# **CB 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.

## Wai Kai

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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 |
| Recognise differences, as well as similarities, in biological and chemical inquiry practices.  Engage with different knowledge systems and perspectives through inquiry approaches  Explore how the impact of chemicals and their derivatives can change depending on the state, quantity, and location of the chemical species. | **Ko au te awa, ko te awa ko au**  Compare models and representations used to represent the structure of atoms, ions and molecules and relate to ‘what’s in water’, using ākonga knowledge or media reports. Consider nitrates, lead ions, phosphates, fluoride, and chloride (swimming pools).  Develop a representation of the particles found in a local waterway – using models which show the types of particles – atoms, ions, and molecules.  Investigate life processes of microorganisms and link to environmental conditions that affect these. Grow microorganisms using agar or [potato media](https://biology.mit.edu/wp-content/uploads/2017/12/PotatoMicrobiology.pdf) – take samples from local water sources. Compare growth in different environmental conditions (salinity, temperature, pH, nutrients).  Develop a representation showing examples of the living material found in a local awa or roto. These examples must use models to show unicellular/multicellular organisms, populations, communities, and ecosystems.  Use monitoring sites of local councils (eg [Environment Waikato](https://www.waikatoregion.govt.nz/environment/natural-resources/water/rivers/water-quality-monitoring-map/)) to describe the nutrient and microbial changes in a river from source to mouth.  Examine a eutrophic local awa or roto to determine the levels of nutrients such as nitrate and phosphate in the water and the impact on the ecosystem and the kai we gather from there. See [Chemical contamination – NIWA](https://niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/chemical-contaminates).  Explore the meaning of the terms mauri and taiao and how they are linked. See [What is Mauri?](https://www.giftofthegulf.org.nz/mauri), [Dirty rivers destroying mauri of our oceans](https://www.newsroom.co.nz/2017/09/11/47259/dirty-rivers-destroying-mauri-of-our-oceans), and pp. 10–15 and 25–30 of [Te Mana o te Taiao - Aotearoa New Zealand Biodiversity Strategy 2020](https://www.doc.govt.nz/globalassets/documents/conservation/biodiversity/anzbs-2020.pdf). See [mauriometer](http://mauriometer.org/) for examples of how to identify aspects of mauri of a taiao.  Use models developed by mana whenua to evaluate the health of a local waterway. For example, use the three domains [identified by Waikato-Tainui](https://www.waikatoregion.govt.nz/assets/Envirolink/PB19-Wai-Ora-Wai-Maori-June-2017.pdf) (Taha Kihokiho, Taha Wairua, Taha Whānau).  Explore regulations of water quality, contaminations, and issues around water quality. Review media items on these issues. | 7 weeks |
| Consider how genetic variation arises and its effect on resilience in biological systems  Explore impacts of disruptions on interrelationships within an ecosystem | **Tuna ā tātou taonga**  Create a resource that tells the story of the [tuna](https://www.doc.govt.nz/nature/native-animals/freshwater-fish/eels/tuna-a-tatou-taonga/) and its Pacific migration, and its links to other eel species around the world. Use this video on the [tuna’s life cycle](https://www.sciencelearn.org.nz/videos/1760-eels), and this [NIWA tuna information resource](https://niwa.co.nz/te-kuwaha/tools-and-resources/tuna-information-resource).  Compare and contrast the migration of the tuna to the story that brought individuals or whānau to New Zealand.  Compare and contrast the long-finned tuna and short-finned tuna. Use multiple models / diagrams to explain the difference between chromosomes, genes, alleles, and DNA. Use these to link changes in genotype to changes in phenotype of New Zealand tuna.  Identify a microorganism that is a pathogen for tuna and explore what this means. See examples on page 30 of this [Eel Learning Resource](http://www.mauricompass.com/uploads/7/9/6/6/7966304/eel_biology_learning_resource_by_ian_ruru.pdf) (flavobacterium diseases, Furunculosis, Haemorrhagic septicaemia, Vibriosis (*V. anguillarum*), white spot disease).  Investigate careers of people that have worked to restore and enhance the mauri of tuna, for example [Tuna relocation](https://www.tewaiaumahikakaitrust.co.nz/tuna-trap-transfer-programme).  Compare and contrast the effects of traditional eel preservation methods (such as smoking) with more modern techniques (freezing / smoke condensates / canning). Explore how the human body responds if we eat food that has spoiled.  **Opportunity for assessment of CB1.1 - Demonstrate understanding of the relationship between a microorganism and the environment**  **Learning covered as part of this unit will contribute to assessment of CB1.3 - Demonstrate understanding of genetic variation in relation to an identified characteristic** | 3 weeks |
