

TEACHING AND LEARNING PROGRAM

SAMPLE PROGRAM 2

Focus Area

EARTH'S NATURAL SYSTEMS

The Cryosphere

Students work through the Earth systems through the lens of the Cryosphere. They draw on a variety of material from Powerful Geography 1, Chapter 2, Visualise This and GEOstories as well as other sources to understand a variety of processes, cycles and circulations and interconnections between them.

Differentiated student activities, tools and skills and key concepts are integrated throughout.

Consider using Visualise This Activities as homework tasks.

The early activities build the conceptual knowledge for the place study of Patagonia. There is time allocated for skill development throughout.

For Fieldwork ideas visit the Authors Blog
[Cryosphere – Integrating fieldwork](#) posted 10/11/2023

Examples of Evidence of learning are provided. These should be teacher developed to suit student capabilities.

Order here: [Powerful Geography 1 - Order Site \(eventsair.com\)](https://www.eventsair.com)

Follow the Authors Blog [HERE](#) for teaching ideas and support.

Stage 6: Year 11		Unit Name: Earth's natural systems	Teacher:	Unit Duration: Term 1, 2024 Weeks 1 - 11
SYLLABUS CONTENT.	Unit Description	Capabilities		Outcomes
	<p>Students investigate the diverse landscapes of the Earth's surface and its distinctive physical features. They examine the cycles, circulations, interconnections and spatial patterns that combine to form the Earth's integrated system, and investigate natural processes, cycles and circulations that change the Earth's land and water cover.</p> <p>This focus area includes an overview of the uniqueness and diversity of the Earth. Allocate a maximum of 4 hours to this part of the focus area.</p>	<p><i>Learning across the Curriculum</i> <i>General Capabilities</i></p> <ul style="list-style-type: none"> • Critical and creative thinking • ICT • Literacy • Numeracy • Personal and social competence <p><i>Cross-curriculum priorities</i></p> <ul style="list-style-type: none"> • Aboriginal and Torres Strait Islander histories and cultures • Sustainability and environment <p><i>Other learning across the curriculum areas</i></p> <ul style="list-style-type: none"> • Civics and Citizenship • Work and Enterprise 		<p>GE-11-01 examines places, environments and natural and human phenomena, for their characteristics, spatial patterns, interactions and changes over time</p> <p>GE-11-02 explains geographical processes and influences, at a range of scales, that form and transform places and environments</p> <p>GE-11-05 analyses and synthesises relevant geographical information from a variety of sources</p> <p>GE-11-06 identifies geographical methods used in geographical inquiry and their relevance in the contemporary world</p> <p>GE-11-07 applies geographical inquiry skills and tools, including spatial technologies, fieldwork, and ethical practices, to investigate places and environments</p> <p>GE-11-08 applies mathematical ideas and techniques to analyse geographical data</p> <p>GE-11-09 communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms</p>
Subject Tools and Skills				
<p>Geographical inquiry skills</p> <ul style="list-style-type: none"> • Develop geographical questions • Acquire quantitative and/or qualitative data and information using ethical practices by: <ul style="list-style-type: none"> - collecting and recording primary geographical data using a range of tools - gathering and / or organise geographical information from secondary sources 		<p>Maps</p> <ul style="list-style-type: none"> • Determine degrees and minutes of latitude and longitude • Interpret contour lines • Calculate the gradient of a slope as a ratio • Construct and annotate a cross-section from a topographic map • Calculate and interpret the vertical exaggeration of a cross-section • Determine aspect, altitude, features within quadrants, and directions, • Use scale to calculate distance and area • Recognise the key features of changing pressure patterns on weather maps <p>Spatial technology skills</p> <ul style="list-style-type: none"> • Use spatial information to determine characteristics and change 		<p>Fieldwork</p> <ul style="list-style-type: none"> • Identify, collect and record geographical data and information • Synthesise and interpret fieldwork data • Evaluate a fieldwork activity <p>Visual Representations</p> <ul style="list-style-type: none"> • Use aerial photographs and satellite images to describe the rate and extent of change • Identify and describe spatial patterns and associations, interactions and change using a range of visual representations • Represent information using a variety of visual tools <p>Graphs and Statistics Interpret graphs, statistics and diagrams</p>
Assessment FOR Learning		Assessment OF Learning		Assessment AS Learning
Diagnostic pre-tests, class brainstorm, application tasks including skills activities		Assessment 1: Weight: 30 % Task and outcomes provide by teacher		Guided writing task Guided skill development

