Transdisciplinary Science

LEVEL 2	15 TCE CREDIT POINTS
COURSE CODE	TDS215122
COURSE SPAN	2022 — 2026
READING AND WRITING STANDARD	NO
MATHEMATICS STANDARD	NO
COMPUTERS AND INTERNET STANDARD	NO

This course is current for 2024.

Transdisciplinary Science Level 2 provides an opportunity to inquire deeply into an area of scientific interest within Tasmania

Learners will apply inquiry-based approaches to design, plan, and undertake investigations across scientific disciplines, responding to local or global situations. Learners will experience and gain expertise in inquiry processes and how knowledge is created. By coming to an evidence-based understanding through the applied observation and thinking skills in this course, learners are prepared for any pathway in the 21st century.

Focus Area

Transdisciplinary projects

Courses aligned to the Years 9 to 12 Curriculum Framework belong to one of the five focus areas of Discipline-based study, Transdisciplinary projects, Professional studies, Work-based learning and Personal futures.

Transdisciplinary Science Level 2 is a Transdisciplinary projects course. Transdisciplinary projects courses require learners to integrate, transfer and reflect on their prior knowledge, skills, attitudes and values in transdisciplinary ways. Learners will engage critically and creatively to integrate the learning and ways of working from multiple disciplines. Learners will produce outcomes that are only possible through the intersection between disciplines. Learners will share the outcomes of Transdisciplinary projects as appropriate to their methodology and their exhibition of work will form a major element of their assessment. Learners will reflect upon their learning by evaluating their project outputs, the effectiveness of their methodology and the implications of their work on the pre-existing body of knowledge.

Transdisciplinary projects courses have three key features that guide teaching and learning:

- engage and ideate
- connect and apply
- exhibit and reflect.

Figure 1: Transdisciplinary project cycle of learning (adapted from OECD Learning Compass 2030)

In this course learners will do this by:

- Utilising their prior learning and the Tasmanian community to engage with an area of inquiry
- Identifying, generating and refining their inquiries by considering approaches across disciplines
- Practising methodologies that span across disciplines of science
- Iteratively applying and refining these methodologies to their chosen area of inquiry
- Reflecting on their learning and inquiries to build their practice and understanding
- Showcasing their inquiries and reflections.

Rationale

Science provides a rational and empirical way of answering interesting and important questions about the biological, physical and technological world. The knowledge it produces has proved to be a reliable basis for action in our personal, social and broader lives.

Innovative and critical thinking in the disciplines of science underpins a cohesive understanding of the natural world and the discovery of new ways of doing and thinking. Science is continually refining and expanding knowledge and stimulating new questions for future investigation.

Transdisciplinary Science Level 2 provides a powerful platform for learners to develop their capabilities, in particular, to think creatively, work collaboratively, be innovative and prepare for Level 3 science courses. In practice, most modern and applied science flows between scientific disciplines and is transdisciplinary by nature.

Learners undertaking *Transdisciplinary Science* Level 2 will apply inquiry-based approaches to design, plan, and undertake investigations across scientific disciplines on a shorter or more extended scale, responding to local or global situations. Collaboratively and individually, learners will employ a scientific approach to collecting, representing, and analysing data, and using technological tools effectively. After evaluating their procedures or models, learners communicate scientifically to draw evidence-based conclusions that may lead to further testing, exploring more effective methods or solutions, or raising new questions. They will be equipped to navigate, understand and adapt to what we experience as 21st century learners.

The purpose of Years 9 to 12 Education is to enable all learners to achieve their potential through Years 9 to 12 and beyond in further study, training or employment.

Years 9 to 12 Education enables personal empowerment, cultural transmission, preparation for citizenship and preparation for work.

This course is built on the principles of access, agency, excellence, balance, support and achievement as part of a range of programs that enables learners to access a diverse and flexible range of learning opportunities suited to their level of readiness, interests and aspirations.

Learning Outcomes

On successful completion of this course, learners will be able to:

1. collaborate with others and monitor, reflect on and manage their learning within a scientific inquiry
2. plan, collect and analyse data within a specific application of science to inquire into a system
3. apply concepts and processes from selected scientific theories and models to inquire into a system
4. communicate data and information using standard scientific conventions for qualitative and quantitative representation and comment on its reliability
5. explain the context of their inquiry locally, nationally and globally and relationships between technology, science and the broader community for a particular scientific application
6. apply information they have researched to implement processes and trial methodologies while inquiring into a system
7. modify and finalise experimental design for an inquiry as they collect and analyse data, undertake further research, and monitor their progress
8. use science inquiry skills to assess and represent the key data and findings from an extended inquiry into systems and make recommendations for further study.

Pathways

- *Transdisciplinary Science* Level 2 has a clear pathway from Australian Curriculum Science F-10 and other TASC Science courses as well as some TASC HASS, HPE, Technologies and Mathematics courses
- *Transdisciplinary Science* Level 2 has a clear pathway to a range of TASC and vocational pathways such as all Level 3 TASC Science courses and some TASC HASS, HPE, Technologies and Mathematics courses, as well as Allied Health, Electrotechnology and Recreation pathways

Integration of General Capabilities and Cross-curriculum Priorities

The general capabilities addressed specifically in this course are:

- Critical and creative thinking
- Ethical understanding
- Literacy
- Numeracy
- Personal and social capability

The cross-curriculum priorities enabled through this course are:

- Aboriginal and Torres Strait Islander histories and cultures
- Sustainability

Course Size And Complexity

This course has a complexity level of 2.

For a full description of courses at a complexity level of 2, please refer to the Levels of Complexity - Tasmanian Senior Secondary Education document.

This course has a size value of 15. Upon successful completion of this course (i.e., a Preliminary Achievement (PA) award or higher), a learner will gain 15 credit points at Level 2 towards the Participation Standard of the Tasmanian Certificate of Education (TCE).

Course Structure

This course consists of three 50-hour modules.

Module 1: Research, trial and plan

Module 2: Conduct, monitor and refine

Module 3: Review, represent and recommend

Course Delivery

It is recommended that the three modules should be delivered in sequential order: 1, 2 and 3.

In Module 1, providers are responsible for ensuring that any inquiry focus considered by learners can be supported by the discipline expertise, equipment and other resources available, and that it follows health and safety regulations.

At the beginning of Module 1 providers will communicate to learners the range of scientific disciplines, as detailed in Appendix 6, that can be addressed within their context. Providers can define the scope of inquiry by listing a range of scientific applications or industry areas available for investigation.

During Module 1 learners will use the skills and knowledge they acquire to plan and document an inquiry proposal that can be successfully completed in Modules 2 and 3.

Course Requirements

Access
Learners are required to work as directed in practical situations as potentially dangerous materials and equipment may be used in this course. This course requires learners to collaborate with others.