| Explore ways that breakthroughs in chemical and biological knowledge have furthered understandings in related disciplines  Engage with different perspectives to inform Chemistry and Biology inquiry approaches  Consider how genetic variation arises and its effect on resilience in biological systems | Explain the link between biodiversity and whakapapa, such as [Science Learning Hub](https://www.sciencelearn.org.nz/videos/258-whakapapa-and-biodiversity)  Describe the application of genomic-wide studies to a New Zealand species (eg [Genomics Aotearoa](https://www.genomics-aotearoa.org.nz/)).  Describe the structure of DNA and relate this to the steps of the investigation as DNA is extracted from polyploid fruit (eg strawberry, kiwifruit, cauliflower).  Describe the use of [eDNA](https://www.epa.govt.nz/community-involvement/open-waters-aotearoa/what-is-edna/) and its potential application in informing biodiversity studies in New Zealand.  Debate who owns the information gained via genomic studies. For example, is it the group that owns the largest population of the organism, the government of the country of origin of the organism, the group that identifies the genome of the organism, the group that is the main current user of the organism, the group with the longest historical ties to the organism. Evaluate the rights of groups to patent genes / genomes.  Describe fertilisation processes in a New Zealand species. Identify the source of genetic variation (mutation) and explain how combinations of alleles are rearranged during gamete formation. Compare the survival challenges of populations with low genetic variation (eg the black robin or Kākāpō) with species with higher genetic variation (eg Pukeko).  Explore the possibilities of DNA sequencing as a means to identify variation and what can be done with this information to support populations. (Details of the process not required but allowing students to see that such a process is possible, what it results in and what can be done with the information is the key learning here).  Investigate variation within a species used as food, such as [apples](https://www.sciencelearn.org.nz/resources/839-breeding-red-fleshed-apples-introduction), tomatoes, [sheep](https://www.sciencelearn.org.nz/resources/814-breeding-easy-care-sheep), cows, or [milk (A1/A2)](https://www.sciencelearn.org.nz/images/2553-a1-and-a2-milk-alleles). Opportunity for case studies or to link in with a local grower here. Selective breeding case studies – for example cows (LIC) brassicas or kiwifruit. Profile pathways opportunities within the horticulture and agriculture industries: for example, [Curious Minds](https://www.curiousminds.nz/profiles/).  **Learning covered as part of this unit will contribute to assessment of CB1.3 – Demonstrate understanding of genetic variation in relation to an identified characteristic** | 7 weeks |
| Consider patterns in the ways that chemical reactions rearrange atoms and redistribute energy  Explore the implications of the conservation of mass | Revisit the concept of [mauri](https://www.giftofthegulf.org.nz/mauri). This learning can sit beside learnings in atomic theory.  Make models to show attractions between particles at an atomic level.  Investigate boiling points of different substances using fractional distillation - eg meths + water. Link to attractive forces at an atomic level.  Investigate how adding salt to water affects the boiling point and conductivity. Compare results of adding salt to adding silt or local sediment.  Investigate common properties of metals (heat conductivity / electrical conductivity / malleability / ductility). Link to attractive forces at an atomic level.  Investigate options for strengthening materials, for example describe alloys, test common materials until destruction.  Identify materials that are soluble in our environment and those that are not. Discuss similarities and differences.  Make informed choices over the design of a local civil engineering project. For example, design a bridge over a local waterway. Identify the materials used in your design and justify your choices of one material over another.  **Learning covered as part of this unit will contribute to assessment of CB1.4 – Demonstrate understanding of how the properties of chemicals inform their use in a specific context** | 7 weeks |
| Make connections between biological and chemical interactions when nutrients cycle and energy flows  Explore how new materials can be developed to meet the needs of a sustainable future | **Nau te raurau, naku te raurau, ka ora te manuhiri**  Investigate a range of products to identify and evaluate local substances that can be used as pH indicators.  Test the chemical and biological properties of soils from the local area, such as acidity (pH), organic reserves (C, N), fertility (P). Link to soil health and microorganisms. Pathways education opportunities – interview gardeners, farmers, stock and station agents, or local hardware store workers. See [The Mana of Soil – Manaaki Whenua](https://www.landcareresearch.co.nz/uploads/public/Events/Link-series/Mana_Soil.pdf).  Consider the chemicals involved in the process of photosynthesis, in terms of naming the ‘reactants’ and ‘products’. Where do plants get their matter from?  Consider the chemicals involved in the process of cellular respiration, in terms of naming the ‘reactants’ and ‘products’. Where do living things get their energy from?  Explore the chemistry of food. For example, why do we not eat unripe fruit? Investigate why some foods are OK to eat while others are not and look at the same food at different stages of development. Explore the toxicity of naturally occurring chemicals produced by plants vs artificial sprays that are used to protect them from insect damage.  Explain how hydroelectric dams can become barriers to tuna migration. Explain mitigation strategies.  Identify reactants and products of complete and incomplete combustion, linked to patterns of electricity generation in New Zealand.  Investigate the use of chemicals to increase the yield of produce, and the possible consequences of these chemicals on the environment or other living things.  Explore pathways education opportunities: visit the supermarket and interview the manager, visit the hardware store to explore chemicals used in community gardens.  Investigate the effect of pH on soils and on the things that grow in them. Conduct an experiment looking at germination or growth in different pH levels/comparison of native vs exotic species in the same pH.  **Opportunity for Assessment of CB1.2 – Demonstrate understanding of a chemical reaction in a specific context** | 8 weeks |

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