Scope and sequence (Condensed version)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11
Content Key Outcomes	Overview GE-11-01, GE-11-09	Processes, cycles and circulations connecting natural systems GE-11-02, GE-11-05, GE-11-07, GE-11-08				Natural systems and land cover change / Human – Environment Interactions Human induced land cover change GE-11-06, 11-07, GE-11-08, 11-09			Study of Patagonia. Skill Development GE-11-01, GE-11-02, GE-11-05, GE-11-07, GE-11-09		

Content	Outcomes AND Skills	Teaching Activities			Evidence of Learning Examples	Register
		Core	Application	Extension		
Weeks 1 - 2 <i>Overview of uniqueness and diversity</i>		<i>How can we value nature?</i>	<i>Why do people have different connections with nature?</i>	<i>How are people's values of nature changing?</i>		
Nature as a source of wonder e.g., <ul style="list-style-type: none"> - Inspirational Landscapes - Biodiversity Hotspots - Wildlife migrations <i>*Allow time for skill development</i>	GE-11-01 examines places, environments and natural and human phenomena, for their characteristics, spatial patterns, interactions and changes over time	Teacher places a selection of satellite, ground level, vertical and oblique aerial photographs of nature around the room. Students do a gallery walkthrough to complete a PMI on the characteristics and features of those places. Students share to find commonalities; then select the image they like the most and develop 5 questions about it (<i>e.g. where is this?</i>). They reflect personally on the criteria they used to make their choice.	Students visit Wingthreads to watch the promotional video. (2 minutes). They <ul style="list-style-type: none"> - discuss what inspired Amelia Formby to travel 20,000 km around Australia in a light aircraft. - they collaboratively develop a short explanation in less than 20 words. - access the About Shorebirds section of the website to explain how migrating birds create a global ecological network - using the numbers 4.5 billion, 22 and 4. Watch The World's longest no- stop flight for a deeper understanding. https://www.youtube.com/watch?v=HXEK3ryoWE4&t=16s (5 minutes)	Examines natural environments for characteristics		
		Students visit Wingthreads to watch the promotional video. (2 minutes). They <ul style="list-style-type: none"> - discuss what inspired Amelia Formby to travel 20,000 km around Australia in a light aircraft. - they collaboratively develop a short explanation in less than 20 words. - access the About Shorebirds section of the website to explain how migrating birds create a global ecological network - using the numbers 4.5 billion, 22 and 4. Watch The World's longest no- stop flight for a deeper understanding. https://www.youtube.com/watch?v=HXEK3ryoWE4&t=16s (5 minutes)	Students watch the video Sea Turtle migration (4 minutes). They identify any new knowledge they gained and share with a fellow student.	Examines the spatial patterns of natural phenomena		
		Students read <i>GEOSTORY 1.1 Inspiring wildlife migrations'</i> and complete the activities. They write a summary to explain how wildlife migrations demonstrate nature as a source of wonder.		Completes skills activities using different types of maps and photographs at different scales.		
People's connection to the natural world and why it can vary <ul style="list-style-type: none"> - Proximity to nature - Worldview - Indigenous groups - Aboriginal Peoples connection to country 	GE-11-01 examines places, environments and natural and human phenomena, for their characteristics, spatial patterns, interactions and changes over time GE-11-09 communicates and applies geographical understanding, using	Teacher distinguishes between different worldviews and the values that can influence peoples perspectives.	Students apply these to determine Amelia Formby's worldview and the value she places on nature. Students read <i>GEOSTORY 1.5 Iceberg Alley</i> .	Examines worldviews influence on environmental values		
		As a class they discuss reasons for the growing global trend to 'Ice Tourism' and the places this would include, such as Newfoundland. They consider the possible worldviews of tourists vs tourism operators.	With teacher guidance, the class designs and produces an online survey (4–6 questions) to gather data about people's different experiences and connections to the natural world. Students collect, interpret and synthesise data and write a	Applies worldview and values to examine places and environments and to determine connections to environments		

