Science

SCC115122

Course Implementation Guide

Personal Futures

SCIENCE

Catholic Education Tasmania

independent schools tasmania

Department *for* Education, Children and Young People

Tasmanian Government

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Science (SCC115122)

About this document

This course implementation guide supports the course document[1]. It supports teachers to create active and engaging learning experiences.

The course document on the Office of Tasmanian Assessment, Standards and Certification's website must be used when planning, delivering and assessing this course.

The Department *for* Education, Children and Young People's A Pedagogical Framework[2] has informed this resource.

Focus area support

This is a Personal Futures course.

This course allows learners to engage with fundamental skills and knowledge to support their personal pathways. Learners will be able to:

- negotiate areas of interest
- identify personal challenges
- plan to meet the goals they set in ways relevant to them.

Teachers should use resources, applications of science, experts and environments in their local communities to deepen the engagement with science in real world contexts valued by learners.

Teachers will support learners to monitor their progress and achievement and assess meeting their own learning goals. Learners will have the opportunity to plan and complete their own scientific inquiry. Exploring traditional science content will support pathways into Level 2 courses. Supplying scaffolded support for investigations in module 3 will allow learners to complete a coherent, achievable and engaging inquiry.

Teachers are responsible for linking what is being studied with its value in the community together with skills and knowledge learners will be able to apply in their possible futures.

Localisation and customisation

Localisation

For providers with low numbers:

- Use the resources available to providers and emphasise the depth of engagement over the breadth of content.

For providers in isolated areas:

[1] A 'course document' refers to accredited course information on the TASC website.
[2] https://documentcentre.education.tas.gov.au/_layouts/15/DocIdRedir.aspx?ID=TASED-1629159896-383

- All communities have their own examples of science application and providers should use what is available.

For providers delivering content remotely:

- Delivery of the content and work requirements can occur synchronously and/or asynchronously.

For providers delivering multiple levels in a single class:

- The flexibility of the content ensures that this course may be taught alongside other courses.

Customisation

Opportunities exist to customise learning and content throughout the course, for example:

- Negotiation and customisation of the content to meet the needs of learners within what is available and achievable. Providers should use their local community, resources and environments wherever possible.
- Emphasis on evidence of understanding and learning over modes of communication.
- Learners being responsible for planning and demonstrating their own learning through a range of modes ideally suited to online provision.

Course delivery advice

Module	Indicative Times
Module 1: Biological, Earth and space sciences • Monitoring and reviewing to demonstrate learning – dialogue and informed action • Science as a human endeavour and science understanding • Science inquiry skills	50 hours
Module 2: Physical and chemical sciences • Monitoring and reviewing to demonstrate learning – dialogue and informed action • Science as a human endeavour and science understanding • Science inquiry skills	50 hours
Module 3: Scientific inquiry • Monitoring and reviewing to demonstrate learning – dialogue and informed action • Science as a human endeavour and science understanding • Science inquiry skills	50 hours

Teaching and learning

Module 1: Biological, Earth and space sciences

The following learning outcomes are a focus of this module:

1. communicate foundational science concepts using appropriate formats and adapt strategies for learning

2. conduct safe, ethical inquiries to collect, present and interpret simple scientific data and improve processes
3. observe and identify components and processes of biological, Earth and space systems and apply scientific knowledge to make predictions
4. identify where applications of biological, Earth and space sciences are used to meet needs in their local community and how these sciences are applied with examples of use of technology.

Module 1: Teaching strategies

Teachers should use the folio for learners to plan, record and comment on their learning. Tailor the mode to learner and task needs. Early in module 1 learners should show what they already know about the big ideas of biology, Earth and space science. Learners could engage with their environment, experts, each other, practical work, or field trips. Use this information to set learning intentions, goals and indicators of learning.

Teachers should use the folio to monitor and encourage learner engagement regularly. Within the big ideas, there is room to negotiate areas of interest. Learners can ask their own questions and build on knowledge either useful for their own pathways or valued in their community or out of curiosity.

Teachers should ensure learning is experiential and connected to the learners and their communities. Allow time for learners to explore and inquire into the natural world. Inquiries should not be restricted to individualised biology, Earth and space sciences. Learners should be free to move between them where appropriate.