Resource requirements
Providers offering this course will need equipment, materials and a suitable space to carry out the practical component of the course effectively and safely.

Course Content: Module 1

Module 1: Research, trial and plan

Science is indispensable in Tasmania now and into our future. Module 1 of *Transdisciplinary Science* Level 2 taps into the wide range of where science is applied in our state. Learners, using their prior knowledge, will engage with and ideate a focus of inquiry that is relevant to our community. Learners will discover that, in practice, science draws from many scientific disciplines.

By researching, connecting and iteratively inquiring into this focus, learners will begin to understand its general place in Tasmania, nationally and globally, and explore the theories, models and methodologies that are key to creating knowledge. The emphasis will be on the Tasmanian context with some links to national and global context only where appropriate or useful.

The application of science through inquiry, reflection and refinement of understanding at every stage is key to this module. Learners should always be prepared to question their work and return to previous work to ensure they build their knowledge. In this module, trialling processes and methodologies is crucial to prepare for further inquiry. Through this process possible lines of inquiry will emerge to be further refined in Module 2. Learners will have the opportunity to demonstrate their findings and plans through a folio.

Module 1 learning outcomes
The following learning outcomes are a focus for this module:

1. collaborate with others and monitor, reflect on, and manage their learning within a scientific inquiry
2. plan, collect and analyse data within a specific application of science to inquire into a system
3. apply concepts and processes from selected scientific theories and models to inquire into a system
4. communicate data and information using standard scientific conventions for qualitative and quantitative representation and comment on its reliability
5. explain the context of their inquiry locally, nationally and globally and relationships between technology, science and the broader community for a particular scientific application
6. apply information they have researched to implement processes and trial methodologies while inquiring into a system.

Module 1 content
In this module learners will discover where science is valued within the Tasmanian context. As they engage and ideate, they will choose one area to investigate and explore in detail to understand the development and limitations of this application of science and its interrelationships with technology and sustainability within Tasmania. They will broadly explore the transdisciplinary nature of this science, the knowledge required and how it is applied. In parallel with this, learners will become familiar with, and iteratively practise, methodologies used for this application of science. Learners will then analyse their understanding and experience to choose a focus and plan for further investigation in Module 2. Scientific communication is a key component of this course. Learners should be provided with opportunities to develop and practise a range of written and oral scientific communication skills.

Module 1 key knowledge
Science as a human endeavour
Within science that is valued, applied or researched in the Tasmanian context, learners will briefly research and analyse the broad context and simple relationships to the focus of the inquiry referring to, for example, where:

- theories have been refined or replaced as new evidence, models or theories have emerged locally, nationally or globally
- technology has assisted in greater understanding
- social, economic or cultural sustainability is impacted in Tasmania
- First Nations Australians' knowledge is valuable.

Science understanding
Within the focus of the inquiry, learners will research and apply:

- specialist knowledge required, involving more than one scientific discipline and not restricted to Australian Curriculum Senior Secondary Science course content
- the models, theories, phenomena and concepts that need to be referenced and the relationships between them
- science understanding at a similar level of complexity as defined by TASC for other Level 2 science courses.

Module 1 key skills
Science inquiry skills – design and implementation of inquiry
Within science that is valued, in the Tasmanian context learners will:

- identify, research and construct questions for investigation
- design, conduct, trial and refine methodologies to collect valid and reliable primary data and to refine procedures
- assess risk and ethical considerations
- trial and refine ways to meaningfully organise and represent data.
- trial and refine other processes to support inquiry – for example the logistics of fieldwork.

Science inquiry skills – evaluation of inquiry
Within science that is valued, in the Tasmanian context learners will:

- analyse the limitations of primary and secondary data to find simple relationships and how they can be addressed
- research and analyse relationships within processes, claims and conclusions within a field of science
- draw valid and reasoned conclusions through discussing the simple relationships between data, concepts, theories and models
- analyse processes, data and conclusions and plan to conduct the inquiry.

Module 1 work requirements summary
This module includes the following work requirements:

- one logbook investigation
- one research and plan investigation.

See Appendix 3 for the full specifications of the work requirements of this course.

Module 1 assessment
This module has a focus on criteria 1, 2, 3, 4, 5 and 6.

Module 2: Conduct, monitor and refine

As the inquiry progresses, all aspects should be monitored and refined. Module 2 of *Transdisciplinary Science* Level 2 will provide an opportunity for the learner to engage more deeply with the focus of inquiry. Through further targeted research, reflection, and investigation into this focus, learners will finalise their inquiry question and the processes they will use to pursue it. By applying theories, models and methodologies they will be able to refine the connections they have already made to support their extended inquiry.

The application of science through inquiry, reflection and refinement of understanding at every stage is key to this module. Learners should always be prepared to question their work and return to previous work to ensure they are able to build their knowledge and narrow the focus of the inquiry. Scientific communication is a key component of this course. Learners should be provided with opportunities to continue and practise a range of written and oral scientific communication skills.

Through this process learners will largely finish conducting the data collection and prepare to complete the remainder of their inquiry in Module 3. Learners will have the opportunity to demonstrate their findings and plans through a folio.

Module 2 learning outcomes

The following learning outcomes are a focus of this module:

1. collaborate with others and monitor, reflect on and manage their learning within a scientific inquiry
2. plan, collect and analyse data within a specific application of science to inquire into a system
3. apply concepts and processes from selected scientific theories and models to inquire into a system
4. communicate data and information using standard scientific conventions for qualitative and quantitative representation and comment on its reliability
5. explain the context of their inquiry locally, nationally and globally and relationships between technology, science and the broader community for a particular scientific application
7. modify and finalise experimental design for an inquiry as they collect and analyse data, undertake further research, and monitor their progress.

Module 2 content
In this module learners will investigate and analyse the focus of inquiry, refining the context explored in Module 1 to only the most relevant background and connections with science as a human endeavour. They will investigate and analyse the transdisciplinary nature of this focus, to target, throughout the module, the knowledge required and how it is applied. In parallel with this, learners will conduct, evaluate, and iteratively refine methodologies identified for their extended inquiry to ensure data and information are valid and reliable, allowing learners to finalise their inquiry question and plan for evaluation, presentation and recommendations in Module 3.

Module 2 key knowledge
Science as a human endeavour
Within the scientific focus of inquiry, learners will briefly investigate, analyse and identify where the broad context and simple relationships can be refined and finalised to best support the inquiry. Contexts can include:

- theories of interest that have been refined or replaced as new evidence, models or theories have emerged
- where there are opportunities to refine theories or gather more data
- technology that has assisted in greater understanding
- where social, economic, or cultural sustainability is impacted
- where there is collaboration to improve knowledge
- where First Nations Australians' knowledge is valuable.