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- the 'overview' effect	geographical knowledge, concepts, terms and tools, in appropriate forms	conclusion about how and why people's connections to the natural world vary. (Adapted NESAS Sample Unit of work). Access The Land Owns Us (6:14) and discuss Aboriginal People's connection to Country and how it varies from those already discussed in the previous activity. (From NSW Department of Education sample program)							
The universal value of Earth's environments - Intrinsic value - Global Commons	GE-11-01 examines places, environments and natural and human phenomena, for their characteristics, spatial patterns, interactions and changes over time GE-11-09 communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms	<p>Students read <i>GEOSTORY 1.2 Forest Elephants. Valuing nature</i></p> <p>They</p> <ul style="list-style-type: none"> - watch How forest elephants fight climate change (2 min) - explain why economic arguments are used to justify the conservation of species and environments. - identify evidence to 'change my mind' on the following statement: <i>Environments that do not provide services for humans, do not hold any value.</i> - Define the term 'intrinsic'. - write a short paragraph of 200 words to add an explanation of the intrinsic value of African forest elephants and African rainforests to the GEOstory <p>Students read the <i>VISUALISE THIS 11: Global Commons'</i> and complete the Core and Application Activities 1-6</p> <p>Students then:</p> <table border="1" data-bbox="542 858 1827 1018"> <tr> <td>Identify the universal value of the global commons.</td> <td>Describe different types of global commons and the goods and services they provide. Students then identify how ONE worldview would perceive the role of global commons.</td> <td>Justify the need for effective governance to protect the universal value of global commons.</td> </tr> </table>			Identify the universal value of the global commons.	Describe different types of global commons and the goods and services they provide. Students then identify how ONE worldview would perceive the role of global commons.	Justify the need for effective governance to protect the universal value of global commons.	Utilises evidence to justify human valuing of environments Writes an explanation of intrinsic value Examines the universal value of the Global commons	
Identify the universal value of the global commons.	Describe different types of global commons and the goods and services they provide. Students then identify how ONE worldview would perceive the role of global commons.	Justify the need for effective governance to protect the universal value of global commons.							
END OF OVERVIEW		<p>Students reflect on the following to complete an anonymous exit slip at the end of class.</p> <ul style="list-style-type: none"> - their own worldview (Select 1) - How they personally value nature (Statement) - a factor that most influenced their view (word or phrase) - whether their attitudes have changed during their years at high school. (Yes or No) <p>Teacher collates and shares with students – digitally or displays in the classroom.</p>							

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<p>The processes, cycles and circulations connecting natural systems; including: atmospheric systems hydrological systems</p>	<p>GE-11-02 explains geographical processes and influences, at a range of scales, that form and transform places and environments</p> <p>GE-11-05 analyses and synthesises relevant geographical information from a variety of sources</p> <p>GE-11-07 applies geographical inquiry skills and tools, including spatial technologies, fieldwork, and ethical practices, to investigate places and environments</p>	<p>NOTE: Teacher explains that the study of the processes, cycles and circulations that impact the functioning of Earth's Natural Systems will be completed through the lens of the cryosphere and a place study of Patagonia. By the end of the Case study students will see how local, regional and global processes, circulations and cycles interact to create the diverse landscapes of the cryosphere and its distinctive physical features.</p> <ul style="list-style-type: none"> What processes, cycles and circulations connect natural systems in the cryosphere? How is climate influenced by the interactions between the atmosphere and hydrosphere in the cryosphere <p>Students complete the following background activities to establish fundamental knowledge of atmospheric and hydrological processes, cycles and circulations.</p> <p>1. <i>The atmosphere.</i> Students revise key features and layers of the atmosphere here and for another perspective watch Earth's Atmosphere in four minutes. They create and annotate a diagram showing the main 5 layers of the atmosphere, height and temperature changes, where weather occurs and where the ozone layer is.</p> <p>2. <i>Global Atmospheric Circulation (GAC).</i> Students</p> <ul style="list-style-type: none"> read and complete the Core Knowledge Activities 1-6 from <i>Visualise This 2: Global Atmospheric Circulation</i>. sketch a diagram of the Earth to show the Hadley, Ferrel and Polar cells with high and low pressure systems. watch the three Met Office videos to clarify their understanding. <p>What is Global circulation: Differential heating What is Global circulation: Three cells What is Global Circulation: Coriolis effect and winds.</p> <p>Students then:</p> <table border="1"> <tr> <td>Identify the pressure system and winds that influence polar locations.</td> <td>Complete Visualise This 2. Application Activities 8, 9 and 10</td> <td>Assess the role of the global atmospheric circulation in redistributing heat to the poles.</td> </tr> </table> <p>3. <i>Weather systems.</i> Teacher explains the connection between global atmospheric circulations and weather systems using the MeteoBlue interactive website.</p>	Identify the pressure system and winds that influence polar locations.	Complete Visualise This 2. Application Activities 8, 9 and 10	Assess the role of the global atmospheric circulation in redistributing heat to the poles.	<p>Creates diagrams to illustrate characteristics</p> <p>Identifies patterns within the atmospheric system</p> <p>Describes the link between the GAC and weather.</p>	
Identify the pressure system and winds that influence polar locations.	Complete Visualise This 2. Application Activities 8, 9 and 10	Assess the role of the global atmospheric circulation in redistributing heat to the poles.					

