charities
Raise and awareness and support those that have been affected by volcanoes or earthquakes

Developing Spirituality

Exploring the raw power and majesty of our planet through a spiritual lens. These are ideas that aim to spark awe, wonder, and a sense of connection to something bigger than themselves:

Earthquakes:
The Unseen Force: Discuss how earthquakes remind us of the powerful, unseen forces at work beneath our feet. This can lead to conversations about the mysteries of the Earth and how much we still don't fully understand. You could ask:
"What does it feel like to know there's so much energy moving beneath us that we can't see?"
"Can we feel a sense of respect for this power, even though it can be scary?"
Fragility and Resilience: Earthquakes highlight the fragility of the human-made world and the incredible resilience of nature and communities in rebuilding. This can connect to themes of:
Impermanence: Everything changes, and even seemingly solid ground can shift.
Hope and Community: How people come together to help each other after a disaster. Share stories of kindness and support.
Listening to the Earth: Encourage pupils to think about what the Earth might be "telling" us through these events (not in a literal, blaming way, but in terms of understanding natural processes).
"If the Earth could speak, what might it say about the energy it holds?"
"How can we be more mindful of the planet we live on?"
Mindful Movement: Engage in mindful movement activities, like slowly swaying or gently shaking, to help them connect with the feeling of movement and change in a safe way.

Volcanoes:
Creation and Destruction: Volcanoes embody both immense destructive power and the creation of new land. This duality can lead to reflections on:
Cycles of Life and Death: How endings can lead to new beginnings.
Transformation: The incredible changes the Earth undergoes over time.
Inner Fire: Discuss the "inner fire" of a volcano as a metaphor for our own inner passions, energy, and emotions.
"What kinds of 'fire' do we have inside us?" (e.g., creativity, anger, joy)
"How can we learn to understand and manage our own 'inner eruptions'?"
Awe and Wonder: Show dramatic images and videos of volcanic eruptions to inspire awe at the sheer power and beauty of nature.
"What feelings arise when you see something so powerful?"
"Does it make you feel small or part of something grand?"
Connecting to the Elements: Discuss the elements involved in a volcano – earth, fire, air (ash and gases) – and how they interact. This can foster a sense of connection to the natural world.

Mountains:
Majesty and Stillness: Mountains often evoke feelings of peace, grandeur, and timelessness.
"What words come to mind when you look at a tall mountain?"
"Can you imagine the stillness and quiet at the top?"
Perspective and Journey: The journey to the top of a mountain can be a metaphor for life's challenges and achievements. The view from the summit can represent a new perspective.
"How might the world look different from the top of a mountain?"
"What 'mountains' do we face in our own lives, and what do we learn by overcoming them?"
Guardians of the Land: Some cultures view mountains as sacred places or guardians. Discuss these beliefs respectfully and consider:

"Why might people feel a spiritual connection to mountains?"
"What places in nature make you feel a sense of peace or reverence?"
Breathing and Grounding: Encourage mindful breathing exercises, imagining standing strong and tall like a mountain, feeling grounded and connected to the earth.

General Spiritual Connections:
Storytelling: Share myths and legends from different cultures that explain earthquakes, volcanoes, and mountains. These stories often carry spiritual or moral lessons.
Art and Creativity: Encourage pupils to express their feelings and reflections through art, poetry, or music inspired by these natural phenomena.
Silence and Reflection: Create moments of quiet reflection after learning about these topics, allowing pupils to process their thoughts and feelings.
Gratitude: Encourage gratitude for the stability we often experience and for the beauty and power of the natural world, even when it seems destructive.

Other Ideas

Here are some extra-curricular ideas about ***'Earthquakes, Volcanoes, and Mountains':***

Hands-on Investigations & Experiments:
Earthquake Shake Table: Construct a simple shake table using a tray, marbles or small objects, and a piece of cardboard or wood on top. Let the pupils experiment with different building materials (e.g., Lego, blocks) to see which structures are more resistant to "earthquakes."
Volcano Eruption Model: This classic is always a hit! Use a plastic bottle, baking soda, vinegar, and red food colouring to create a simulated volcanic eruption. Discuss the gases and lava that erupt from real volcanoes.
Mountain Building with Playdough/Clay: Provide playdough or clay and have the pupils model different types of mountains (fold mountains, block mountains, volcanic mountains) by pushing, folding, and layering the material.
Density and Layers of the Earth: Use different coloured liquids (e.g., oil, water, honey) in a clear container to represent the Earth's layers (crust, mantle, core). Discuss the relative densities and how this relates to tectonic plate movement.
Fault Line Demonstration: Use two thick books or blocks to represent tectonic plates. Demonstrate different types of faults (normal, reverse, strike-slip) by moving the books in various ways.

Creative & Imaginative Activities:
Earthquake Survival Skits: Have the pupils work in groups to create short skits demonstrating what to do during an earthquake (drop, cover, and hold on).
Volcano Diary/Story: Encourage creative writing by having pupils imagine they are near an erupting volcano and write a diary entry or short story about their experience.
Mountain Adventure Tales: Challenge the pupils to write adventure stories about climbing a mountain, encountering mythical creatures, or discovering hidden secrets.
Design a Disaster-Proof City: In small groups, have the pupils design a city that can withstand earthquakes and volcanic eruptions, considering building materials, location, and emergency plans. They can draw their designs or build models.
Volcano Board Game: As a group, design and create a board game centred around volcanoes, including facts, challenges, and eruption scenarios.

Research & Presentation:

Famous Earthquakes & Volcanoes: Assign different famous earthquakes or volcanic eruptions (e.g., Mount Vesuvius, San Francisco earthquake) for pupils to research and present to the group.
Types of Mountains: Have pupils research and create presentations (posters, slideshows) on the different ways mountains are formed and examples of each type around the world.
Plate Tectonics Explained: Guide Y5/6 pupils to research the theory of plate tectonics and how the movement of these plates causes earthquakes, volcanoes, and mountain formation. They can create visual aids to explain this complex concept.
Mapping Earthquakes & Volcanoes: Use world maps to locate major earthquake zones and volcanoes. Discuss the patterns and their relationship to plate boundaries.

Outdoor & Active Learning (Weather Permitting):
"Earthquake Drill" Outdoors: Practice earthquake safety procedures in an outdoor setting.
Creating Mountain Landscapes: If you have access to a sandpit or a suitable outdoor space, allow pupils to create mountain ranges and valleys using sand, soil, and rocks.
Nature Walk Focusing on Landforms: Take a walk in a local park or natural area and identify any hills or changes in elevation, discussing how they might have formed over time.

Technology & Media:
Virtual Field Trips: Explore online resources like Google Earth or virtual tours of volcanoes and mountainous regions.
Documentary Clips: Show short, age-appropriate clips from documentaries about earthquakes, volcanoes, and mountain formation.
Interactive Apps & Games: Utilise educational apps or online games that focus on Earth science topics.