# **PES Level 1 Course Outline 3**

# Guide to aid teacher planning only - designed to be printed or viewed in A3, Landscape.

## Purpose

This example Course Outline has been produced to help teachers and schools understand the new NCEA Learning and Assessment matrices, and could be used to create a year-long programme of learning. It will give teachers ideas of how the new standards might work to assess the curriculum at a particular level.

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| **Significant Learning** | **Learning activities and assessment opportunities**Throughout the year assessment for learning happens often. Evidence may also be collected for summative assessment. | **Duration** Total of 32 weeks |
| Explain how maramataka is used to gain mōhiotanga of tātai arorangi as we describe interactions between the sun and Earth-Moon systems and their effect on planet Earth.Understand that forces have an effect on the motion of objects in the taiao. In a variety of contexts, including te ao Māori, understand how the application of forces and its effect on motion has been used effectively in the past and is also being used effectively in the present. Explore how energy transfers are involved in everyday interactions. Understand how the knowledge and significance of energy transfer has been passed down through pūrākau and tikanga practices. Learn how these same science concepts are still being applied to a variety of te ao Māori activities today. | **Tama-nui-te-rā: the Sun*** Engage with [whakapapa](https://teara.govt.nz/en/whakapapa/7654/whakapapa-of-light-and-darkness) and [pūrākau](https://www.sciencelearn.org.nz/resources/1752-maui-and-the-sun) related to tama-nui-te-rā, the Sun.
* Explore what happens to light ([radiation](https://www.sciencelearn.org.nz/resources/1004-greenhouse-effect)) as it enters the atmosphere.
* Investigate the [reflection of light](https://www.sciencelearn.org.nz/resources/48-reflection-of-light).
* Use a [role-play](https://www.sciencelearn.org.nz/resources/2631-what-is-refraction) to visualise [refraction of light](https://www.sciencelearn.org.nz/resources/49-refraction-of-light).
* Investigate [solar radiation](https://niwa.co.nz/publications/wa/vol13-no4-december-2005/solar-energy) and learn key terms such as transmission, reflection, absorption, and refraction.

**Opportunity for collecting evidence towards AS 1.2 Demonstrate understanding of a physics phenomenon in the taiao through modelling**  | 5 weeks |
| Explain how maramataka is used to gain mōhiotanga of tātai arorangi as we describe interactions between the sun and Earth-Moon systems and their effect on planet Earth. | **Exploring day and night*** Look at the pūrākau of Māui and the Sun and the links to day and night.
* Use a scale model to illustrate day and night.
* Use own [kōrero pūrākau](https://teara.govt.nz/en/leisure-in-traditional-maori-society-nga-mahi-a-te-rehia/page-4) and drama to show how radiation from the Sun interacts with atmosphere.
* Investigate [shadows and the position of the Sun](https://www.sciencelearn.org.nz/resources/2773-investigating-shadows-and-the-position-of-the-sun).
* Make observations of the [Sun’s position](https://www.sciencelearn.org.nz/resources/2771-light-and-shadows) at [different times](https://blog.metservice.com/How-the-Sun-Moves-Across-the-Sky) of the day.

**Opportunity for formative assessment of 1.3 Demonstrate understanding of the effects on planet Earth of interactions between the Sun and the Earth-Moon system** | 3 weeks |
| Describe interactions between the Sun and Earth-Moon system. Explore how people can use tātai arorangiandkaitiakitanga to inform their actions. | **Location, location, location: the effect of latitude on seasons and surface temperature*** Use a globe to model day and night and how the [seasons](https://niwa.co.nz/rangi/lesson-5-introduction-to-climate#why) change.
* Investigate the relationship between the angle of the Sun and the [position of the Sun](https://www.sciencelearn.org.nz/images/683-sun-rising-in-the-southern-hemisphere) on the horizon.
* Compare [seasons](https://www.nationalgeographic.org/encyclopedia/season/) in Aotearoa New Zealand with the Pacific and Antarctica.
* Examine daytime surface temperatures at different locations.
* Investigate how [latitude](https://www.youtube.com/watch?v=DD_8Jm5pTLk) affects the amount of solar radiation received.
* Relate midday average temperatures to the angle of the Sun at different latitudes.