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<p><i>*Allow time for skill development</i></p> <p>Characteristics of Earth's natural systems and factors affecting their functioning</p> <p>The processes, cycles and circulations connecting natural systems; including: Atmospheric - Hydrological systems</p> <p>Factors</p> <ul style="list-style-type: none"> - Latitude. - Altitude - Oceanity 		<p>Students</p> <ul style="list-style-type: none"> - observe the location and landform characteristics of Patagonia using Figures 2.5.2 and 2.5.3 - access MeteoBlue to investigate the link between atmospheric circulations and weather for Patagonia. - identify high and low pressure systems, isobars, cold/warm fronts, ridges and troughs, wind speed and direction. Use the tools in the menu to observe precipitation, snow depth and temperature Example. - suggest a reason for the distribution of snow (shown in purple) using Figure 2.5.2. <p>Students</p> <ul style="list-style-type: none"> - work in groups of three. Each person investigates one type of rainfall: orographic, frontal and convectional. - teach their type of rainfall to others in their group until all students know about all three. - collectively construct an annotated diagram to explain the different types and how they influence environments - explain the type of precipitation western Patagonia would receive (frontal, convectional or orographic) - discuss the factors that would contribute to Patagonia receiving snow instead of rainfall. <p>4. <i>ENSO Cycle</i></p> <p>Students read the ENSO Cycle in <i>Visualise This 2: Global Atmospheric Circulation</i> and study <i>Source 2.1</i></p> <p>Teacher leads a class discussion on the functioning of the ENSO Cycle.</p> <p>Students explain why the ENSO Cycle would not affect weather in Patagonia but does affect the weather in Australia. (Consider the factors that affect the functioning of natural systems)</p> <p>5. <i>Albedo effect</i></p> <p>Students read The Albedo Effect in <i>The Cryosphere 2.3 Integrated natural Systems and climate</i> and study Figures 2.3.2 and Figure 2.3.3. They complete Core Activities 1 and 2 and Application Activities 7, 8 and 9.</p> <p>6. <i>Global ocean circulations</i></p> <p>Students read Powerful Geography - Visualise This 3: Global Ocean Circulations.</p> <p>They then</p> <table border="1" data-bbox="539 1222 1798 1310"> <tr> <td>Complete Core Activities 1-6</td> <td>Complete Visualise This 3 Application Activity 7</td> <td>Complete Visualise This 3. Extension Activity 10.</td> </tr> </table> <p>Students read The Cryosphere Section 2.3 Integrated Natural Systems and climate.</p> <p>They mind map the atmospheric and hydrological processes, cycles and circulations that impact on the Cryosphere.</p>	Complete Core Activities 1-6	Complete Visualise This 3 Application Activity 7	Complete Visualise This 3. Extension Activity 10.	<p>Explains the influence of GAC on the weather in in Patagonia.</p> <p>Identifies factors influencing precipitation in Patagonia.</p> <p>Applies knowledge about types of rainfall to a place of</p> <p>Applies knowledge of atmospheric circulations and cycles</p> <p>Summarises information diagrammatically</p>	
Complete Core Activities 1-6	Complete Visualise This 3 Application Activity 7	Complete Visualise This 3. Extension Activity 10.					










