**Stage 1 Earth and Environmental Science**

**Urban Earth and Environmental Science Program**

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| **Week** | **Topic and Subtopics** | **Science Understanding** | **Possible Teaching Strategies** | **Science Inquiry**  **Activities and experiments ❓** | **Science As A Human**  **Endeavour** | **Assessment** |
| 1-3 | **Turbulent Earth**  Types of Earth Hazards | Interactions of Earth systems may result in Earth hazards.   * Describe different types of Earth hazards that can occur * Describe how Earth hazards affect life, health, poverty, and the environment, particularly in urban areas. * Discuss different strategies that have helped lessen the severity of Earth hazards. | Explore Earth hazards: earthquakes, tsunamis, volcanic eruptions, hurricanes, cyclones, floods, droughts, and landslides.  Examine examples of life affected by Earth hazards in Urban areas:   * Los Angeles near the San Andreas Fault Line * Cyclone Tracey 1974 in Darwin * Mexico City next to the Popocatépetl active volcano * Thailand 2004 tsunami * Christchurch 2011 earthquake * Fukushima 2012 earthquake * Nepal 2015 earthquake.   Examine some of the teaching resources for this topic at ESWA <http://www.earthsciencewa.com.au/course/view.php?id=21> | **Activity: Monitor Current Earth Hazards**  Use the following websites to monitor current Earth Hazard activity which is also close to major cities.  Current Earthquakes:  <http://earthquake.usgs.gov/earthquakes/map/>  Current Volcanoes:  <https://www.volcanodiscovery.com/erupting_volcanoes.html>  Current Extreme weather:  <http://www.accuweather.com/en/world/satellite> | Explore**:**  - the construction of tsunami barriers in Japan  - design of earthquake-resistant buildings  - monitoring of volcanic and seismic activity and evaluate different designs. |  |
| 4-5 | Earth Processes | Processes within the geosphere generate Earth hazards.   * Describe how plate tectonics generate earthquakes, volcanic eruptions, and tsunamis. * Discuss how earthquakes, volcanic eruptions, and tsunamis affect other Earth systems processes. | Explore how:   * Earthquakes, volcanic eruptions, and tsunamis are related * volcanoes can cause ash clouds that may influence global weather * a massive eruption can cause flash flooding * Hawaiian volcanic fog forms * volcanic activity occurs at the East Pacific Rise and El Niño cycles. | **Investigate** factors causing earthquakes using the Quakecaster apparatus.  And/Or  Use a Seismograph App on Smartphone to investigate seismic activity.  **Guest Speaker**: Classroom talk by John Mignone, the Earth Science Community Educator at the Department of State Development to come and speak about one of the Earth Hazard topics from:  <http://minerals.statedevelopment.sa.gov.au/knowledge_centre/education_service/teaching_resources/lectures_and_workshops> | Explore the evidence for plate tectonics on other planets. | **Summative Task 1: AT1 SHE Investigation**  Living near an Earth Hazard Presentation |
| 6 | Measuring and Predicting Hazards | Earthquake and volcanic eruption data can be used to map hazardous zones and to predict future events.   * Describe how Earth hazards are monitored by measuring various factors. * Discuss how data can contribute to future predictions of Earth hazards. | Compare the effectiveness of various tsunami early warning systems.  Use changes in size and shape of the volcano cone, chemistry of volatiles and Earth tremors to predict eruptions. | **Virtual Lab Activity**: Earthquake epicentres and Volcanoes  <http://www.glencoe.com/sites/common_assets/science/virtual_labs/E27/E27.html>  **Virtual Lab Activity**: Seismograph Stations  <http://www.glencoe.com/sites/common_assets/science/virtual_labs/ES09/ES09.html>  **Practical Activity**: Use the Quakecaster apparatus to explore why earthquakes are very difficult to predict. |  |  |
