**Science Teaching, Learning and Assessment Guide Mar 2023**

<https://ncea.education.govt.nz/science/science>

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# What is Science about?

*Subject terms can be found in the glossary*

Science involves generating and testing ideas and gathering evidence to understand, explain, and develop knowledge about the natural world. Scientists do this by making observations, carrying out investigations and modelling, and by communicating and debating with others.

Scientific thinking does not belong to one culture. It is a global collection of understandings that have come from logical, systematic work, and from creative insight built on a foundation of respect for evidence.

Scientific progress comes from questioning that knowledge and how it is applied, so that new evidence and different perspectives can contribute to the global understanding of our natural world.

In Aotearoa New Zealand, Science uses the **nature of science** strand from the New Zealand Curriculum to teach ākonga what science is, and how scientists work. Ākonga will develop their scientific literacy, and their understanding of mātauranga Māori as a body of knowledge that both supports and challenges scientific thinking.

Science learning is theoretical and practical. It has diverse areas of specialization with internationally recognised symbols, languaging and conventions. Through developing science literacies and inquiry methods, and understanding different knowledge systems and perspectives, ākonga will be further empowered to make decisions, and take action in an ever-changing local and global landscape.

### ****Whakataukī****

**Mā te whakaaro nui e hanga te whare; mā te mātauranga e whakaū.**

Big Ideas create the house; knowledge maintains it.

The Science Learning Area whakataukī draws on the image of the wharenui to describe important ideas. This is significant in several ways.

Before the wharenui is built, the foundation must be firm and level. In science, respect for evidence is the foundation on which all ideas are built. The wharenui is constructed using various materials, and each serves a specific purpose with its own uniqueness. A poupou (wall post) is not the same as a heke (rafter), but they are joined and connected to make one wharenui. Science is also made of various disciplines, with their own properties, that focus on different areas of knowledge. The different areas of science connect and overlap to strengthen our understanding of complex ideas.

The wharenui is built by people, for people. It is a place of meeting and learning, built to protect and serve people through time. Science too, is a knowledge base built by people, for people. It informs decisions we make about health and our environment, it leads to technological advancement, and wellbeing. It is important that people and their wellbeing are housed at the centre of scientific developments, so that the wharenui of ideas can protect and serve us well.

The whakataukī also refers to the maintenance of the wharenui through knowledge. To maintain the wharenui, scientists must think critically about new and old ideas, and constantly work to refine understanding. As new knowledge comes to light, scientists must adjust their thinking to carry the knowledge and ideas of the past into the future.

This wharenui of collected wisdom is a shared responsibility. Everyone who lives in this wharenui is responsible for its maintenance, and we, as kaitiaki, must learn the tools needed to maintain it well. Science learning from the past is a gift to us from our ancestors, and science literacy is how ākonga access this gift and contribute to it. Kaiako, ākonga, scientists, and society, build and maintain the wharenui of knowledge and ideas.

# Big Ideas and Significant Learning

This section outlines the meaning of, and the connection between the Big Ideas and Significant Learning, which together form the Learning Matrix. It then explains each Science Big Idea.

The Science Learning Area, including its Whakataukī, informs this subject's Significant Learning – learning that is critical for students to know, understand, and do in a subject by the end of each Curriculum Level. This covers knowledge, skills, competencies, and attitudes. It also includes level-appropriate contexts students should encounter in their education.

The subject's Big Ideas and Significant Learning are collated into a Learning Matrix for Curriculum Level 6. Teachers can use the Learning Matrix as a tool to construct learning programmes that cover all the ‘not to be missed’ learning in a subject.

There is no prescribed order to the Learning Matrix within each Level. A programme of learning might begin with a context that is relevant to the local area of the school or an idea that students are particularly interested in. This context or topic must relate to at least 1 Big Idea and may also link to other Big Ideas.

There are four Big Ideas in Science. The nature of this subject as a discipline means aspects of Significant Learning often cross over multiple Big Ideas, and vice versa.

The Science Learning Area has four distinct subjects at NCEA Level 1. These are: Science; Chemistry and Biology; Physics, Earth and Space Science; and Agricultural and Horticultural Science.

These subjects are distinct but also interconnected. Ākonga who explore more than one of these subjects will find connecting themes in the Significant Learning and the Nature of Science, but the Achievement Standards for these subjects assess different competencies.

### Big Idea : Science knowledge is contested and refined over time

Science as a body of knowledge has rules and it is held accountable to them. Evidence must be collected in a manner that is repeatable, and established theories can be challenged by new evidence or new understanding. This means that scientists take part in peer review and discuss evidence, theories, and conclusions. Scientists work hard to identify bias in their work and in the work of others.

Scientists also draw on understandings from other bodies of knowledge to gain insights through different ways of looking at the world. People working in science in Aotearoa New Zealand learn from and build on knowledge that has been generated by those who came before them, especially from Māori and Pacific Peoples’ knowledge sources.

By understanding how science knowledge has developed, extended, and changed over time, ākonga can appreciate how science operates and can use appropriate tools in their own science practice.