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<p>The processes, cycles and circulations connecting natural systems; including:</p> <p>Geomorphic systems</p> <ul style="list-style-type: none"> • processes at tectonic boundaries • cycles of weathering, erosion and deposition. 	<p>GE-11-02 explains geographical processes and influences, at a range of scales, that form and transform places and environments</p> <p>GE-11-05 analyses and synthesises relevant geographical information from a variety of sources</p> <p>GE-11-07 applies geographical inquiry skills and tools, including spatial technologies, fieldwork, and ethical practices, to investigate places and environments</p> <p>GE-11-09 communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms</p>	<p>NOTE: Consider a pre- test to determine student prior knowledge of plate tectonics, processes at plate boundaries and processes of weathering, erosion and deposition. The focus will be on the application of this knowledge to the cryosphere, particularly in Patagonia.</p> <ul style="list-style-type: none"> • <i>How have geological systems influenced the cryosphere in Patagonia?</i> <p>Students study a map and cross section of Earth’s tectonic plates to revise processes at plate boundaries. Geology.com</p> <p>They</p> <ul style="list-style-type: none"> - identify areas of subduction and collision. - use their knowledge of the spatial patterns of the cryosphere to suggest how movement of Earth’s plates has impacted the cryosphere in a class discussion. <p>Teacher draws attention to changes in factors such as latitude, altitude, oceanity and continentality.</p> <p>Then students</p> <table border="1"> <tr> <td>Revise plate tectonics. Watch National Geographic Plate Tectonics (6 mins)</td> <td>Construct a diagram to show what happens at a subduction zone.</td> <td>Watch Plate Tectonics Theory Lesson and write a paragraph justifying why it is scientifically sound theory.</td> </tr> </table> <p>Students use Google Earth Pro to construct a terrain profile across the Andes Mountains in Patagonia.</p> <p>Teacher explains a brief geologic history of Patagonia (reference Geologic History of the Patagonian Mountains) and the role of plate tectonics and weathering and erosion in forming the present day Patagonian mountains. Students suggest the geomorphic processes impacting on the Patagonian mountains today.</p> <p>Students read the <i>GEOstory 1.4 Blown Away: The story of dust.</i></p> <table border="1"> <tr> <td>Complete Activities 1 - 4. Restrict Activities 2 & 4 to focus on the cryosphere</td> <td>Refer to <i>Chapter 2.2 Figures 2.2.7</i> and <i>Figure 2.2.8</i> to describe evidence of the dust cycle in cryospheric ice.</td> <td>Refer to Attack of the cryonites to explain how dust absorbs heat and increases glacial ice melt</td> </tr> </table> <p>Students write an explanation that includes annotated diagrams. They ‘Explain the influence of geomorphic systems on cryospheric landscapes in Patagonia.’</p>	Revise plate tectonics. Watch National Geographic Plate Tectonics (6 mins)	Construct a diagram to show what happens at a subduction zone.	Watch Plate Tectonics Theory Lesson and write a paragraph justifying why it is scientifically sound theory.	Complete Activities 1 - 4. Restrict Activities 2 & 4 to focus on the cryosphere	Refer to <i>Chapter 2.2 Figures 2.2.7</i> and <i>Figure 2.2.8</i> to describe evidence of the dust cycle in cryospheric ice.	Refer to Attack of the cryonites to explain how dust absorbs heat and increases glacial ice melt	<p>Identification of geomorphic processes impacting the cryosphere over time.</p> <p>Uses spatial technologies to construct and elevation profile (transect)</p> <p>Links the dust cycle to processes in the cryosphere.</p> <p>Creates a written explanation incorporating illustration(s)</p>	
Revise plate tectonics. Watch National Geographic Plate Tectonics (6 mins)	Construct a diagram to show what happens at a subduction zone.	Watch Plate Tectonics Theory Lesson and write a paragraph justifying why it is scientifically sound theory.								
Complete Activities 1 - 4. Restrict Activities 2 & 4 to focus on the cryosphere	Refer to <i>Chapter 2.2 Figures 2.2.7</i> and <i>Figure 2.2.8</i> to describe evidence of the dust cycle in cryospheric ice.	Refer to Attack of the cryonites to explain how dust absorbs heat and increases glacial ice melt								