Module 1: Examples of learning activities

The why for learners

These activities describe how to help learners set goals and make connections.

- Early in this module walk around areas close to the school and prompt learners to notice natural and geological features. Discuss what they know about them, and use this as a basis for discussion while learners are planning what is best to explore in the biological, Earth and space sciences.
- Invite an expert to discuss how they apply the biological, Earth or space sciences. This could involve people who for example, work in horticulture, agriculture, forestry or environmental management. Learners can ask questions and note areas of interest for them.
- Design a field study or practical task where learners follow an inquiry process. Then ask questions to find evidence and make conclusions related to biological, Earth or space sciences. Ask the learners to brainstorm other questions they might want to investigate.

The what for learners

These activities describe how to help learners to grasp big ideas and key understandings, make links to prior learning and organise new information:

- Support learners to consider questions they can explore and answer practically. Ensure they reflect on what they might know already about this and ask questions to identify future learning. The learners can then create knowledge by applying their understanding.
- Once learners have found something to engage with deeply then they can explore what might be a clear question to inquire into. Learners can then test what they think is happening with repeated experiments to ensure their answer is valid.

- Support learners to make connections with their preferred pathways and biological, Earth or space sciences. Learners can then choose one aspect to explore more deeply, noting why it is important and what science can explain it.

The how for learners

These activities describe how to support learners to create, transfer and deepen knowledge and understanding:

- Learners use First Nations Tasmanians' knowledge to understand interconnected and difficult concepts. Such as ecosystem change and management and deep time and the impacts of sea level change.
- Learners complete an inquiry that links biological, Earth and space sciences. For example:
  - » the effect of seasons on a particular ecosystem and why seasons occur
  - » organisms and in the intertidal zone and the changing timing and size of tides in your area.
- Learners explore different ways to represent what they are discovering during an inquiry, discuss what they have found and what further questions are emerging. They can use this to determine the validity of their work and identify further work.

Module 1: Focus area guidance

Theory and dialogue

- Learners will use theory from the biological, Earth and space sciences to explore their communities, values and future.
- They will identify local applications of biological, Earth and space sciences and develop their own goals to inform their actions.

Informed action

- Learners will plan and direct aspects of their own learning to research, apply, test and compare their solutions.
- They will consider how we inquire into the natural world and the tools we use to do this.

Reflection and dialogue

- Learners will develop skills and strategies to address and reflect on their stated goals.
- They will employ critical thinking skills to review, justify and refine personal decisions.

Module 1: Recommended resources

Providers offering this course will need equipment, materials and a suitable space to carry out the practical component of the course effectively and safely. Providers will oversee the delivery of a safe program for Science Level 1 in their school and ensure adherence to these procedures.

Use of ICT resources will support learners to collect and represent information in different modes effectively and efficiently.

- Science by Doing (Science, 2021).
- Tasmanian Field Study Centres (Department of Education, 2021).
- Aboriginal Education Services (Aboriginal Education Services, 2021).

- Deep Time History of Indigenous Australians
- Communities of Practice may provide additional resources.

Module 2: Physical and chemical sciences

The following learning outcomes are a focus of this module:

1. communicate foundational science concepts using appropriate formats and adapt strategies for learning
2. conduct safe, ethical inquiries to collect, present and interpret simple scientific data and improve processes
5. observe and identify components and processes of physical and chemical systems and apply scientific knowledge to make predictions
6. identify where applications of physical and chemical sciences are used to meet needs in their local community and how these sciences are applied with examples of use of technology.

Module 2: Teaching strategies

Teachers should use the folio for learners to plan, record and comment on their learning. Tailor the mode to the learner and task as need. Early in module 1 learners should show what they already know about the big ideas of physical and chemical science. Learners could use this knowledge to engage with their environment, experts, each other, practical work or field trips to set learning intentions, goals and indicators of learning.

Teachers should use the folio to monitor and encourage learner engagement regularly and explicitly. With the big ideas in this module there is plenty of room to negotiate areas of interest. Learners can ask their own questions and build on their knowledge. This will be either useful for their own pathways or valued in their community or out of curiosity.