Finally, ākonga will understand that wānanga and talanoa can be used to discuss existing knowledge and in so doing, allow new knowledge to emerge.

### Big Idea: Science uses different inquiry approaches to develop understanding

Investigations are used to generate and evaluate knowledge to answer questions. A variety of investigation methods exist that involve making observations, gathering evidence, and collecting and interpreting data. Different investigation approaches are appropriate for answering different questions.

By engaging in investigations themselves, ākonga are more likely to think critically about information, data, and claims from the investigations of others. A life-long learner is able to investigate, evaluate, and collect data to enhance their participation in society.

### Big Idea : Science uses subject-specific literacy to communicate knowledge

### Young people have access to a huge volume of information from the internet and other sources. This information can be presented in many different modes including infographics, diagrams, tables, and anecdotes. The tools to discern valid evidence and to distinguish science from disinformation, are vital in this information-rich world. Ākonga need to understand how science is communicated and miscommunicated.

Science texts use subject specific vocabulary and science specific strategies to communicate information. Experimental reports, graphs, and data sets are also used to communicate in science. Different audiences will require ākonga to communicate their own findings and understandings in different styles. Clear, logical, well-reasoned arguments based on solid evidence are a cornerstone of science practice.

### Big Idea : Science based information can be used in decision making and action

### Ākonga are empowered when they learn to explore different perspectives, develop and express their own reasoned opinions, and make decisions to take action. Ākonga will use the practices and knowledge drawn from science to inform their perspectives, opinions, and actions.

Ākonga will engage with real world issues (including problems, needs, and opportunities) at a personal, community, or global level. They will bring their own worldview, experiences, and knowledge while building new capabilities such as critical inquiry, to develop evidence-based opinions.

By engaging with real world examples, ākonga will understand the complexity of decision making, and the importance of mātauranga Māori in conjunction with science knowledge for responsible decision making and action.

# Key Competencies in Science

### Developing Key Competencies through Science

Learning in Science provides meaningful contexts for developing Key Competencies from the New Zealand Curriculum. These Key Competencies are woven through, and embedded in, the Big Ideas and Significant Learning. Students will engage with critical thinking and analysis, explore different perspectives on scientific issues, and develop their understanding of the role of science in society.

**Thinking**

Students of Science will:

* understand that there is no one scientific method
* develop a greater understanding of the nature of science
* recognise how science and mātauranga Māori can help solve world problems
* understand how models and theories have developed through time and are influenced by culture and politics
* grasp increasingly complex science concepts & apply them to an ever-growing range of contexts
* understand that science knowledge is developed through investigation
* select, plan & carry out a range of appropriate investigations (including evaluating method & data)
* analyse information in its various forms and know how to check the sources of information
* identify the assumptions that underlie claims made by journalists, scientists, and themselves, and to check these against the evidence
* learn to distinguish science from disinformation.

**Using language, symbols, and texts**

Students of Science will:

* develop knowledge of the vocabulary, numeric and symbol systems, and conventions of science such as graphs, significant figures, formulae, units, and diagrams.
* use appropriate ways to communicate their own science ideas and understanding of evidence.

**Relating to others**

Students of Science will:

* learn to define the problem or issue to be investigated and establish what knowledge they already bring and what new knowledge they may need to gain
* learn how to determine the different perspectives by which people view a science issue
* use scientific understandings to make decisions and respond in social and cultural contexts.

**Managing self**

Students of Science will:

* engage in scientific conversations about their science experiences, the quality of their evidence and the evidence of others
* be open-minded and able to distinguish between their own and others' positions and findings.

**Participating and contributing**

Students of Science will:

* use the science conclusions to generate and evaluate a range of possible responses (including consideration of cultural, social, environmental, ethical, economic and political implications)
* understand that science is a collaborative activity and practise talanoa or mahi tahi in their own science activities
* engage in wānanga or talanoa to consult a body of knowledge and the work and ideas of others,
* where appropriate, debate evidence and justify points of view using a scientific perspective.

### [Key Competencies](http://nzcurriculum.tki.org.nz/Key-competencies)

This section of The New Zealand Curriculum Online offers specific guidance to school leaders and teachers on integrating the Key Competencies into the daily activities of the school and its Teaching and Learning Programmes.

## **Connections**

## Science uses transferrable, interdisciplinary skills that connect with other subjects, particularly those that use critical thinking, systems thinking, analysis, and research.

Some examples of links to other subjects are:

Mathematics and Statistics: All sciences use Statistics conventions for collecting and analysing data and Mathematics conventions for recognising and interpreting patterns.

Technology: Advances in science can lead to new materials and resources for technological applications. New technologies allow science advancements and novel applications in fields such as medical science, engineering, product development, and resource management.

Geography: Science includes geology and the study of natural forces that shape the land and bodies of water. Geography includes the way that land and water resources are used by people.

Music: Physics includes the study of soundwaves. Musical instruments create soundwaves and musical performance includes the use of acoustics, amplification, and resonance.

Health and Physical Education: Health and Physical Education shares understandings with Biology of how the human body works and behaves.