**Opportunity for formative assessment of 1.3 Demonstrate understanding of the effects on planet Earth of interactions between the Sun and the Earth-Moon system** | 3 weeks |
| Use systematic and scientific processes, models, and other representations, to explain physics, Earth, and space science principles and explore how these processes are applied in a taiao context. Explore how different ways of applying models can strengthen the work of kaitiakitanga to restore mana and mauri to a system.Explore how energy transfers are involved in everyday interactions. Understand how the knowledge and significance of energy transfer has been passed down through pūrākau and tikanga practices. Learn how these same science concepts are still being applied to a variety of te ao Māori activities today.Understand that the total amount of energy is maintained when it is transferred during an event. Te ao Māori acknowledges the interconnectedness and interrelationship of all living and non-living things. Understand the cultural significance to Māori of seeking to understand the total system, and the role energy conservation plays in it. | **Earth’s structure and magnetic field*** Use the pūrākau of [Rūaumoko](https://teara.govt.nz/en/historic-earthquakes/page-1) to introduce te ao Māori perspectives of Earth science concepts.
* Learn about the geosphere and consider the following questions:
	+ what’s [inside the Earth](https://www.sciencelearn.org.nz/resources/337-inside-the-earth)?
	+ why does the Earth have a [magnetic field](https://www.sciencelearn.org.nz/images/1820-earth-s-magnetic-field)?
	+ how do we know the Earth has a magnetic field?
	+ what is a [magnetic field](https://www.sciencelearn.org.nz/resources/2562-introducing-magnetism)?
	+ are all magnetic fields the same? (ie magnetic field strength).
* Make a scale model of the internal structure of the Earth.
* Investigate how [hāngi rocks](https://www.rnz.co.nz/national/programmes/ourchangingworld/audio/201790432/hangi-stones-and-magnetism) record the Earth’s magnetic field.
* Model the magnetic field of the Earth.
* Explore magnetic fields around bar and horseshoe [magnets](https://www.sciencelearn.org.nz/resources/2563-investigating-magnetism) using iron filings and compasses.
* Explore [continental drift](https://www.sciencelearn.org.nz/resources/952-continental-drift), [plate tectonics](https://www.sciencelearn.org.nz/concepts/tectonic-plates), and heat transfer (radiation, convection, and conduction) in the [Earth’s interior layers](https://www.sciencelearn.org.nz/resources/337-inside-the-earth).
* Model [convection](https://www.sciencelearn.org.nz/images/839-convection) currents in the Earth’s mantle.
* Explore applications of heat transfer, including hāngi.
* Complete a [continental drift](https://www.sciencelearn.org.nz/resources/952-continental-drift) jigsaw activity.

**Opportunity for assessment of AS** **1.2 Demonstrate understanding of a physics phenomenon in the taiao through modelling, and for formative assessment of** **AS** **1.4 Demonstrate understanding of physics concepts in the taiao** | 5 weeks |
| Understand that forces have an effect on the motion of objects in the taiao. In a variety of contexts, including te ao Māori, understand how the application of forces and its effect on motion has been used effectively in the past and is also being used effectively in the present. Understand that the taiao is centred on mauri, and encompassed and maintained by kaitiakitanga, and described in science as consisting of interacting spheres - the hydrosphere, biosphere, atmosphere, and geosphere.Examine interactions between the hydrosphere, biosphere, atmosphere, and geosphere. Through aspects of whakapapa, consider how these interactions are woven into te ao Māori. | * Explore [gravity](https://www.sciencelearn.org.nz/resources/294-alternative-conceptions-about-gravity), mass, weight, and friction.
* Learn about net [force](https://www.sciencelearn.org.nz/resources/2720-physics-made-simple-force-and-motion) and force diagrams.
* Find out different ways to slow motion through friction.
* Explore geothermal activity.
* Complete a case study into the generation of [geothermal electricity](https://www.sciencelearn.org.nz/resources/1573-geothermal-power).
* Explore [energy transformations](https://www.sciencelearn.org.nz/resources/2826-energy-transfer).
* Investigate electricity generation, including a comparison of electrical and mechanical power.
* Investigate electrical energy use in the home.
* Learn about [electricity](https://www.sciencelearn.org.nz/resources/2745-electricity-electrons-insulators-and-conductors), including simple circuits.