Teachers should ensure learning is experiential and connected to the lives of the learners and their communities. Allow time for learners to explore and inquire into physical and chemical phenomena. Inquiries should not be restricted to individualised physical and chemical sciences and learners should be free to move between them where appropriate.

Module 2: Examples of learning activities

The why for learners

These activities describe how to help learners set goals and make connections:

- Give some examples where physical and chemical sciences are applied in their community. Such as cleaning, gardening, hairdressing or driving a car. Learners brainstorm where else they are applied and how they might explain it using their current knowledge and what questions they have.
- Walk around the community identifying and exploring applications of physical and chemical sciences. Learners can pick one or two that interest them to explain current knowledge and brainstorm areas that they could choose to inquire into.
- Learners engage with an example inquiry into a physical or chemical phenomenon to explain common and known phenomenon. Challenge learners to apply the knowledge to another familiar phenomenon.

The what for learners

These activities describe how to help learners to grasp big ideas and key understandings, make links to prior learning and organise new information:

- Support learners to consider questions they can explore and answer practically. Ensure they reflect on what they might know already about this and question what else needs to be learnt. The learners can then create knowledge by applying their understanding.
- Once learners have found something to engage with deeply then they can explore what might be a clear question to inquire into. Learners can then test what they think is happening with repeated experiments to ensure their answer is valid.
- Support learners to make connections with their preferred pathways and physical or chemical science. Learners can then choose one aspect to explore more deeply, noting why it is important and what science can explain it.

The how for learners

These activities describe how to support learners to create, transfer and deepen knowledge and understanding:

- Learners use First Nations Tasmanians' knowledge to understand interconnected and difficult concepts. For example: the physical and chemical properties of kelp and its uses; ochre; or traditional weapons.
- Learners complete an inquiry that links physical and chemical sciences. For example, energy transfers and transformations involved in an electric car, the effect of dye on hair strength, corrosion and structural strength, or the change in texture of food with different ingredient ratios.
- Learners explore different ways to represent what has been measured, what this means and what further questions are emerging, and the further measurements to be made. They can use this to determine the validity of their work and identify further work.

Module 2: Focus area guidance

Theory and dialogue

- Learners will use theory from the physical and chemical sciences to explore their communities, values and future.
- They will identify local applications of physical and chemical sciences and develop their own goals to inform their actions.

Informed action

- Learners will plan and direct aspects of their own learning to research, apply, test and compare their solutions.
- They will consider how we inquire about physical and chemical phenomena and the tools we use to do this.

Reflection and dialogue

- Learners will develop skills and strategies to address and reflect on their stated goals.
- They will employ critical thinking skills to review, justify and refine personal decisions.

Module 2: Recommended resources

In addition to resources listed in module 1 and 2, the following resources are recommended:

- Year 7 to 10 University of Western Australia
- Science, Queensland Department of Education
- Australian Curriculum: Science Online

Module 3: Scientific inquiry

The following learning outcomes are a focus of this module:

1. communicate foundational science concepts using appropriate formats and adapt strategies for learning
2. conduct safe, ethical inquiries to collect, present and interpret simple scientific data and improve processes
7. observe and identify components and processes of simple scientific systems within their local community and apply scientific knowledge to make predictions
8. identify where related applications of scientific knowledge and skills are used to meet needs in their local community and how the knowledge and skills are applied with examples of use of technology.

Module 3: Teaching strategies

Teachers should use an established folio process with learners to negotiate an area of focus for the related investigations. These investigations should be extensions of work from modules 1 or 2 and/or follow what is valued by the learners. This may span across sciences and be related to:

- preparation for Level 2 TASC courses
- other pathways
- another area of interest.

Learning intentions, goals and indicators of learning can then be negotiated and set.

Teachers should encourage learners to devise and conduct practical and field work. This will enable learners to test for answers to questions they have about their focus area. Learners can support each other though shared inquiry or dialogue around progress. Learners should use the folio to plan, document and reflect on their work. Tailor the mode of communication to the learners and the focus of inquiry. Teachers can use this evidence to monitor, provide feedback and progress learning in dialogue with the learner.