## **Learning Pathway**

## Science offers ākonga a platform for gaining and applying skills across a wide range of potential pathways. Science thinking is logical and creative, subject specific and transferrable. Through Science, ākonga will learn skills in critical thinking, communication, collaboration, analysis, research, inquiry, peer review, and systems thinking.

Learning in Science may lead ākonga to a career in research and development, medicine, dentistry, food and nutrition, psychology, engineering, education, agriculture, viticulture, biosecurity, forestry, conservation, resource management, architecture, or politics.

There are many pathways for furthering science studies at tertiary level. Ākonga may wish to study a general science course, or specialise in areas such as neuroscience, zoology, medical laboratory science, forensic pathology, physiotherapy, veterinarian science, electrical engineering, psychology, or aeronautics

More broadly, science skills are used in career pathways such as hairdressing, dairy farming, production management, health and safety advisor, pest control, or the armed forces.

Science fosters the ability to interpret and communicate information about complex issues which will help ākonga to make informed, responsible decisions related to themselves, their communities, and the world. Science encourages looking at the world from multiple perspectives and seeking out evidence to support conclusions. These skills are valuable in every career pathway.

# Science Learning Matrix <https://ncea.education.govt.nz/science/science?view=learning>

|  |  |
| --- | --- |
| **Big Ideas** | Significant Learning |
| Science knowledge is contested and refined over time  Science uses different inquiry approaches to develop understanding  Science uses subject-specific literacy to communicate knowledge  Science based information can be used in decision making and action | At curriculum level 6 ākonga will   * engage with the iterative process of science investigation through innovation, problem solving, inquiry, collaboration, and evaluation * recognise how different approaches can be used in science investigations * consider mātauranga Māori alongside science in contexts that relate to Aotearoa New Zealand * consider how different perspectives can be used when making decisions on socio-scientific issues * identify interrelationships between science practices, technological advances, mātauranga Māori, and the practical advancement of science knowledge * recognise that scientific ideas are developed through critical and creative thinking, regulated by evidence * recognise science ideas are communicated using a range of methods with discipline-specific practices * consider how the values and needs of a society can influence the focus of scientific endeavours * use science understanding to critique claims or predictions made in communicated information. |

# Sample Course outlines

## <https://ncea.education.govt.nz/science/science?view=teaching>

The Sample Course Outlines provide a clear overview of learning across one year and link to the Learning and Assessment Matrices. They are indicative only and do not mandate any particular context or approach. Course Outlines should be developed using the appropriate template.

# Assessment Matrix

|  |  |  |  |
| --- | --- | --- | --- |
| **Science 1.1 (91920)**  [Develop a science-informed response to a local socio-scientific issue](https://ncea.education.govt.nz/science/science/1/1)  Internal  5 Credits | Science 1.2 (91921)  [Use a range of scientific investigative approaches in a taiao context](https://ncea.education.govt.nz/science/science/1/2?view=standard)  Internal  5 Credits | **Science 1.3 (91922)**  [Describe features of science involved in the development of a scientific idea in an Aotearoa New Zealand or Pacific context](https://ncea.education.govt.nz/science/science/1/3?view=standard)  91921  External  5 Credits | Science 1.4 (91923)  [Demonstrate understanding of science claims in communicated information using māramatanga](https://ncea.education.govt.nz/science/science/1/4?view=standard)  External  5 Credits |

**Subject Glossary**

Both EnglishandTe Reo Māori<https://ncea.education.govt.nz/glossary/science>

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# Science 1.1 (AS 91920) version 3

**Title:** Demonstrate understanding of a science-informed response to a local issue

## Credits: 5 Level: NCEA Level 1 Assessment mode: Internal

## Status: Draft for pilot Date published: 30 Mar 2023 Date version reviewed: n/a

## 

## Purpose :

## Students are able to demonstrate understanding of a science-informed response to a local issue

## Achievement criteria:

|  |  |  |
| --- | --- | --- |
| Achievement | Achievement with Merit | Achievement w Excellence |
| Demonstrate understanding of a science-informed response to a local issue | Explain a science-informed response to a local issue | Analyse a science-informed response to a local issue |

Explanatory Note 1:

Demonstrate understanding of a science-informed response to a local issue involves:

* describing a science idea that informs a science perspective involved in the issue
* outlining another perspective relevant to the issue
* identifying a science-informed response to the issue.

Explain a science-informed response to a local issue involves:

* explaining the science idea that informs the science perspective relevant to the issue
* explaining another perspective relevant to the issue
* explaining the science-informed response to the issue.

Analyse a science-informed response to a local issue involves:

* discussing the importance of the science-informed perspective and the other perspective in the science-informed response to the issue.

Explanatory Note 2:

As part of the evidence provided, students must include a discussion of tiakitanga in the context of responsible science practice in the local issue. In this achievement standard, the tiakitanga approach is one that demonstrates taking care, ownership, or responsibility, in response to the issue.

Explanatory Note 3:

A local issue is an issue about which people hold varying perspectives. Local refers to the issue being of interest or importance to the student.

Explanatory Note 4:

A perspective is shaped by values and belongs to a group, such as an iwi or hapu, rather than an individual.