| 7 -8 | **Composition of The Geosphere**  Minerals | Minerals may be identified by their characteristic properties.   * Identify common rock-forming minerals by observing their properties. * Discuss how the uses of minerals are related to their properties. | Examine some of the teaching resources for this topic at ESWA <http://www.earthsciencewa.com.au/course/view.php?id=21>  Revise chemical symbols for elements that are commonly found in minerals. Use Minerals of the Earth Sheet: Their Chemistry and Uses  <https://sarigbasis.pir.sa.gov.au/WebtopEw/ws/samref/sarig1/image/DDD/ISEDUCATION%20SHEET%2028.pdf>  **Guest Speaker**: Classroom talk by John Mignone, the Earth Science Community Educator at the Department of State Development to come and speak about one of the MInerals topics from:  <http://minerals.statedevelopment.sa.gov.au/knowledge_centre/education_service/teaching_resources/lectures_and_workshops> | **Practical Investigation**: Identifying common minerals.  Identify minerals such as quartz, feldspar, biotite, muscovite, calcite, augite, and clay minerals (kaolinite) by investigating properties such as colour, streak, cleavage, hardness, lustre, density, magnetism, and reaction to dilute hydrochloric acid.  Identifying Minerals PDF: <http://www.oresomeresources.com/resources_view/resource/activity_identifying_minerals>  **Virtual Lab Activity**: How can minerals be defined by their properties  <http://www.glencoe.com/sites/common_assets/science/virtual_labs/ES03/ES03.html> | Explore the difference between synthetic diamonds and natural occurring diamonds. | **Formative Excursion to the City:**  Explore common rocks and minerals used in building stones in Adelaide.  Use the North Terrace Geological Trail Pamphlet: <http://www.sa.gsa.org.au/Brochures/North_Terrace_final1.pdf>  Visit the SA Museum Mawson Exhibit |

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| 9-11 | Igneous, Sedimentary and Metamorphic Rocks | Rocks are composed of characteristic assemblages of mineral crystals or grains that are formed through igneous, sedimentary, and metamorphic processes, as part of the rock cycle.   * Classify rocks as one of igneous, sedimentary, or metamorphic by identification of their characteristic minerals and texture. * Describe the processes that form igneous, sedimentary, and metamorphic rocks. | Use a simple diagram when explaining the interactions within the rock cycle.   * [Weathering](https://www.geolsoc.org.uk/ks3/gsl/education/resources/rockcycle/page3461.html) * [Erosion and Transport](https://www.geolsoc.org.uk/ks3/gsl/education/resources/rockcycle/page3462.html) * [Deposition of Sediment](https://www.geolsoc.org.uk/ks3/gsl/education/resources/rockcycle/page3463.html) * [Burial and Compaction](https://www.geolsoc.org.uk/ks3/gsl/education/resources/rockcycle/page3464.html) * [Deformation and Metamorphism](https://www.geolsoc.org.uk/ks3/gsl/education/resources/rockcycle/page3571.html) * [Melting](https://www.geolsoc.org.uk/ks3/gsl/education/resources/rockcycle/page3466.html) * [Crystallisation of Magma](https://www.geolsoc.org.uk/ks3/gsl/education/resources/rockcycle/page3595.html) * [Uplift](https://www.geolsoc.org.uk/ks3/gsl/education/resources/rockcycle/page3468.html)   Examine the Geological Society resource for the Rock Cycle :  <https://www.geolsoc.org.uk/ks3/gsl/education/resources/rockcycle/page3446.html> | **Practical Investigation**: Identify common igneous, sedimentary and metamorphic rocks.  **Igneous Rocks**: e.g. Granite, rhyolite, pegmatite, basalt, andesite, gabbro and dolerite.  **Sedimentary Rocks**: e.g. Conglomerate, sandstone, shale, tillite, fossiliferous limestone and calcrete.  **Metamorphic Rocks**: e.g. Slate, schist, gneiss, quartzite and Marble.  **Virtual Lab Activity**: How are rocks classified?  <http://www.glencoe.com/sites/common_assets/science/virtual_labs/ES04/ES04.html> | Explore the difference between engineered stone e.g. caeser stone and natural rock types used for kitchen benchtops e.g. granite, gabbro, marble, slate and quartzite. | **Formative Graveyard Geology Excursion**  Visit a local cemetery and investigate rock types used for headstones  <https://www.ucl.ac.uk/earth-sciences/impact/geology/walks/Earth_Sciences_Geotrail_Graveyard_Geology.pdf>  **Summative Task 2:AT2** Rock Identification Test |