Teachers need to support learners to collate and present what they have found during their related investigations. Teachers should be mindful that learners should gain knowledge and skills they value and can use in the future whilst putting together their presentations.

Module 3: Examples of learning activities

The why for learners

These activities describe how to help learners set goals and make connections:

- Support learners to decide what they would like to investigate related to their pathways and reflect on how that might be related to science. Learners choose what might be best to investigate given the resources available and the most valuable knowledge for them.

- Support learners to reflect on the investigations they have completed so far and what other questions might have emerged. They can answer these questions using the range of scientific knowledge they have gained so far. Learners can then choose a focus.
- Learners choose to inquire into the science behind First Nations Tasmanians' knowledge and practices. How has this science been applied over the millennia? How is this science used in other cultures?

The what for learners

These activities describe how to help learners to grasp big ideas and key understandings, make links to prior learning and organise new information:

- Support learners to visit work sites or speak to people in an employment area of interest to inquire into the science applied. Learners can use this information to inspire their inquiry to gain knowledge and insight into their chosen path.
- Learners research and understand the scientific knowledge related to their chosen focus of inquiry. They can then explore how this science can be applied and/or tested within this focus.
- Learners explore what can be measured or observed in relation to their inquiry question. They consider the information each of these gives and the place they may have in the inquiry, for example, are they a variable or to be kept constant for a fair test.

The how for learners

These activities describe how to support learners to create, transfer, and deepen knowledge and understanding:

- Learners explore the different sciences used for their inquiry. They illustrate or exemplify what the links are between these sciences and how they have applied them together to gain further understanding. Learners will choose two or more investigations to complete.
- Learners explore different ways to represent what has been measured and observed, how is this related to their inquiry and further questions. They can use this to determine the validity of their work and identify further work. This may lead to a second investigation.
- Learners use their claims and conclusions, and links between the two or more investigations to suggest improvements to the inquiry and what could be further inquired into and to build on what they have found.

Module 3: Focus area guidance

Theory and dialogue

- This module aims to provide further learning contexts where related scientific knowledge and skills are chosen and valued by learners.
- Learners will identify local applications of science and develop their own goals to inform their actions.

Informed action

- Learners will plan and direct aspects of their own learning to research, apply, test and compare their solutions.
- They will consider how we inquire into the world and the tools we use to do this.

Reflection and dialogue

- Learners will develop skills and strategies to address and reflect on their stated goals.
- They will employ critical thinking skills to review, justify and refine personal decisions.

Module 3: Recommended resources

In addition to resources listed in module 1 and 2, the following resources are recommended:

- *Effect of Inquiry based Learning Method on Students' Motivation* (Bayram & al, 2013).
- Inquiry-based learning (Department of Education, Skills and Employment, 2021).
- Enquiry-based learning (Griffith University, 2021).
- Assessment in inquiry-based learning (OPHEA, 2021).
- Discover, Discuss, Demonstrate: Using Inquiry-Based Learning to Keep Students Engaged (Stephanie Rothstein, 2021).

Supporting learner responses

The work requirements outlined in the course document describe the fundamental assessment evidence. Inclusion of other tasks may support and enhance learning. Learning activities aim to support and enrich understanding and achievement of the learning outcomes. Possible strategies to support learner responses to work requirements are provided.

Module 1: Biological, Earth and space sciences

Work requirement 1 of 2

Title - Biological, Earth and space sciences folio

Context

The folio is a record of learning for the module (that same folio may be extended as a record for the other two modules). Create the folio in an exercise book, a loose-leaf folder, or an online platform such as OneNote. An electronic record makes it easier to embed images, sound, and video.

Relevant learning outcomes

1. communicate foundational science concepts using appropriate formats and adapt strategies for learning
2. conduct safe, ethical inquiries to collect, present and interpret simple scientific data and improve processes
3. observe and identify components and processes of biological, Earth and space systems and apply scientific knowledge to make predictions
4. identify where applications of biological, Earth and space sciences are used to meet needs in their local community and how these sciences are applied with examples of use of technology.