Shared Explanatory Note:

Refer to the NCEA [glossary](https://ncea.education.govt.nz/glossary) for Māori, Pacific, and further subject-specific terms and concepts.

This Achievement Standard is derived from the Science Learning Area at Level 6 of *The New Zealand Curriculum:*Learning Media, Ministry of Education, 2007.

# Science 1.2 (AS 91921) version 3

**Title:** Demonstrate understanding of the use of a range of scientific investigative approaches in a context

## Credits: 5 Level: NCEA Level 1 Assessment mode: Internal

## Status: Draft for pilot Date published: 30 Mar 2023 Date version reviewed: n/a

## Purpose :

Students are able demonstrate understanding of the use of a range of scientific investigative approaches in a context.

## Achievement criteria:

|  |  |  |
| --- | --- | --- |
| Achievement | Achievement with Merit | Achievement w Excellence |
| Demonstrate understanding of the use of a range of scientific investigative approaches in a context | Explain the use of a range of scientific investigative approaches in a context | Analyse the use of a range of scientific investigative approaches in a context |

Explanatory Note 1:

Demonstrate understanding of the use of a range of scientific investigative approaches in a context involves:

* carrying out a range of investigative approaches that each answer a question
* describing the purpose of each investigative approach, supported by evidence.

Explain the use of a range of scientific investigative approaches in a context involves:

* giving an evidence-based reason why each investigative approach was or was not appropriate to answer a question.

Analyse the use of a range of scientific investigative approaches in a context involves:

* using evidence to validate findings with reference to the range of investigative approaches used.

Explanatory Note 2

Examples of a range of scientific investigative approaches include at least three of:

* pattern seeking
* exploring and observing
* modelling
* classifying and identifying
* fair testing.

Explanatory Note 3

Examples of evidence include:

* experimental data
* observational data
* statistics
* surveys
* consultation with a wider body of knowledge or discussion such as wānanga.

Explanatory Note 4

Validate means to use evidence to check or prove how appropriate, or not, the data or findings are when used to respond to the question or context investigated.

Shared Explanatory Note

Refer to the NCEA [glossary](https://ncea.education.govt.nz/glossary) for Māori, Pacific, and further subject-specific terms and concepts.

This Achievement Standard is derived from the Science Learning Area at Level 6 of The New Zealand Curriculum: Learning Media, Ministry of Education, 2007

# Science 1.3 (AS 91922) version 3

**Title:** Describe features of science that have contributed to the development of a science idea in a local context

## Credits: 5 Level: NCEA Level 1 Assessment mode: External

## Status: Draft for pilot Date published: 30 Mar 2023 Date version reviewed: **N/A**

## Purpose :

Students are able to describe features of science that have contributed to the development of a science idea, within a local context.

## Achievement criteria:

|  |  |  |
| --- | --- | --- |
| Achievement | Achievement with Merit | Achievement w Excellence |
| Describe features of science that have contributed to the development of a science idea in a local context | Explain features of science that have contributed to the development of a science idea in a local context | Examine features of science that have contributed to the development of a science idea in a local context |

Explanatory Note 1:

Describe features of science that have contributed to the development of a science idea in a local context involves:

* identifying characteristics of the features of science for an identified scientific idea
* outlining how the features of science contributed to the development of the scientific idea.

Explain features of science that have contributed to the development of a science idea in a local context involves:

* giving a reason why each identified feature of science was significant to the development of a scientific idea.

Examine features of science that have contributed to the development of a science idea in a local context involves:

* discussing how the features of science have interacted in the development of the scientific idea.

Explanatory Note 2:

Examples of *features of science* may include:

* replicable, verifiable data collection
* interpreting patterns and interactions
* linking new evidence to existing models, theories, and ideas
* the development of science ideas in response to new evidence or varied perspectives, such as Māori and Pacific knowledge systems
* the influence of social and cultural factors on science
* the influence of the development and use of technology on science
* responding to needs and opportunities
* rigorously reviewing claims
* using specific language, symbols, and conventions
* being tentative by nature; the only certainty in science is when a claim is disproved
* the attributes of the people who carry out the science such as curiosity, collaboration, competitiveness, creativity, and critical thinking.

Explanatory Note 3:

A local context refers to an Aotearoa New Zealand or Pacific context

Shared Explanatory Note:

Refer to the NCEA [glossary](https://ncea.education.govt.nz/glossary) for Māori, Pacific, and further subject-specific terms and concepts.

This Achievement Standard is derived from the Science Learning Area at Level 6 of *The New Zealand Curriculum:*Learning Media, Ministry of Education, 2007.

# Science 1.4 (AS 91923) version 3

**Title:** Demonstrate understanding of science-related claims in communicated information

## Credits: 5 Level: NCEA Level 1 Assessment mode: External

## Status: Draft for pilot Date published: 30 Mar 2023 Date version reviewed: n/a

## Purpose :

Students are able to demonstrate understanding of science-related claims in communicated information.