Science understanding
Within the scientific focus of inquiry, learners will research, refine and apply:

- specialist knowledge required involving more than one scientific discipline and not restricted to Australian Curriculum Senior Secondary Science courses
- detailed relationships between theories and concepts being used, including mathematical modelling
- different methodologies and specific terminology being used
- science understanding at a similar level of complexity as defined by TASC for other Level 2 science courses.

Module 2 key skills
Science inquiry skills – design and implementation of inquiry
Within the scientific focus of inquiry, learners will conduct and refine investigations to develop and support an extended inquiry, including:

- refining and finalising the inquiry question
- adapting and refining methodologies to collect valid and reliable primary data
- monitoring to improve procedures, and adapting risk assessment and ethical documentation
- refining ways to usefully organise and represent simple relationships within data.

Science inquiry skills – evaluation of inquiry
Within the scientific focus of inquiry, learners will conduct and refine investigations to develop and support an extended inquiry, including:

- analysing some simple limitations of primary and secondary data and how they can be addressed
- drawing valid and reasoned conclusions through discussing the relationships between data, theories and models
- analysing processes, data and conclusions to finalise plans to complete the inquiry.

Module 2 work requirements summary
This module includes the following work requirements:

- one investigation folio
- one conduct, monitor and refine investigation.

See Appendix 3 for the full specifications of the work requirements of this course.

Module 2 assessment
This module has a focus on criteria 1, 2, 3, 4, 5 and 7.

Module 3: Review, represent and recommend

Scientific inquiry requires significant time to reflect, analyse, communicate and recommend. Module 3 of *Transdisciplinary Science* Level 2 provides an opportunity to finalise data collection and focus on completing the inquiry. By engaging with this module learners can complete any further investigation or research required to support answering their inquiry question. By applying only the most relevant theories, models and methodologies, they will be able to make the connections required to develop valid and supported conclusions.

As with previous modules, specific application of science through inquiry, reflection and refinement of understanding at every stage is key. At this stage learners should do this to ensure that their analysis, communication and presentation reflect their inquiry question. Through this process possible answers emerge for discussion and will be finalised. Learners will demonstrate and communicate their findings through a folio, a poster and a presentation.

Module 3 learning outcomes
The following learning outcomes are a focus of this module:

1. collaborate with others and monitor, reflect on and manage their learning within a scientific inquiry
2. plan, collect and analyse data within a specific application of science to inquire into a system
3. apply concepts and processes from selected scientific theories and models to inquire into a system
4. communicate data and information using standard scientific conventions for qualitative and quantitative representation and comment on its reliability
5. explain the context of their inquiry locally, nationally and globally and relationships between technology, science and the broader community for a particular scientific application
8. use science inquiry skills to assess and represent the key data and findings from an extended inquiry into systems and make recommendations for further study.

Module 3 content
In this module, learners will distil only the most relevant context for their inquiry. They will finalise and analyse the transdisciplinary nature of their investigation, the knowledge required, and how it is applied. In parallel with this, learners will finalise and evaluate the evidence and methodologies they used in their extended investigation that contributed to providing conclusions. Learners will then analyse their understanding and experience to produce a poster and a folio that represent their work and what they have found.

Module 3 key knowledge
Science as a human endeavour
Within a scientific inquiry, learners will analyse and refine the most relevant simple relationships within the context for their inquiry, which may include where:

- theories of interest have been refined or replaced as new evidence, models or theories have emerged
- there are opportunities to refine theories or gather more data
- technology has assisted in greater understanding
- social, economic or cultural sustainability considerations are important
- there is collaboration
- First Nations Peoples' knowledge may be valuable.

Science understanding
Within the scientific focus of inquiry, learners will conclude their extended inquiry by applying:

- specialist knowledge involving more than one scientific discipline and not restricted to Australian Curriculum Senior Secondary Science courses
- the detailed relationships between theories and concepts that are used, including mathematical modelling
- different methodologies and the specific terminology being used
- science understanding at a similar level of complexity as defined by TASC for other Level 2 science courses.

Module 3 key skills
Science inquiry skills – design and implementation of inquiry
Within a scientific inquiry, learners will finalise and document:

- the design, data and procedures used
- risk assessments and ethical considerations applied.

Science inquiry skills – evaluation of inquiry
Within a scientific inquiry, learners will finalise and document:

- the key limitations of primary and secondary data and how this was addressed
- the research and analysis of the relationships between processes, claims and conclusions
- valid and reasoned conclusions through discussing the relationships between data, theories and models
- analysis processes, data and conclusions to recommend further investigation.

Module 3 work requirements summary
This module includes the following work requirements:

- one logbook investigation
- one inquiry folio
- one review, represent and recommend presentation.

See Appendix 3 for the full specifications of the work requirements of this course.

Module 3 assessment
This module has a focus on criteria 1, 2, 3, 4, 5 and 8.

Assessment

Criterion-based assessment is a form of outcomes assessment that identifies the extent of learner achievement at an appropriate end-point of study. Although assessment – as part of the learning program – is continuous, much of it is formative and is done to help learners identify what they need to do to attain the maximum benefit from their study of the course. Therefore, assessment for summative reporting to TASC will focus on what both provider and learner understand to reflect end-point achievement.

The standard of achievement each learner attains on each criterion is recorded as a rating 'A', 'B', or 'C', according to the outcomes specified in the standards section of the course.

A 't' notation must be used where a learner demonstrates any achievement against a criterion less than the standard specified for the 'C' rating.

A 'z' notation is to be used where a learner provides no evidence of achievement at all.

Internal assessment of all criteria will be made by the provider. Providers will report the learner's rating for each criterion to TASC.

Quality Assurance Process

The following processes will be facilitated by TASC to ensure there is:

- a match between the standards of achievement specified in the course and the skills and knowledge demonstrated by individual learners
- community confidence in the integrity and meaning of the qualification.

Process
TASC will verify that the provider's course delivery and assessment meet the course requirements and community expectations for fairness, integrity and validity of qualifications TASC issues. This will involve checking:

- scope and sequence documentation (Provider Standard 1):
  - course delivery plan
  - course assessment plan (assessment matrix)
- course provider procedures for approving learner Inquiry Projects (Provider Standard 1)
- student attendance records (Provider Standard 2)
- examples of assessment tools or instruments, and associated rubrics or marking guides (Provider Standard 3)
- examples of student work, including that related to any work requirements articulated in the course document (Provider Standard 1 & 3)
- class records of assessment (Provider Standard 4).

This process will be scheduled by TASC using a risk-based approach.

Providers must retain electronic copies of each learner's major folio in a centralised storage system for three (3) years. TASC may require these to monitor the integrity of folios produced in other courses in subsequent years.