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<p>Characteristics of Earth's natural systems and factors affecting their functioning</p> <p>Ecological systems</p> <ul style="list-style-type: none"> - energy flows - nutrient cycles - biological productivity - land-based and marine ecosystems - natural phenomena such as species migration. <p>Factors</p> <ul style="list-style-type: none"> - Latitude. - Seasonality - Continentiality - Oceanity <p>COMPLETION OF CHARACTERISTICS OF EARTH'S NATURAL SYSTEMS AND FACTORS AFFECTING THEIR FUNCTIONING USING THE CRYOSPHERE</p>	<p>GE-11-02 explains geographical processes and influences, at a range of scales, that form and transform places and environments</p> <p>GE-11-05 analyses and synthesises relevant geographical information from a variety of sources</p> <p>GE-11-07 applies geographical inquiry skills and tools, including spatial technologies, fieldwork, and ethical practices, to investigate places and environments</p> <p>GE-11-09 communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms</p>	<ul style="list-style-type: none"> • <i>How are the ecological systems in the cryosphere a response to other natural systems.</i> <p>The following activities refer to <i>Chapter 2.2 Unique and diverse ecological systems</i>. Class reads and discusses the introduction to ecological interactions to clarify</p> <ul style="list-style-type: none"> - the meaning of 'ecological systems' (What does it incorporate?) - the challenges to the functioning of ecological systems in the cryosphere. <p>Students read <i>Icebergs. Frigid Mobile homes</i> and examine <i>Figure 2.2.6</i>. They record their impressions in a 3 column table using the headings <i>I did know; I didn't know, and I have one question</i> Teacher leads a class discussion around student questions, biological diversity in the cryosphere and connections between cryosphere the hydrosphere via marine ecosystems.</p> <p>Students work independently through <i>Chapter 2.2 Unique and diverse ecological systems</i>. Teachers provides explicit revision on food chains, food webs, Net Primary Productivity (NPP) and Feedback Loops (Visualise This 16) where needed and apply these to ecosystems in the cryosphere. Students complete scaffolded activities.</p> <table border="1"> <tr> <td>Complete Core Activities 1 a – e, Application Activity 2</td> <td>Complete Application Activity 3</td> <td>Complete Extension Activities 5 and 6</td> </tr> </table> <p>Students collaborate in small groups to create a diagram of Carbon Cycle in the Arctic or Antarctic cryosphere.</p> <p>Students read <i>GEOSTORY 1.3: Whales as ecological engineers</i> and complete activities 1-6. They respond to the following short answer question. Assess the role of whales as ecological engineers in Arctic and Antarctic ecosystems. They can refer to GEOSTORY 1.3 Sources 1.3.1 and Chapter 2.2 Figures 2.2.4 in their responses. Teacher models how to incorporate evidence from an illustration to support a written argument.</p> <p>Students complete a mapping activity for Antarctica. <i>Chapter 2.2 Unique and diverse ecological systems</i> Activity 7</p> <p>NOTE: If the class is not using <i>Chapter 10. The Arctic Region, 10.2 Ecological systems</i>. They could investigate factors affecting terrestrial ecosystems the impact of permafrost (<i>Visualise This 6</i>) in seasonal changes to tundra ecosystems.</p>	Complete Core Activities 1 a – e, Application Activity 2	Complete Application Activity 3	Complete Extension Activities 5 and 6	<p>Examines of ecological system processes in the cryosphere</p> <p>Works independently and collaborates in groups to complete set tasks.</p>	
Complete Core Activities 1 a – e, Application Activity 2	Complete Application Activity 3	Complete Extension Activities 5 and 6					

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Weeks 6-9 <i>Natural systems and land cover change in the Cryosphere</i>		<i>How do processes, cycles and circulations determine land and water cover?</i>	<i>How have natural processes, cycles and circulations shaped land cover in the Cryosphere?</i>	<i>How will changes to natural processes, cycles and circulations shape land and water cover in the future?</i>				
<p>The nature and extent of Earth's land and water cover including:</p> <ul style="list-style-type: none"> climatic and glacial cycles <p>Natural processes, cycles and circulations that change Earth's land cover, including:</p> <ul style="list-style-type: none"> the invasion and ecological succession of vegetation communities 	<p>GE-11-02 explains geographical processes and influences, at a range of scales, that form and transform places and environments</p> <p>GE-11-06 identifies geographical methods used in geographical inquiry and their relevance in the contemporary world</p> <p>GE-11-08 applies mathematical ideas and techniques to analyse geographical data</p> <p>GE-11-09 communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms</p>	<p>NOTE: The study of Land cover change for Earth's Natural Systems is integrated into The Cryosphere Case Study.</p> <ul style="list-style-type: none"> <i>What natural processes and cycles change the natural systems in the cryosphere?</i> <p>1. Land cover change – glacial and interglacial cycles Teacher overview of nature and extent of global land cover across marine and terrestrial environments. They</p> <ul style="list-style-type: none"> discuss with students how to distinguish between <i>land cover</i> and <i>land use</i>. use Chapter 3: Forest Systems Figures 3.4.9 and 3.4.10 to illustrate land cover change in North America. <p>Students describe the identified changes in a paragraph – they reference last glacial maximum, ice retreat and ecosystem changes.</p> <p>Teacher overview of glacial and interglacial cycles of Earth. Students read Visualise This 4: Glacial and Interglacial cycles and complete the relevant activities. Students then:</p> <table border="1"> <tr> <td>Annotate historic temperature graphs to identify glacial and interglacial periods on Earth</td> <td>Annotate historic temperature and CO₂ atmospheric composition graphs. Identify similar patterns of change.</td> <td>Using evidence from temperature and CO₂ graphs, predict the implication of changes to the natural cycle of glacial and interglacial periods.</td> </tr> </table> <p>Students read Powerful Geography Visualise This 6: Permafrost and complete activities (if not done during a study of the cryosphere). They create a diagram that explains how glacial and interglacial cycles would influence permafrost. Students refer to Chapter 2: The Cryosphere 2.4 Changing land and Sea Cover - Natural change in the cryosphere. They read Glacial and Interglacial cycles AND Causes of natural change and complete Core Activities 1 & 2.</p> <p>2. Land cover change - Ecological Succession Teacher refers to Visualise This 5: Ecological Succession to explain ecological succession using Source 5.1 AND how ecological succession occurs following a glacial period using Source 5.2. Students prepare written responses to Activities 1 – 7 and 11 (Optional).</p>	Annotate historic temperature graphs to identify glacial and interglacial periods on Earth	Annotate historic temperature and CO ₂ atmospheric composition graphs. Identify similar patterns of change.	Using evidence from temperature and CO ₂ graphs, predict the implication of changes to the natural cycle of glacial and interglacial periods.	<p>Determine changes to land cover using graphs and photos</p> <p>Use mapping skills to calculate the change of land cover on small scale and then larger scale maps</p> <p>Interpret various graphs and statistics to make informed judgements on patterns in the atmosphere and glacial/interglacial periods</p> <p>Communicate information visually</p>		
Annotate historic temperature graphs to identify glacial and interglacial periods on Earth	Annotate historic temperature and CO ₂ atmospheric composition graphs. Identify similar patterns of change.	Using evidence from temperature and CO ₂ graphs, predict the implication of changes to the natural cycle of glacial and interglacial periods.						