## Achievement criteria:

|  |  |  |
| --- | --- | --- |
| Achievement | Achievement with Merit | Achievement w Excellence |
| Demonstrate understanding of science-related claims in communicated information | Explain science-related claims in communicated information | Examine science-related claims in communicated information |

Explanatory Note 1:

Demonstrate understanding of science-related claims in communicated information involves:

* describing the source and intended purpose of the communicated information
* describing science-related claims in communicated information
* describing science language or conventions used in the communicated information.

Explain science-related claims in communicated information involves:

* explaining how science language and conventions are used to support science-related claims in the communicated information.

Examine science-related claims in communicated information involves:

* evaluate the use of science language or conventions used to support science-related claims in the communicated information.

Explanatory Note 2:

Science-related claims use scientific evidence to justify a conclusion.

Explanatory Note 3:

Communicated information is information from any channel, source, or media such as conversations with people, radio shows, published research, advertising and online content.

Explanatory Note 4:

The source refers to the person, persons, or organisation, who wrote or commissioned the writing of, the communicated information.

Shared Explanatory Note:

Refer to the NCEA [glossary](https://ncea.education.govt.nz/glossary) for Māori, Pacific, and further subject-specific terms and concepts.

This Achievement Standard is derived from the Science Learning Area at Level 6 of The New Zealand Curriculum: Learning Media, Ministry of Education, 2007.

# 

# Unpacking standards

Unpacking Standard 1.1

*Mātauranga Māori constitutes concepts and principles that are richly detailed, complex, and fundamental to Māoridom. It is important to remember that the practice of these are wider and more varied than their use within the proposed NCEA Achievement Standards and supporting documentation.*

*We also recognise that the cultures, languages, and identities of the Pacific Islands are diverse, varied, and unique. Therefore the Pacific concepts, contexts, and principles that have been incorporated within NCEA Achievement Standards may have wide-ranging understandings and applications across and within the diversity of Pacific communities. It is not our intention to define what these concepts mean but rather offer some ways that they could be understood and applied within different subjects that kaiako and students alike can explore.*

**Intent of the Standard**

The purpose of this Standard is for ākonga to show their understanding of the role of science ideas in decision making. Real-world applications of science are complex and variable. Decision makers use science-informed ideas and ideas from other perspectives to make decisions.

Many individuals have opinions about local issues, and opinions can change rapidly. This Achievement Standard is not about examining individual opinions. For the purpose of this Achievement Standard, ākonga will identify two different perspectives that relate to a local issue: a science perspective and another perspective held by a group. Perspectives are shaped by values and informed by a knowledge system such as mātauranga Maōri, science, politics, Pacific knowledges, economics, or history.

Recognising the importance of multiple knowledge systems is an essential skill for using science knowledge appropriately. The intention is not to force comparisons between different perspectives or knowledge systems, but to recognise that different perspectives are important. Ākonga who understand why decisions have been made, and the complexity of decision making, are better placed to recognise the influences acting on local issues.

Decisions about local issues have associated costs, consequences, and benefits. Responsible decision making involves careful consideration about both people and resources. Decision makers need to understand multiple perspectives to make a decision that is in the best interests of those affected.

This Standard aligns with the following items of Significant Learning:

* consider mātauranga Māori and Pacific knowledges alongside science in contexts that relate to Aotearoa New Zealand and the Pacific
* consider how different perspectives can be used when making decisions on socio-scientific issues
* consider how the values and needs of a society can influence the focus of scientific endeavours

**Making reliable judgements**

As part of the evidence provided, ākonga must show understanding of a science-based idea, and an understanding of one related perspective informed by a different knowledge system. The two perspectives do not have to be in conflict, for example, mātauranga Māori, Pacific knowledge systems, economics, politics, and ecology all provide different perspectives but would all support sustainable fishing practices.

Ākonga will need to think about the relationship between the perspectives and how they are relevant to the local issue. At higher levels of achievement, ākonga will need to show an understanding of why a response was made in relation to their chosen issue, and why more than one perspective is important in decision making.

At all levels of achievement, ākonga must include a discussion of tiakitanga in the context of responsible science practice in a local issue. Evidence that shows understanding of tiakitanga is a requirement of this Achievement Standard but does not contribute to the level of achievement.

**Collecting evidence**

Evidence for this standard will be collected by ākonga individually, or as part of a group. Ākonga must be actively involved in any group component to this assessment and will need to identify their contribution. The final assessment will be an individual presentation.

**Possible contexts**

This Standard has a particular focus on local curriculum. The issue chosen as a case study should have both a science element, and relevance to ākonga. For example, ākonga living in coastal communities may be interested in sustainable fishing quota, but ākonga living inland may be more interested in reforestation practices.

When researching perspectives informed by a knowledge system other than science, ākonga could consider:

* mātauranga Māori
* Pacific knowledges
* historical or societal practices.

In Aotearoa New Zealand it is important to consider the views of local iwi who have kaitiaki responsibilities over local whenua, awa, and moana.

It is also important that contexts for study are selected with respect for whānau and ākonga. Teachers need to be mindful that personal, religious, or cultural views will inevitably influence responses to an issue. These should not prevent ākonga from achieving, provided they have demonstrated clear understanding of the science ideas involved in an issue. Guidance may be needed in the choice of contexts or issues to enable students to engage fully with all aspects of the task.