Criteria

The assessment for *Transdisciplinary Science* Level 2 will be based on the degree to which the learner can:

1. work independently and collaboratively to achieve goals
2. collect and analyse data within a scientific inquiry
3. apply concepts and processes from scientific models and theories
4. communicate scientific data and information
5. apply the local, national, and global context within a scientific inquiry
6. research, trial and refine within the process of an inquiry
7. apply experimental design methods
8. present scientific inquiry findings.

	Module 1	Module 2	Module 3
Criteria focus	1, 2, 3, 4, 5, 6	1, 2, 3, 4, 5, 7	1, 2, 3, 4, 5, 8

Standards

Criterion 1: work independently and collaboratively to achieve goals

The learner:

Criterion Elements	Rating A	Rating B	Rating C
E1 - Self-management	uses a range of planning and self-management strategies to effectively complete tasks within agreed timeframes	uses planning strategies to complete tasks within agreed timeframes	uses planning strategies to complete of parts of tasks within agreed timeframes
E2 -Improve tasks	explains how modifications were made to improve and complete tasks	describes how modifications were made to improve and complete tasks	identifies how modifications were made to improve and complete tasks
E3 - Collaborative activities†	performs tasks, demonstrates initiative when contributing to the completion of individual and collaborative activities	performs tasks and demonstrates initiative when contributing to the completion of individual and collaborative activities	performs tasks as directed to contribute to the completion of individual and collaborative activities
E4 - Own contribution	explains own and other learners' contributions to the completion of collaborative activities.	describes own contribution to the successful completion of activities.	identifies own contribution to the successful completion of activities.

† Collaborative activities include any activities such as planning, collecting data or information and experimenting undertaken with peers, teachers, mentors, lab technicians or other individuals identified by the teacher.

Criterion 2: collect and analyse data within a scientific inquiry

The learner:

Criterion Elements	Rating A	Rating B	Rating C
E1 - Ethical and safety issues	records, monitors and adapts ethical and safety risk assessments for investigations	records and monitors ethical and safety risk assessments for investigations	identifies ethical and safe practices for investigations from a given set
E2 - Investigations	designs and conducts investigations to collect valid data in response to a question or problem	plans and conducts investigations to collect data in response to a question or problem	conducts investigations to collect simple data in response to a question or problem
E3 -Data as evidence	uses valid data as evidence to make logical conclusions	uses data as evidence to make logical conclusions	uses data to inform conclusions
E4 - Improvements	explains experimental processes and describes a range of valid improvements.	describes experimental processes and suggests valid improvements.	identifies experimental processes and suggests an improvement.

Criterion 3: apply concepts and processes from scientific models and theories

The learner:

Criterion Elements	Rating A	Rating B	Rating C
E1 - System components	explains interactions between objects, materials or processes	describes interactions between objects, materials or processes	identifies interactions between objects, materials or processes
E2 - Understand theories and models	describes a theory or model used to explain scientific systems	describes a theory or model related to scientific systems	identifies aspects of a theory or model related to scientific systems
E3 - Observational changes	analyses† observable changes to systems in experimental investigations	explains observable changes to systems in experimental investigations	describes observable changes to systems in experimental investigations
E4 - Use theories and models	uses theories or models to explain problems and make logical and valid predictions	uses given theories or models to describe problems and make logical predictions	uses given theories or models to identify problems and make predictions
E5 - Mathematical analysis	explains trends, outliers, expected or unexpected results in mathematical data.	describes trends, outliers, expected or unexpected results in mathematical data.	identifies trends, outliers, expected or unexpected results in mathematical data.

†analyses in this context is to demonstrate understanding of why the changes occurred

Criterion 4: communicate scientific data and information

The learner:

Criterion Elements	Rating A	Rating B	Rating C
E1 - Representation of data	effectively uses data and information to clearly communicate scientific information	uses data and information to communicate scientific information	uses data and information as directed to communicate scientific information
E2 - Reliability of data	Explains the reliability of data and information from a variety of relevant sources	describes the reliability of data and information from a range of relevant sources	identifies the reliability of data and information from a limited range of relevant sources
E3 - Format and units	selects and uses appropriate scientific formats and units for communication of data and information	uses appropriate scientific formats and units for communication of data and information from a given range	uses appropriate scientific formats and units for communication of data and information as directed
E4 - Scientific terminology	uses appropriate scientific terminology correctly to clearly communicate concepts and ideas.	uses scientific terminology to clearly communicate concepts and ideas.	uses given scientific terminology to clearly communicate concepts and ideas.

Criterion 5: apply the local, national, and global context within a scientific inquiry

The learner:

Criterion Elements	Rating A	Rating B	Rating C
E1 - Inquiry context	explains the local, national and global context of a scientific inquiry	describes the local, national and global context of a scientific inquiry	identifies the local, national and global context of a scientific inquiry
E2 - Scientific knowledge	explains how specific scientific knowledge has developed over time	describes how specific scientific knowledge has developed over time	identifies how specific scientific knowledge has developed over time
E3 - Technologies in science	explains the role of technologies in the development of specific scientific knowledge	describes the role of technologies, in the development of specific scientific knowledge	identifies the role of technologies in the development of specific scientific knowledge
E4 - Science meets needs in society	explains ways in which science has been used in society to meet specific needs in society and describes implications of these applications.	describes ways in which science has been used in society to meet specific needs and identifies implications of these applications.	identifies ways in which science has been used in society to meet specific needs.

Criterion 6: research, trial and refine within the process of an inquiry

The learner:

Criterion Elements	Rating A	Rating B	Rating C
E1 - Researches information	selects and explains the relevance of information from researched sources	selects relevant information from researched sources	identifies relevant information from provided sources
E2 - Researches methodologies	explains relevant methodologies to plan an inquiry	describes relevant methodologies to plan an inquiry	identifies relevant methodologies to plan an inquiry from a given range
E3 - Trials processes	effectively trials processes to appropriately plan next steps in an inquiry	appropriately trials processes to plan next steps in an inquiry	trials given processes to plan next steps in an inquiry
E4 - Refines inquiry	uses evidence of patterns and trends in experimental trials to appropriately refine an inquiry.	uses evidence of patterns and trends in experimental trials to refine an inquiry.	identifies evidence of patterns and trends in experimental trials to refine an inquiry.

Criterion 7: apply experimental design methods

The learner:

Criterion Elements	Rating A	Rating B	Rating C
E1 - Relevance of information	explains the relevance of information used and identifies further research needed in an inquiry	describes the relevance of information used in an inquiry	identifies the relevance of information used in an inquiry
E2 - Informs experimental design	uses a combination of data collected, theories and models to make valid connections that inform experimental design	uses a combination of data collected, theories and models to make connections that inform experimental design	uses a combination of data collected, theories and models as directed to inform experimental design
E3 - Refines experimental design	identifies issues and suggests valid improvements in further trial methods.	identifies issues and suggests improvements in further trial methods.	given identified issues suggests improvement in further trial methods.