**Opportunity for assessment of AS** **1.2 Demonstrate understanding of a physics phenomenon in the taiao through modelling, and for formative assessment of** **AS** **1.4 Demonstrate understanding of physics concepts in the taiao** | 3 weeks |
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* Learn about [altitude](https://www.nationalgeographic.org/encyclopedia/altitude/) and investigate why it is harder to breathe the higher you go up a mountain.
* Conduct an [air pressure experiment](https://www.metlink.org/experiment_topic/air-pressure/) using simple materials.
* Graph the relationship between air temperature/density and altitude.
* Investigate the falling rate of an object through different materials, eg [air](https://www.bbc.co.uk/bitesize/guides/zgv797h/revision/1) and [fluid](https://www.teachengineering.org/activities/view/cub_surg_lesson03_activity1), and graph distance-time
* Explore free fall force [diagrams](https://www.youtube.com/watch?v=N7KsnUNmyJE), energy changes, and motion.
* Consider how the [burning of fossil fuels](https://www.sciencelearn.org.nz/videos/1011-burning-fossil-fuels) contributes to [climate change](https://www.sciencelearn.org.nz/resources/2954-what-is-climate-change), by:
* conducting a combustion experiment
* exploring the concept of a ‘personal [carbon footprint](https://www.sciencelearn.org.nz/videos/882-fuels-and-greenhouse-gases)’
* investigating the properties of CO2.
* Explore [climate change](https://www.sciencelearn.org.nz/resources/2962-climate-change-key-terms) and its effects, eg global warming, through:
	+ interpreting representations of global warming
	+ using molymods to represent molecules associated with climate change
	+ investigating the causes of atmospheric [warming](https://www.sciencelearn.org.nz/videos/1990-climate-change-a-warming-world)
	+ finding out why we are experiencing more [extreme weather events](https://www.sciencelearn.org.nz/resources/2188-extreme-weather)
	+ investigating a local example of an extreme weather event as a result of climate change.

**Opportunity for assessment AS 1.1 Demonstrate understanding of human-induced changes within the Earth system, and for formative assessment of** **AS** **1.4 Demonstrate understanding of physics concepts in the taiao** | 6 weeks |
| Understand that forces have an effect on the motion of objects in the taiao. In a variety of contexts, including te ao Māori, understand how the application of forces and its effect on motion has been used effectively in the past and is also being used effectively in the present. Understand that the taiao is centred on mauri, and encompassed and maintained by kaitiakitanga, and described in science as consisting of interacting spheres - the hydrosphere, biosphere, atmosphere, and geosphere.Examine interactions between the hydrosphere, biosphere, atmosphere, and geosphere. Through aspects of whakapapa, consider how these interactions are woven into te ao Māori.Explore the effects of natural, and human-induced changes to the taiao. Explore how mauri is an essential part of the natural and human-constructed world and how it is essential to maintain or restore mauri. | **Kiwa and Tangaroa*** Learn about the basic properties of water [waves](https://www.sciencelearn.org.nz/resources/121-behaviour-of-waves) and consider how they are formed and measured.
* Investigate wave properties by using a [slinky](https://www.sciencelearn.org.nz/resources/576-modelling-waves-with-slinkies)/[ripple tank](https://www.bbc.co.uk/bitesize/guides/zsxvdxs/revision/7).
* Calculate the speed of waves.
* Investigate how wave erosion, transportation, and deposition can change the shape of a coastline.
* Use a model to observe the force of waves on a shoreline.
* Explore energy changes involved in erosion.
* Consider what will happen if sea levels continue to rise.
* Carry out [density investigations](https://www.sciencelearn.org.nz/resources/2280-temperature-salinity-and-water-density)
* Look at graphs of ocean temperature and make inferences.
* Build simple models to demonstrate the impact of melting land ice and sea ice on sea level rise.
* Explore and observe effects of [sea-level rise](https://www.sciencelearn.org.nz/resources/2277-climate-change-melting-ice-and-sea-level-rise) on coastal communities.
* Investigate a local example of sea-level rise due to human-induced climate change.

**Opportunity for assessment of AS 1.1 Demonstrate understanding of human-induced changes within the Earth system** | 7 weeks |