### Standard Exclusions

This Standard has exclusion(s). Standards that recognise the same or similar learning outcomes as other Achievement or Unit Standards need to be excluded to prevent 'double dipping'. Where two or more Standards assess the same learning outcome, those Standards are specified in the Exclusions List. You can only use credits gained from one of these Standards towards your NCEA qualification.

[Click here for the exclusions list for the new NCEA Level 1 pilot Standards.](https://ncea.education.govt.nz/exclusion-list) [90926]

### Literacy and Numeracy Requirements

This standard has been tagged for literacy meaning that it can be used to meet the NCEA Literacy and Numeracy | Te Reo Matatini me te Pāngarau requirements until the new unit standards become mandatory.

## Unpacking Standard 1.2

Mātauranga Māori constitutes concepts and principles that are richly detailed, complex, and fundamental to Māoridom. It is important to remember that the practice of these are wider and more varied than their use within the proposed NCEA Achievement Standards and supporting documentation.

We also recognise that the cultures, languages, and identities of the Pacific Islands are diverse, varied, and unique. Therefore the Pacific concepts, contexts, and principles that have been incorporated within NCEA Achievement Standards may have wide-ranging understandings and applications across and within the diversity of Pacific communities. It is not our intention to define what these concepts mean but rather offer some ways that they could be understood and applied within different subjects that kaiako and students alike can explore.

**The intent of the Standard**

Understanding the world around us requires a variety of investigative approaches that each fit different purposes. By doing investigations themselves, ākonga are more likely to think critically about information, data, and claims that they encounter in daily life.

The purpose of this Achievement Standard is for ākonga to show their understanding of different investigative approaches giving different results in response to different inquiry questions. Critical thinking is needed to determine the type of investigation to use and the data or information to gather. Scientists collaborate and share their ideas to develop robust findings.

This Standard aligns with the following items of Significant Learning:

* engage with the iterative process of science investigation through innovation, problem solving, inquiry, collaboration, and evaluation
* recognise how different approaches can be used in science investigations
* recognise that scientific ideas are developed through critical and creative thinking, regulated by evidence
* recognise that science ideas are communicated using a range of methods with discipline-specific practices.

**Making reliable judgments**

Ākonga will be able to describe the purpose of three different investigative approaches used in the same context and understand the relationship between the type of investigation used, and the findings it produced. At higher levels of achievement ākonga will be able to discuss the validity of their findings in relation to the investigation and the context.

Ākonga should work in groups to carry out their investigations and collect their findings. Ākonga will be assessed through individual responses to the investigations.

At Level 6 of the New Zealand Curriculum, kaiako give direction by providing a purpose and instructions for the investigative method and context.

**Collecting evidence**

In this Standard ākonga will carry out investigations within one identified context, using three different approaches. Each investigative approach will explore a question that relates to the same context. Ākonga will gather data in each investigation.

Gathered data includes evidence that can either be quantitative or qualitative. Quantitative data can be measurements, tallies, statistics, or sample surveys. Qualitative data can be photos, annotated drawings, observations, or interviews.

During their investigations ākonga may wānanga, consult with others, discuss with classmates, or consult a wider body of knowledge as they collect overarching findings that relate to their learning.

Ākonga will reflect individually on the validity of their findings.

**Possible contexts**

Ākonga will show an understanding of how to conduct three different types of investigations within a single context. They will understand which investigations are appropriate for which purposes. They will process data, report on findings, and compare the different approaches used. Investigative approaches may include:

* pattern seeking
* exploring and observing
* modelling
* classifying and identifying
* fair testing.

The identified context could be an aspect of local environment or a topic of interest to ākonga.

As part of the assessment for this Achievement Standard, an investigation may need to use a model to collect observations or data. Ākonga may change factors, testing the effect of different variables and generating some results. For example, ākonga may use computer programs or models to explore the effect of introducing a new gene into a population for a certain length of time.

Interrogation of databases forms the foundation of many investigations. Ākonga can use either primary or secondary data to develop methods, and gather, and analyse evidence, to support findings.

To achieve this Achievement Standard, ākonga must understand how scientific findings can be verified. Wānanga can contribute to the process ākonga use to verify their findings.

The emphasis is on understanding how to investigate, rather than interpreting the evidence ākonga may gather through their investigations. Ākonga will also understand that different investigations involve several of the same features.

### Standard Exclusions

This Standard has exclusion(s). Standards that recognise the same or similar learning outcomes as other Achievement or Unit Standards need to be excluded to prevent 'double dipping'. Where two or more Standards assess the same learning outcome, those Standards are specified in the Exclusions List. You can only use credits gained from one of these Standards towards your NCEA qualification.

[Click here for the exclusions list for the new NCEA Level 1 pilot Standards.](https://ncea.education.govt.nz/exclusion-list) [90925]

### Literacy and Numeracy Requirements

This standard has been tagged for literacy meaning that it can be used to meet the NCEA Literacy and Numeracy | Te Reo Matatini me te Pāngarau requirements until the new unit standards become mandatory.