Criterion 8: present scientific inquiry findings

The learner:

Criterion Elements	Rating A	Rating B	Rating C
E1 - Scientific arguments	explains connections between experimental data and theoretical models to make plausible scientific arguments	describes connections between experimental data and theoretical models to make plausible scientific arguments	identifies connections between experimental data and theoretical models to make plausible scientific arguments
E2 - Conclusion	makes valid conclusions based on logical scientific arguments presented in an inquiry	makes valid conclusions based on scientific arguments presented in an inquiry	makes conclusions based on scientific arguments presented in an inquiry
E3 - Recommendations	makes evidence-based and plausible recommendations based on conclusions drawn.	makes plausible recommendations based on conclusions drawn.	makes recommendations based on conclusions drawn.

Qualifications Available

Transdisciplinary Science Level 2 (with the award of):

EXCEPTIONAL ACHIEVEMENT (EA)

HIGH ACHIEVEMENT (HA)

COMMENDABLE ACHIEVEMENT (CA)

SATISFACTORY ACHIEVEMENT (SA)

PRELIMINARY ACHIEVEMENT (PA)

Award Requirements

The final award will be determined by the Office of Tasmanian Assessment, Standards and Certification from 8 ratings. The minimum requirements for an award in this course are as follows:

EXCEPTIONAL ACHIEVEMENT (EA)
6 'A' ratings, 2 'B' ratings

HIGH ACHIEVEMENT (HA)
3 'A' ratings, 4 'B' ratings, 1 'C' rating

COMMENDABLE ACHIEVEMENT (CA)
4 'B' ratings, 3 'C' ratings

SATISFACTORY ACHIEVEMENT (SA)
6 'C' ratings

PRELIMINARY ACHIEVEMENT (PA)
4 'C' ratings

A learner who otherwise achieves the rating for a CA (Commendable Achievement) or SA (Satisfactory Achievement) award but who fails to show any evidence of achievement in one or more criteria ('z' notation) will be issued with a PA (Preliminary Achievement) award.

Course Evaluation

Years 9 to 12 Learning will develop and regularly review and revise the curriculum. Course evaluation is informed by the experience of the course's implementation, delivery and assessment. More information about course evaluation can be found on the Years 11 and 12 website.

Course Developer

This course has been developed by the Department of Education's Years 9 to 12 Learning Unit in collaboration with Catholic Education Tasmania and Independent Schools Tasmania.

Accreditation

Accredited on 15 October 2021 for use from 1 January 2022 until 31 December 2026.

Version History

Version 1

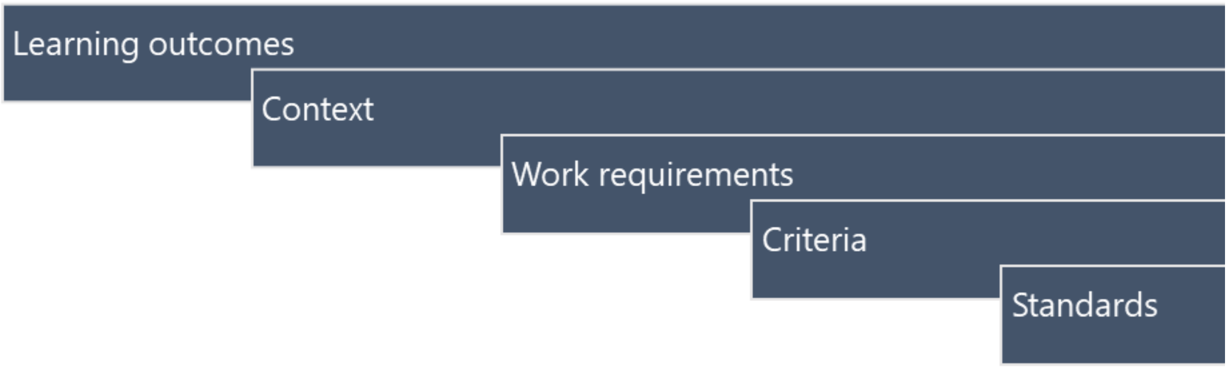
Accredited on 15 October 2021 for use from 1 January 2022 until 31 December 2026.

Version 1a

Approved on 5 July 2022. A number of the work requirement titles in modules 2 and 3 were amended to maintain consistency throughout the document.

Appendix 1 – Line of sight

Line of sight



Learning outcomes	Course content: module(s)	Work requirements: module(s)	Criteria	General capabilities
1. collaborate with others and monitor, reflect on and manage their learning within a scientific inquiry.	1, 2, 3	1, 2, 3	1	Personal and social capability; Literacy; Critical and creative thinking
2. plan, collect and analyse data within a specific application of science to inquire into a system	1, 2, 3	1, 2, 3	2	Literacy; Numeracy; Critical and creative thinking; Ethical understanding
3. apply concepts and processes from selected scientific theories and models to inquire into a system	1, 2, 3	1, 2, 3	3	Literacy; Critical and creative thinking
4. communicate data and information using standard scientific conventions for qualitative and quantitative representation and comment on its reliability	1, 2, 3	1, 2, 3	4	Literacy; Numeracy; Critical and creative thinking
5. explain the context of their inquiry locally, nationally and globally and relationships between technology, science and the broader community for a particular scientific application	1, 2, 3	1, 2, 3	5	Literacy; Critical and creative thinking
6. apply information they have researched to implement processes and trial methodologies while inquiring into a system	1	1	6	Literacy; Numeracy; Critical and creative thinking
7. modify and finalise experimental design for an inquiry as they collect and analyse data, undertake further research and monitor their progress	2	2	7	Literacy; Numeracy; Critical and creative thinking
8. use science inquiry skills to assess and represent the key data and findings from an extended inquiry into systems and make recommendations for further study	3	3	8	Literacy; Numeracy; Critical and creative thinking

Appendix 2 – Alignment to curriculum frameworks

Alignment to curriculum frameworks

Links to Foundation to Year 10

Progression from the F-10 Australian Curriculum: Science

This course continues to develop learner understanding and skills from across the three strands of the Australian Curriculum: F-10 Science. The Science Understanding strand draws on knowledge and understanding from across the four sub-strands of biological, physical, chemical, and Earth and space sciences.

Mathematical skills expected of learners studying transdisciplinary science

This course component requires learners to use the mathematical skills they developed through the F-10 Australian Curriculum: Mathematics, in addition to the numeracy skills they developed through the Science Inquiry Skills strand of the Australian Curriculum: Science.

Within the Science Inquiry Skills strand, learners are required to gather, represent and analyse numerical data to identify the evidence that forms the basis of scientific arguments, claims or conclusions. In gathering and recording numerical data, learners are required to make measurements using appropriate units to an appropriate degree of accuracy.