Content	Outcomes AND Skills	Teaching Activities			Evidence of Learning Examples	Register	
		Core	Application	Extension			
<p>Focus Area Human – Environment Interactions</p> <p>Overview of change to Earth’s Natural Systems over time</p> <ul style="list-style-type: none"> Natural change compared to human induced change Evidence of climate change in the contemporary world Evidence for the causes of climate change over time Land cover change at a global scale including deforestation, desertification, melting ice sheets and retreating glaciers melting <p>COMPLETION OF LAND COVER CHANGE</p>	<p><i>NOTE: Students also need a short explanation of land cover change for deforestation (3.00) and desertification (2.00)</i></p> <p><i>Visualise This 14 and Chapter 3.6 forest Systems cover deforestation</i></p>	<p>Teacher leads an examination of <i>Chapter 2. The Cryosphere, Figure 2.4.7</i> to explain ecological succession in Andes mountain landscapes during glacial and interglacial periods.</p> <p>Students create a single illustration to summarise the main changes identified.</p> <p>The predict the impact of anthropogenic climate change on vegetation zones in the Andes mountains.</p> <p>Students complete remaining activities from <i>Visualise This 5: Ecological Succession</i> to broaden their understanding of ecological succession in different contexts.</p> <ul style="list-style-type: none"> <i>How do human induced- processes impact the natural systems in the cryosphere?</i> <p><i>3.Land cover change - Anthropogenic change</i></p> <p><i>NOTE: This is an opportunity to study anthropogenic change in the context of the cryosphere</i></p> <p><i>This content appears in the NESA 2022 Syllabus in the Focus Area Human – Environment Interactions.</i></p> <p>Students use the following Visualise This to understand key concepts associated with climate change. They complete the listed activities</p> <p><i>Visualise This 13 The Anthropocene.</i> Activities 1-6</p> <p><i>Visualise This 14 Land Cover Change (Melting ice sheets and retreating glaciers)</i> Activities 1, 2, 8,9, 10</p> <p><i>Visualise this 15 Tipping Points (Climate System tipping Points)</i> Activities 1-3 and 10.</p> <p><i>Chapter 2 The Cryosphere</i> includes references to anthropogenic changes to the Cryosphere</p> <p><i>2.4 Changing Land and Sea Cover</i></p> <p>Anthropogenic change</p> <p>The impact of anthropogenic change</p> <ol style="list-style-type: none"> <i>Ice mass loss and Ice sheet extent</i> <i>Rising sea levels</i> <i>permafrost</i> <i>Greening - an ecological response to change</i> <i>Human impacts</i> <p>Students read the sections listed above. They complete</p> <table border="1"> <tr> <td>Core Activities 4 and 5</td> <td>Application Activities 7, 9 and 10</td> <td>Extension Activity 11 a-e</td> </tr> </table> <p>Students read <i>Visualise This 18 Antarctica’s Doomsday Glacier</i> and complete selected Activities.</p>	Core Activities 4 and 5	Application Activities 7, 9 and 10	Extension Activity 11 a-e	<p>Communicate information in a range of visual formats to explain how succession changes environments over time</p> <p>Compares photographs and satellite images to describe the rate and extent of change on Earth</p> <p>Uses photographs to identify change</p> <p>Conducts various mapping skills to assess land use change and impacts on processes, cycles and circulations in the cryosphere</p>	
Core Activities 4 and 5	Application Activities 7, 9 and 10	Extension Activity 11 a-e					