## Unpacking Standard 1.3

Mātauranga Māori constitutes concepts and principles that are richly detailed, complex, and fundamental to Māoridom. It is important to remember that the practice of these are wider and more varied than their use within the proposed NCEA Achievement Standards and supporting documentation.

We also recognise that the cultures, languages, and identities of the Pacific Islands are diverse, varied, and unique. Therefore the Pacific concepts, contexts, and principles that have been incorporated within NCEA Achievement Standards may have wide-ranging understandings and applications across and within the diversity of Pacific communities. It is not our intention to define what these concepts mean but rather offer some ways that they could be understood and applied within different subjects that kaiako and students alike can explore.

**Intent of the Standard**

The purpose of this Achievement Standard is for ākonga to demonstrate their understanding of science as a knowledge system. Ākonga will be familiar with the features of science that define it as a reliable and valid collection of information. This includes understanding that science ideas are open to challenge and change. Throughout their science education, ākonga will encounter ideas about the inquiry process, peer review, repetition, objectivity, and transparency. In this Achievement Standard, ākonga will show their understanding of science as a body of knowledge that critiques itself, and challenges its claims as new evidence and different interpretations come to light.

In Aotearoa New Zealand, mātauranga Māori and Pacific knowledges are increasingly contributing to how science ideas are viewed and reviewed.

This Achievement Standard aligns with the following items of Significant Learning:

* consider mātauranga Māori and Pacific knowledges alongside science in contexts that relate to Aotearoa New Zealand and the Pacific
* identify interrelationships between science practices, technological advances, mātauranga Māori, and the practical advancement of science knowledge
* recognise that scientific ideas are developed through critical and creative thinking, regulated by evidence
* consider how the values and needs of a society can influence the focus of scientific endeavours.

**Making reliable judgements**

As part of the evidence provided, ākonga must show that they understand the characteristics of science knowledge and how knowledge has changed over time in a specific context. At higher levels of achievement, ākonga will show that they understand the significance of changed understanding, and how the features of science have influenced each other in the development of a scientific idea.

**Collecting evidence**

External Assessment Specifications will be published by NZQA and will specify details about how and at what stage of the year this standard will be assessed.

**Possible contexts**

Ākonga engaging with this achievement standard will develop transferable knowledge about the science process and the characteristics of science knowledge.

These characteristics include that:

* evidence is collected through repeatable tests
* results are observable and predictable
* scientific theories are subject to change over time.

The main emphasis of this Achievement Standard is to understand why science as a body of knowledge is not static.

Features of science could include:

* replicable, verifiable data collection
* interpreting patterns and interactions
* linking new evidence to existing models, theories, and ideas
* the development of science ideas in response to new evidence or varied perspectives, such as Māori and Pacific knowledge systems
* the influence of social and cultural factors on science
* the influence of the development and use of technology on science
* responding to needs and opportunities
* rigorously reviewing claims
* using specific language, symbols, and conventions
* being tentative by nature; the only certainty in science is when a claim is disproved
* the attributes of the people who carry out the science such as curiosity, collaboration, competitiveness, creativity, and critical thinking.

Ākonga should engage with rich case studies to develop their understanding of where science ideas have come from. The context for the case studies should include an example from Aotearoa New Zealand or the wider Pacific. Ākonga should select case studies that show how science ideas span across time and change in response to new information and technologies. An example of this would be the changing understanding of DNA from Watson and Crick’s model, to the gene sequencing used to identify the CDH1 gene in Stan Walker’s diagnosis.

The case studies should encompass a range of features that have contributed to the development of the science idea such as ongoing observations, use of new technologies, or links to existing models.

### Standard Exclusions

This Standard has exclusion(s). Standards that recognise the same or similar learning outcomes as other Achievement or Unit Standards need to be excluded to prevent 'double dipping'. Where two or more Standards assess the same learning outcome, those Standards are specified in the Exclusions List. You can only use credits gained from one of these Standards towards your NCEA qualification.

[Click here for the exclusions list for the new NCEA Level 1 pilot Standards.](https://ncea.education.govt.nz/exclusion-list) [90931]

### Literacy and Numeracy Requirements

This standard has been tagged for literacy meaning that it can be used to meet the NCEA Literacy and Numeracy | Te Reo Matatini me te Pāngarau requirements until the new unit standards become mandatory.

## 

## Unpacking Standard 1.4

Mātauranga Māori constitutes concepts and principles that are richly detailed, complex, and fundamental to Māoridom. It is important to remember that the practice of these are wider and more varied than their use within the proposed NCEA Achievement Standards and supporting documentation.

We also recognise that the cultures, languages, and identities of the Pacific Islands are diverse, varied, and unique. Therefore the Pacific concepts, contexts, and principles that have been incorporated within NCEA Achievement Standards may have wide-ranging understandings and applications across and within the diversity of Pacific communities. It is not our intention to define what these concepts mean but rather offer some ways that they could be understood and applied within different subjects that kaiako and students alike can explore.