Learners may need to be taught when it is appropriate to join points on a graph and when it is appropriate to use a line of best fit. They may also need to be taught how to construct a straight line that will serve as the line of best fit for a set of data presented graphically.

Relationship to the Senior Secondary Australian Curriculum: Science Achievement Standards

The criteria and standards for this course have been aligned with the Senior Secondary Australian Curriculum: Science Achievement Standards for Units 1 and 2.

There is explicit alignment with Science as a Human Endeavour and Science Inquiry Skills, but Science Understanding is dependent on the nature of the inquiry the learner undertakes.

Work requirements

The work requirements of a course are processes, products or presentations that provide a significant demonstration of achievement that is measurable against the course's standards. Work requirements need not be the sole form of assessment for a module.

Module 1 work requirements specifications

Work requirement 1 of 2

Title of work requirement: Logbook

Mode or format: investigation

Description: Learners will use a logbook or an electronic equivalent to document:

- research notes and progress
- emerging simple relationships between scientific disciplines applied
- ongoing evaluation
- planning
- observations and data
- time on tasks
- peer and self-assessment of progress
- their contribution to collaboration with other learners.

Learners will spend approximately 10 hours throughout Module 1 organising this information in preparation for the Research and plan work requirement.

Size: approximately 10 hours
Timing: throughout Module 1
External agencies: Engagement with scientists and their institutions is optional.

Focus criteria: 1, 2, 3, 4 and 5.

Work requirement 2 of 2

Title of work requirement: Research and plan

Mode or format: investigation

Description: Learners will produce an experimental research outline, including:

- a justified inquiry question
- a valid hypothesis
- a background research summary with reference to scientific disciplines applied
- an annotated bibliography of relevant sources
- an experimental proposal that includes:
  - the experimental model used
  - the system/s they are investigating

- a summary of trials of experimental design for their extended inquiry
- analysis and evaluation of simple relationships within data collected
- a risk management plan with an ethical assessment
- a future focus of experiments including a plan for Module 2.

The outline can be in any mode or modes to convey the progress made through the module. Where appropriate, learners are encouraged to use accepted scientific formats in place of words, including but not limited to diagrams, data tables, graphs, statistical analysis and algebraic modelling.

Size: 800-1200 words or equivalent

Timing: This is the culminating performance for Module 1.

External agencies: Engagement with scientists and their institutions is optional.

Focus criteria: 2, 3, 4, 5 and 6.

Module 2 work requirements specifications

Work requirement 1 of 2

Title of work requirement: Folio

Mode or format: investigation

Description: Learners will continue their logbook or an electronic equivalent to document:

- research notes and progress
- emerging simple relationships between scientific disciplines applied
- ongoing evaluation
- planning
- observations and data
- time on tasks
- peer and self-assessment of progress.

Learners will spend a maximum of 10 hours throughout Module 2 organising this information in preparation for the Conduct, monitor and refine work requirement for Module 2.

Size: maximum 10 hours

Timing: throughout Module 2

External agencies: Engagement with scientists and their institutions is optional.

Focus criteria: 1, 2, 3 and 4.

Work requirement 2 of 2

Title of work requirement: Conduct, monitor and refine

Mode or format: investigation

Description: Learners will produce an experimental research outline, including:

- a poster referring to:
  - the finalised inquiry question and hypothesis
  - the method
  - the results
  - the conclusions so far with reference to scientific disciplines applied
- a live or recorded presentation referring to the poster
- a detailed plan for Module 3 including:
  - time allocated for analysis, evaluation and communication
  - a summary of relationships with the local, national and global context so far.

The detailed plan for Module 3 can be in any mode or modes to convey the information required effectively. Where appropriate, learners are encouraged to use accepted scientific formats in place of words, including but not limited to diagrams, data tables, graphs, mathematical analysis and modelling.

Size: maximum 800-1200 words or equivalent and an approximately 5-minute presentation

Timing: This is the culminating performance for Module 2.

External agencies: Engagement with scientists and their institutions is optional.

Focus criteria: 1, 2, 3, 4, 5 and 7.

Module 3 Work requirements specifications

Work requirement 1 of 3

Title of work requirement: Logbook

Mode or format: investigation

Description: learners will continue their logbook or an electronic equivalent to document:

- research notes and progress
- emerging simple relationships between scientific disciplines applied
- ongoing evaluation
- planning
- observations and data
- time on tasks
- peer and self-assessment of progress.

Learners will spend a maximum of 10 hours throughout Module 3 organising this information in preparation for the Review, Represent and Recommend – Folio work requirement for Module 3.

Size: maximum 10 hours

Timing: throughout Module 3

External agencies: Engagement with scientists and their institutions is optional.

Focus Criteria: 1, 2, 3 and 4.

Work requirement 2 of 3

Title of work requirement: Scientific paper

Mode or format: folio

Description: Learners will finalise and document a scientific paper including:

- how the context of the inquiry has been refined since the end of Module 2
- a summary of findings including changes since the end of Module 2
- risk assessments and ethical considerations applied
- the design, data and procedures used
- research and analysis processes and what was found
- relationships between data, theories and models with reference to scientific disciplines applied
- the limitations of the primary and secondary data and how these were addressed
- valid and reasoned conclusions with supporting evidence from scientific disciplines applied
- analysis of processes, data and conclusions recommending further investigation
- a detailed bibliography.

The scientific paper can be in any mode or modes to convey the information required effectively. Where appropriate, learners are encouraged to use accepted scientific formats in place of words, including but not limited to diagrams, data tables, graphs, statistical analysis and algebraic modelling.

Size: 1200-1500 words or equivalent

Timing: This is a culminating performance for Module 3.

External agencies: Engagement with scientists and their institutions is optional.

Focus Criteria: 1, 3, 4, 5 and 8.

Work requirement 3 of 3

Title of work requirement: Poster and presentation

Mode or format: presentation

Description: Learners will produce an A1 Poster to support a 10-minute recorded or live presentation including time for synchronous or asynchronous questions and answers.

The A1 poster will include:

- the inquiry question and hypothesis
- a summary of the findings
- a summary of the relationships between data, theories and models
- the limitations of the primary and secondary data and how these were addressed
- valid and reasoned conclusions with reference to scientific disciplines applied
- analysis of processes, data and conclusions and recommending opportunities for further investigation.

Where appropriate, learners are encouraged to use accepted scientific formats in place of words, including but not limited to diagrams, data tables, graphs, mathematical analysis and modelling.

Providers must retain electronic copies of each learner's major folio in a centralised storage system for three (3) years. TASC may require these to monitor the integrity of folios produced in other courses in subsequent years.

Size: approximately 10-minute presentation including question and answer

Timing: this is a culminating performance

External agencies: Engagement with scientists and their institutions is optional

Focus Criteria: 4, 5 and 8.