Content	Outcomes AND Skills	Teaching Activities			Evidence of Learning Examples	Register
		Core	Application	Extension		
Weeks 10-11		<i>What processes, cycles and circulations determine features of the cryosphere in Patagonia?</i>	<i>How have natural and human induced land cover change impacted Patagonia?</i>	<i>What climate trends will impact features of the cryosphere in Patagonia in the future?</i>		
<p>The natural processes, cycles and circulations that have shaped the land and/or water cover of ONE place PATAGONIA</p> <p>COMPLETION OF PLACE BASED STUDY FOR EARTH'S NATURAL SYSTEMS</p> <p>ADDITIONAL SKILL DEVELOPMENT IN THE CONTEXT OF THE CRYOSPHERE</p>	<p>GE-11-02 explains geographical processes and influences, at a range of scales, that form and transform places and environments</p> <p>GE-11-07 applies geographical inquiry skills and tools, including spatial technologies, fieldwork, and ethical practices, to investigate places and environments</p> <p>GE-11-09 communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms</p>	<p>PLACE STUDY: PATAGONIA</p> <p>By completing this section students will reinforce their understanding of</p> <ul style="list-style-type: none"> - natural processes, cycles and circulations connecting Earth's Natural Systems - factors affecting Earth's Natural Systems. - the global impact of natural and human induced climate change <ul style="list-style-type: none"> • <i>How have the mountain landscape of Patagonia been shaped by natural processes, cycles and circulations?</i> • <i>What has been the impact of natural and human induced climate change on the cryosphere in Patagonia?</i> <p>Students work through <i>Chapter 2.5 The glacial landscapes of Patagonia.</i></p> <p>Teacher selects appropriate Activities to build skills and assess understanding.</p> <p>Additional Skill development. Maps</p> <p>Students complete a range of mapping activities using the contour map of Greenland <i>Chapter 10 The Arctic Figure Region. 10.2.13.</i></p> <p>They complete</p> <ul style="list-style-type: none"> - Activity 12 a-e. - Additional activities - Identify the highest point on the map in the Southwest quadrant - Calculate the gradient between point Z and the coastline at 70°N - Calculate the approximate area of Greenland north of 70°N. 			<p>Communicate and applies geographic terminology to explain processes, cycles and circulations in Patagonia</p> <p>Completes mapping activities</p>	

Teacher Evaluation	Comments/Variations																																										
<p><i>How did the unit 'rate' in these areas?</i></p> <table border="1" data-bbox="719 217 1104 1193"> <thead> <tr> <th data-bbox="719 217 853 344"></th> <th data-bbox="853 217 981 344"></th> <th data-bbox="981 217 1104 344"></th> </tr> </thead> <tbody> <tr><td>Time allocated for topic</td><td></td><td></td></tr> <tr><td>Student understanding of content</td><td></td><td></td></tr> <tr><td>Opportunities for student reflection on learning</td><td></td><td></td></tr> <tr><td>Suitability of resources</td><td></td><td></td></tr> <tr><td>Variety of teaching strategies</td><td></td><td></td></tr> <tr><td>Integration of Quality Teaching strategies</td><td></td><td></td></tr> <tr><td>Integration of ICTs</td><td></td><td></td></tr> <tr><td>Literacy strategies used</td><td></td><td></td></tr> <tr><td>Numeracy strategies used</td><td></td><td></td></tr> <tr><td>Differentiation for Learning Support students</td><td></td><td></td></tr> <tr><td>Differentiation for HPGE students</td><td></td><td></td></tr> <tr><td>Appropriateness of associated Assessment Task</td><td></td><td></td></tr> <tr><td>Student Engagement</td><td></td><td></td></tr> </tbody> </table>				Time allocated for topic			Student understanding of content			Opportunities for student reflection on learning			Suitability of resources			Variety of teaching strategies			Integration of Quality Teaching strategies			Integration of ICTs			Literacy strategies used			Numeracy strategies used			Differentiation for Learning Support students			Differentiation for HPGE students			Appropriateness of associated Assessment Task			Student Engagement			
																																											
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