**Intent of the Standard**

The purpose of this Achievement Standard is for ākonga to demonstrate their ability to identify and critique the use of science ideas in published information. Many publications present information as ‘science’ without verifying their sources, or they make claims based on partial information. Ākonga will use their science-specific literacy skills to examine data and the use of scientific vocabulary, graphics, and conventions in publications. Ākonga will also need to think critically about sources of information and the influences on authors in the way that they represent ideas in their writing.

Ākonga are exposed to a huge volume of information from different sources and over multiple platforms. Those who can recognise science ideas will be less likely to view disinformation as an authentic scientific claim.

This Standard aligns with the following items of Significant Learning:

* recognise that scientific ideas are developed through critical and creative thinking, regulated by evidence
* recognise that science ideas are communicated using a range of methods with discipline-specific practices
* use science understanding to critique claims or predictions made in communicated information.

**Making reliable judgements**

As part of the evidence provided, ākonga must show that they are able to interpret and critique information, and examine claims related to scientific ideas.

Ākonga will show they understand how the intended purpose of a publication can influence the represent-ation of data. At higher levels of achievement, ākonga will show they understand how science language or conventions can be used to represent, or misrepresent, a science idea when a claim is being made.

**Collecting evidence**

External Assessment Specifications will be published by NZQA and will specify details about how and at what stage of the year this Standard will be assessed.

**Possible contexts**

Possible contexts could include science communications, or apparent science communications, that present data and information using science vocabulary and conventions.

These communications could include:

* representation of data and graphs
* conflicts of interest
* claims about correlation and causation
* sample sizes
* use of controls, blind testing, or peer review.

### Literacy and Numeracy Requirements

This standard has been tagged for literacy meaning that it can be used to meet the NCEA Literacy and Numeracy | Te Reo Matatini me te Pāngarau requirements until the new unit standards become mandatory.

# Conditions of Assessment (for internally assessed standards)

Assessor involvement during the assessment event is limited to providing general feedback. They can suggest sections of student work that would benefit from further development, or skills a student may need to revisit across the work. Student work that has received sustained or detailed feedback is not suitable for submission towards this standard.

Internal assessment tasks

* 1. <https://ncea.education.govt.nz/science/science/1/1?view=activities>
  2. <https://ncea.education.govt.nz/science/science/1/2?view=activities>

# Assessment Specifications (for externals)

The External Assessment Specifications for achievement standards 1.3 and 1.4 will be published in May.

2021 external assessment for 1.4

<https://ncea.education.govt.nz/science/science/1/4?view=supporting-material>

2021 external assessment for 1.3

<https://ncea.education.govt.nz/science/science/1/3?view=supporting-material>

# Draft for 2023

# Chemistry and Biology Learning Matrix Curriculum L6 <https://ncea.education.govt.nz/science/chemistry-and-biology>

|  |  |
| --- | --- |
| **Big Ideas** | Significant Learning |
| Chemistry and Biology use a variety of inquiry approaches to gain understandings  Matter and energy flow through biological systems  Properties of matter are determined by interactions of particles  All living things are interconnected | At curriculum level 6 ākonga will   * recognise differences, as well as similarities, in biological and chemical inquiry practices * engage with different perspectives to inform Chemistry and Biology inquiry approaches * consider patterns in the ways that chemical reactions rearrange atoms and redistribute energy * explore the implications of the conservation of mass * explore how the impact of chemicals and their derivatives can change depending on the state, quantity and location of the chemical species * make connections between biological and chemical interactions when nutrients cycle and energy flows * explore impacts of disruptions on interrelationships within an ecosystem * consider how genetic variation arises and its effect on resilience in biological systems * explore ways that breakthroughs in chemical and biological knowledge have furthered understandings in related disciplines * explore how new materials can be developed to meet the needs of a sustainable future. |

# Physics Earth & Space Science Learning Matrix Curriculum L6 <https://ncea.education.govt.nz/science/physics-earth-and-space-science>

|  |  |
| --- | --- |
| **Big Ideas** | Significant Learning |
| Earth and space systems are dynamic and interact with each other  Inquiry approaches can be applied to explain concepts of the physical world  Interacting processes within and between Earth’s systems influence the surface, climate, and life on Earth  Physical phenomena can be explained through physics principles and communicated using physics conventions | At curriculum level 6 ākonga will   * understand that Physics, Earth, and Space Science knowledge is continuously developed through collaboration and review * investigate observable interactions between the Sun and Earth-Moon systems * understand that the hydrosphere, biosphere, atmosphere, and geosphere interact in the Earth system * explore how Earth processes interact and influence the surface, climate, and life on Earth * explore natural and human induced changes on Earth systems and consider the implications of their effects * interpret representations, critique evidence, and communicate knowledge within Physics, Earth and Space Science contexts * apply inquiry approaches to develop understanding of Physics, Earth and Space Science concepts, including how mātauranga Māori can inform inquiry practice * understand that a range of physical concepts can be used to explain an interaction * explore the nature of energy and force in the physical world * apply relevant modelling techniques to demonstrate understanding of physical phenomena within Physics, Earth and Space Science contexts. |