Appendix 4 – General capabilities and cross-curriculum priorities

Learning across the curriculum content, including the cross-curriculum priorities and general capabilities, assists students to achieve the broad learning outcomes defined in the *Alice Springs (Mparntwe) Education Declaration* (December 2019).

General capabilities:

The general capabilities play a significant role in the *Australian Curriculum* in equipping young Australians to live and work successfully in the twenty-first century.

In the *Australian Curriculum*, capability encompasses knowledge, skills, behaviours and dispositions. Students develop capability when they apply knowledge and skills confidently, effectively and appropriately in complex and changing circumstances, in their learning at school and in their lives outside school.

The general capabilities include:

- Critical and creative thinking
- Ethical understanding
- Information and communication technology capability
- Intercultural understanding
- Literacy
- Numeracy
- Personal and social capability

Cross-curriculum priorities:

Cross-curriculum priorities enable students to develop understanding about and address the contemporary issues they face, for their own benefit and for the benefit of Australia as a whole. The priorities provide national, regional and global dimensions which will enrich the curriculum through development of considered and focused content that fits naturally within learning areas. Incorporation of the priorities will encourage conversations between students, teachers and the wider community.

The cross-curriculum priorities include:

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia's engagement with Asia
- Sustainability

Glossary

adaptation
A physical or behavioural characteristic that is inherited and which results in an individual being more likely to survive and reproduce in its environment.

analyse
To consider in detail for the purpose of finding meaning or relationships and identifying patterns, similarities and differences.

characteristic
A distinguishing aspect, including features and behaviours of an object material, living thing or event.

chart
A visual display of information.

classify
To arrange items into named categories in order to sort, group or identify them.

collaborate
To work with others to perform a specific task.

communication
To convey scientific information using a range of modes, conventions, formats and structures

conclusion
A judgement based on evidence.

contemporary science
New and emerging science research and issues of current relevance and interest.

continuous data
Quantitative data with a potentially infinite number of possible values along a continuum.

controlled variable
A variable that is kept constant, or changed in constant ways, during an investigation.

convention
An agreed method of representing concepts, information and behaviours.

data
The plural of datum; the measurement of an attribute, the volume of gas or the type of rubber. this does not necessarily mean a single measurement: it may be the result of averaging several repeated measurements and these could be quantitative or qualitative.

dependent variable
A variable that changes in response to changes to the independent variable in an investigation.

design
To plan and evaluate the construction of a product or process, including an investigation.

digital technologies
Systems that handle digital data, including hardware and software, for specific purposes.

discrete data
Quantitative data consisting of a number of separate values where intermediate values are not permissible.

environment
All the surroundings, both living and non-living.

evaluate
To examine and judge the merit or significance of something, including processes, events, descriptions, relationships or data.

evidence
In science, evidence is data that is considered reliable and valid, and that can be used to support a particular idea, conclusion or decision. Evidence gives weight or value to data by considering its credibility, acceptance, bias, status, appropriateness and reasonableness.

experiment or experimental investigation
An investigation that involves carrying out a practical activity.

fair test
An investigation where one variable (the independent variable) is changed and all other conditions (controlled variables) are kept the same; what is measured or observed is referred to as the dependent variable.

field study or work
An observational or practical research undertaken in a normal environment of the subject of a study, that is, an investigation can be conducted outside the laboratory.

force
A push or pull between objects, which may cause one or both objects to change speed and/or direction of their motion, that is, accelerate, or change their shape. All interactions between matter can be explained as an action of one or a combination of forces.

formal measurement
Measurement based on an agreed standard unit such as metre, second or gram.

graph
A visual representation of the relationship between quantities plotted with reference to a set of axes.

guided investigation
An investigation partly directed by a teacher.

informal measurement
Measurement that is not based on any agreed standard unit, for example, hand spans, paces or cups.

investigation
A scientific process of answering a question, exploring an idea or solving a problem that requires activities such as planning a course of action, collecting data, interpreting data, reaching a conclusion and communicating these activities.

law
A statement of a relationship based on available evidence.

material
A substance with particular qualities or that is used for specific purposes.

matter
A physical substance; anything that has mass and occupies space.

methodology
the process of developing and applying the specialised methods of study designed to meet the requirements of a discipline

model
A representation that describes, simplifies, clarifies or provides an explanation of the workings, structure or relationships within an object, system or idea.

natural materials
Products or physical matter that come from plants, animals, or earth and have undergone very little modification by humans.

observable
Something that can be seen, heard, felt, tasted or smelled either directly by an individual or indirectly by a measuring device, for example, a ruler, camera or thermometer.

processed materials
Products of physical matter that have been modified from natural materials by human intervention or that do not occur at all in the natural environment, but have been designed and manufactured to fulfil a particular purpose.

property
An attribute of an object or material, normally used to describe attributes common to a group.

qualitative data
Information that is not numerical in nature.

quantitative data
Numerical information.

relate
To identify connections or associations between ideas or relationships or between components of systems and structures.

relationship
A connection or association between ideas or between components of systems and structures.

report
A written account of an investigation.

represent
Use words, images, symbols or signs to convey meaning.

scientific literacy
An ability to use scientific knowledge, understanding, and inquiry skills to identify questions, acquire new knowledge, explain science phenomena, solve problems and draw evidence-based conclusions in making sense of the world, and to recognise how understandings of the nature, development, use and influence of science help us make responsible decisions and shape our interpretations of information.

senses
Hearing, sight, smell, touch and taste.

system
A group of interacting objects, materials or processes that form an integrated whole.

technology
A development of products, services, systems and environments, using various types of knowledge, to meet human needs and wants.

theory
An explanation of a set of observations that is based on one or more proven hypotheses, which has been accepted through consensus by a group of scientists.

The transdisciplinary nature of science

Scientific disciplines

Science aims to understand the world we experience in an objective way. This world is transdisciplinary and disciplines are a human construct. When we inquire scientifically into our shared world, inevitably understanding requires working across disciplines of science. In practice, within contemporary science almost all research requires elements that span a number of disciplines. This course requires learners to complete an extended inquiry that spans more than one scientific discipline.

According to the Australian and New Zealand Standard Research Classification there are 10 Fields of Research Divisions directly related to science listed below. The Divisions are reflected in *Australian Curriculum Senior Secondary* and TASC science courses and each span a number of scientific disciplines. Each Division is mapped to 91 Fields of Research Groups (see below) which are considered disciplines within the scientific community. The Groups within the divisions are further split into 577 Fields of Research. Although many of these Fields of Research may be considered disciplines within themselves, for the purposes of this course disciplines are limited to the Groups of Fields of Research.