| 12-13 | Soil | Interactions between the atmosphere, geosphere, hydrosphere, and biosphere lead to the formation of soil.   * Describe the composition of soil as rock and mineral particles, organic material, water, gases and living organisms * Discuss the relationship between a soil, its origin, and its possible uses. | Observe some examples of physical and chemical weathering in a local area.  Test soil samples from students’ backyards and predict the suitability of these sites for various activities such as construction of houses or growing plants.  Examine some teaching resources from:  <http://www.soil-net.com/dev/page.cfm?pageid=activities_sheets&loginas=anon_activities> | **Practical Investigation:** Weathering Experiments  [**https://www.geolsoc.org.uk/ks3/webdav/site/GSL/shared/pdfs/education%20and%20careers/RockCycle/Weathering%20Experiments.pdf**](https://www.geolsoc.org.uk/ks3/webdav/site/GSL/shared/pdfs/education%20and%20careers/RockCycle/Weathering%20Experiments.pdf)  **Virtual Lab Activity**: How does soil affect the movement of groundwater  <http://www.glencoe.com/sites/common_assets/science/virtual_labs/CT02/CT02.html> | Investigate current techniques used to decontaminate polluted soil. | **Summative Task 3:AT1 Design Practical Investigation** Comparing Soils Design Practical Investigation |
| 14 | **The Earth’s Atmosphere**  Layers of the Atmosphere | The modern atmosphere has a layered structure: the troposphere, mesosphere, stratosphere, and thermosphere.   * Discuss the key features that characterise the four main layers of the atmosphere. * Describe the variation of temperature with altitude in the layers of the atmosphere. | Construct a scaled drawing (on a very large piece of paper) of a part of the Earth’s cross-section, including the layers of the atmosphere. Include, for example, the highest mountain, deepest ocean trench, and the altitudes of highest-flying aircraft and earth orbiting satellites.  Construct a scaled drawing of the layers of the atmosphere that includes a plot of temperature vs height. | **Online Activity**: Structure of the Earth’s Atmosphere  <http://glencoe.mheducation.com/sites/0078778026/student_view0/unit5/chapter15/virtual_lab.html> |  |  |
| 15-16 | Ozone Layer | * Explain the importance of the ozone layer in protecting living organisms from damaging UV radiation. Focus on urban examples. * Describe how albedo affects the Earth’s climate. | Examine some of the teaching resources at ESWA <http://www.earthsciencewa.com.au/course/view.php?id=21>  Investigate the development of the ozone layer over time. | **Practical Activity**: Albedo Effect:  <https://pmm.nasa.gov/education/sites/default/files/lesson_plan_files/Global%20Energy%20Budget/GPM%20Global%20Energy%20Budget%20-%20Albedo%20Lab.pdf>  **Online Activity**: Ozone Hole Watch  <http://ozonewatch.gsfc.nasa.gov/education/SH.html> | Explore how imagery from Flock 1 satellites using NanoRacks Smallsat can be used as a resource for global environmental protection measures, such as monitoring changes to polar ice caps.  Investigate how the monitoring of stratospheric ozone led to the discovery of the hole in the ozone layer and how continued monitoring informs current knowledge about the repair of the hole. | **Summative Task 4: AT1 Practical Investigation**  The effect of different types of surfaces on albedo in the built environment. |
| 17-18 | Greenhouse Gases | Greenhouse gases in the Earth’s atmosphere produce a phenomenon known as the greenhouse effect.   * Explain how greenhouse gases absorb and reradiate some of the thermal radiation emitted from Earth’s surface to warm the atmosphere. | Use examples of atmospheric gases that act as greenhouse gases, such as water vapour, nitrous oxide, methane and carbon dioxide, to explain the greenhouse effect.  Identify how these are produced in urban areas.  Compare air quality in the troposphere differs between rural and urban areas. | **Practical Activity**: Sunscreen and Zinc Cream  Investigate differences in chemistry, physical properties and uses of Sunscreen and Zinc Cream | Explore the use of nanoparticles in sunscreen |  |