Scaffolding

- The sections of the folio should mirror the work requirement, such as:
  - » planning and monitoring learning, including pages for self, peer and teacher assessment

  - » understanding of biological, Earth and/or space sciences
  - » providing examples of applications within their community
  - » maintaining a record of practical and/or field investigations
  - » identifying the work required for the Biological, Earth and space sciences presentation.
- To help learners pages may be pre-structured with recording, assessing and presenting information sections.
- Emphasis should be on learners demonstrating what they have learnt and how they have learnt it, rather than any specific mode or modes of communication.
- Work should span across the Biological, Earth and space sciences with an emphasis on depth of understanding rather than breadth.
- Learners should illustrate clear connections to the community, their pathway and technology used in each example.
- Learners should organise their work for presentation as they complete investigations.

Module 2: Physical and chemical sciences

Work requirement 2 of 2

Title - Physical and chemical sciences presentation

Context

In this module, learners have explored physical and chemical sciences with a particular focus on practical and field-trip based inquiries for a period of 10 weeks. Additionally, they may have undertaken/participated in excursions, workplace visits or expert discussions.

This work requirement for a presentation allows the learner to demonstrate the depth of their science understanding and applications. They will need to refer to a folio of work and have some work chosen, organised and presented to discuss.

Relevant learning outcomes

1. communicate foundational science concepts using appropriate formats and adapt strategies for learning
2. conduct safe, ethical inquiries to collect, present and interpret simple scientific data and improve processes
5. observe and identify components and processes of physical and chemical systems and apply scientific knowledge to make predictions
6. identify where applications of physical and chemical sciences are used to meet needs in their local community and how these sciences are applied with examples of use of technology.

Scaffolding

- Support learners to work towards this goal throughout the module.
- Practise this process with peers and/or a teacher as important investigations are completed.
- Emphasis for the presentation is finding out what the learner knows rather than gaps in knowledge.
- Learners should be able to explain the science that they have learned and its context.

- The presentation is an ideal time for learners to demonstrate their own participation and collaboration with others.
- Teachers and peers ask questions about the presentation and meaning of information and data.
- Ask questions about any claims or recommendations made.

Module 3: Scientific inquiry

Work requirement 2 of 2

Title - Physical and chemical sciences presentation

Context

In this module, learners will complete two or more related investigations into any related scientific applications. These investigations will focus on applications in their local community or those used in their possible pathways for a period of 9 weeks. Additionally, they may have undertaken/participated in excursions, workplace visits or expert discussions.

This work requirement for a presentation allows the learner to demonstrate the depth of their science understanding and applications. They will need to refer to a folio of work and have some work chosen, organised and presented to discuss.

This presentation differs from the earlier presentations as it requires the creation of an additional product.

Relevant learning outcomes

1. communicate foundational science concepts using appropriate formats and adapt strategies for learning
2. conduct safe, ethical inquiries to collect, present and interpret simple scientific data and improve processes
7. observe and identify components and processes of simple scientific systems within their local community and apply scientific knowledge to make predictions
8. identify where related applications of scientific knowledge and skills are used to meet needs in their local community and how the knowledge and skills are applied with examples of use of technology.

Scaffolding

- Give time for the creation of the product as well as the presentation.
- Emphasis for the presentation is finding out what the learner knows rather than gaps in knowledge.
- Choose the mode or modes of communication to suit the learner and the circumstances of learning.
- Either prepared or live presentations are acceptable.
- This should follow the work requirement structure for the Scientific Inquiry Presentation:
  - » the investigations undertaken
  - » the relationships between the investigations
  - » the major findings and the evidence for them
  - » opportunities for further simple investigation
- Questions and answers can be in a prepared or live format.

- Use the folio to generate questions to find out any information the learner may have missed.

Additional support resources[3]

- Course Document
- Sample Scope and Sequence
- Community of Practice Information

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[3] All resources cited were accessed and checked for accuracy and appropriateness of content in October 2022. Teachers should check the suitability of all recommended resources for their specific group.

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CONTACT	years9-12learning@decyp.tas.gov.au
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