Divisions and groups of fields of research that represent scientific disciplines

Divisions	Groups
Agricultural, veterinary and food sciences	Agricultural biotechnology, agriculture, land and farm management, animal production, crop and pasture production, fisheries sciences, food sciences, forestry sciences, horticultural production, veterinary sciences, other agricultural, veterinary and food sciences
Biological sciences	Biochemistry and cell biology, Bioinformatics and computational biology, Ecology, Evolutionary biology, Genetics, Industrial biotechnology, Microbiology, Plant biology, Zoology, other biological sciences
Chemical sciences	Analytical chemistry, Inorganic chemistry, Macromolecular and materials chemistry, Medicinal and biomolecular chemistry, Organic chemistry, Physical chemistry, Theoretical and computational chemistry, Other chemical sciences
Earth sciences	atmospheric sciences, climate change science, geochemistry, geoinformatics, geology, geophysics, hydrology, oceanography, physical geography and environmental geoscience, other earth sciences
Environmental sciences	climate change impacts and adaptation, ecological applications, environmental biotechnology, environmental management, pollution and contamination, soil sciences, other environmental sciences
Health sciences	allied health and rehabilitation science, epidemiology, health services and systems, midwifery, nursing, public health, sports science and exercise, traditional, complementary and integrative medicine, other health sciences
Mathematical sciences	applied mathematics, mathematical physics, numerical and computational mathematics, pure mathematics, statistics, other mathematical sciences
Physical sciences	astronomical sciences, atomic, molecular and optical physics, classical physics, condensed matter physics, medical and biological physics, nuclear and plasma physics, particle and high energy physics, quantum physics, space sciences, synchrotrons and accelerators, other physical sciences
Psychology	applied and developmental psychology, biological psychology, cognitive and computational psychology, other psychology

Disciplines closely related to science

Other disciplines that are most likely to be used in some transdisciplinary science inquiries are contained within the following Divisions:

- built environment and design
- engineering
- information and computing sciences.

Additional disciplines

The remaining Divisions are much less likely to contain disciplines related to science and would require justification for inclusion. These are:

- commerce, management, tourism and services
- creative arts and writing
- economics
- education
- history, heritage and archaeology
- human society
- indigenous studies
- language, communication and culture
- law and legal studies
- philosophy and religious studies.

Appendix 7 - Inquiry project approval procedures

Inquiry project approval procedures
All providers are required to have documented procedures in place for approving individual learners' inquiry projects, and to explain how inquiry proposals that are not approved will be managed.

This inquiry project approval procedure must be provided to learners enrolled in the course and supplied to TASC if requested.

An inquiry project for *Transdisciplinary Science* Level 2 may be approved by the provider if, based on the research plan provided by the learner, the following standards are met. The criteria are the minimum and providers may impose additional requirements.

Science inquiry skills	Criteria
The inquiry question and inquiry	• The inquiry question involves new ideas and concepts for the learner and for which an answer is not readily and publicly available • The inquiry question spans two or more scientific disciplines • The inquiry question is capable of being researched and answered in the specified timeframe by the student • The inquiry question is sufficiently challenging to provide the evidence described in the work requirements • The inquiry identifies the local, national and global context and relevance of the inquiry question • The provider has the human and physical resources to support learners to gain an understanding of the scientific system components and aspects of theories and models of the scientific disciplines to be applied in the inquiry
The design, data and procedures used	• The design outlines a plan to collect simple, valid data • The design includes opportunities to review and refine scientific methodologies • The provider has ensured the physical resources are available to implement the proposed collection and analysis of the data.
Risk assessment and ethical considerations	• The student has undertaken academic integrity learning relevant to the disciplines to be addressed in the inquiry • A risk assessment plan approved by the provider has been documented for experimental investigations – identifying, assessing and managing risks in line with state and national regulations • The inquiry proposal explains how ethical and safe practices, identified in the risk management plan, will be implemented and monitored • Any investigation involving or impacting on animals is justified, humane and considerate of each animal's needs avoiding any experimentation on live non-human vertebrate animals and cephalopods • Any investigation involving humans is justified, has no negative impact and informed consent is given by all participants†.

†Further information to support providers.

- National Statement on Ethical Conduct in Human Research (2007) - Updated 2018 published by the National Health and Medical Research Council of Australia
- 'About Human Research Ethics' on the University of Tasmania's website

Appendix 8 – Content depth, science content and mathematical analysis for this course

Content depth and Level 2 Science

Depth of inquiry at Level 2

Within Transdisciplinary Science Level 2 the focus is on exploring, applying, analysing and evaluating simple relationships within science. These simple relationships may be within or between the three interrelated strands (described above) identified within Australian Curriculum: Science (F-12):

- Science understanding
- Science as a human endeavour
- Science inquiry skills

Science content[I]
Science understanding is evident when a person selects and integrates appropriate science concepts, models and theories to explain and predict phenomena and applies those concepts, models and theories to new situations. Models in science can include diagrams, physical replicas, mathematical representations, word-based analogies, including laws and principles and computer simulations. Development of models involves selection of the aspects of the system or systems to be included in the model and thus models have inherent approximations, assumptions and limitations.

Learners are guided to engage in scientific investigations that are relevant to Tasmania, which may be mandated by providers. Learners develop and extend their knowledge and understanding of key scientific concepts through the contexts they are investigating. Learners may explore and extend their understanding of a range of scientific concepts relevant to the contexts they are studying. They investigate and apply their understanding of these concepts through science inquiry skills. Learners make connections between these key scientific concepts and their influence in society through investigations of science as a human endeavour. These contexts provide the basis for developing, understanding and investigating key scientific concepts. The contexts must encompass two or more scientific disciplines.

Through a focus on science inquiry skills and scientific ways of observing, questioning, and thinking, learners in *Transdisciplinary Science* Level 2 actively investigate and respond to authentic, engaging, and complex questions, problems or challenges.

Learners apply inquiry-based approaches to design, plan and undertake investigations on a short term and more extended scale, responding to local, national or global situations. Both collaboratively and individually, they employ a scientific approach to collecting, representing and analysing data and using technological tools effectively. After evaluating their procedures or models, learners communicate scientifically to draw evidence-based conclusions that may lead to further testing, exploring more effective methods or solutions or new questions.

Practical activities may take a range of forms, for example, using or developing models and simulations that enable learners to develop their understanding of particular concepts related to science inquiry skills. The activities include laboratory and field studies during which learners develop investigable questions or notice a problem or need, formulate a testable inquiry question or propose a solution and select and use equipment appropriately to collect data. The data may be observations, measurements or other information obtained during the investigation.

[I] Based on text from Studies Stages 1 and 2 (South Australian Certificate of Education Board, 2021)

Mathematical analysis
The primary focus of the course is on scientific disciplines. For this course at level 2 complexity, mathematical analysis will be focussed on collection and manipulation of data. From the collection and collation of data, learners are expected to identify and explain:

- patterns or trends
- outliers
- unexpected results
- expected results

Other mathematical analysis can take place if it is relevant to the inquiry and the skill of the learner.