DEPARTMENT OF EDUCATION
learners first

Transdisciplinary Projects

Science

Transdisciplinary Science 3

COURSE DOCUMENT

PHASE 4

DRAFT FOR CONSULTATION

Catholic Education Tasmania

INDEPENDENT SCHOOLS TASMANIA

Years 9 to 12 Learning

Tasmanian Government

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Transdisciplinary Science, 150 Hours – Level 3

This course is the Level 3 component of the proposed *Transdisciplinary Science* suite.

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 3 is a Transdisciplinary Projects course.

Transdisciplinary Projects courses require students to integrate, transfer and reflect on their prior knowledge, skills, attitudes and values in transdisciplinary ways. Students will engage critically and creatively to integrate the learning and ways of working from multiple disciplines. Students will produce outcomes that are only possible through the intersection between disciplines. Students 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. Students 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:

- analysing their prior learning and the Tasmanian community to engage with an area of inquiry
- identifying, generating and analysing their inquiries by considering approaches across disciplines
- practising complex methodologies that span across disciplines of science
- iteratively analysing these methodologies and applying them to their chosen area of inquiry
- reflecting on and analysing their learning and inquiries to evolve their practice and understanding
- showcasing their inquiries and evaluation.

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 world 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 3 is one component in a proposed suite of flexible science courses and provides a powerful platform to prepare learners for many pathways and to develop their capabilities of, in particular, thinking creatively, working collaboratively and being innovative. In practice, most modern and applied science flows between scientific disciplines and is transdisciplinary by nature.

Learners undertaking *Transdisciplinary Science* Level 3 will apply inquiry-based approaches to design, plan and undertake investigations across scientific disciplines, which respond to local and global situations. Both collaboratively and individually, learners will employ a scientific approach to collecting, representing, analysing data, and using technological tools effectively. After critically 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 students 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 students 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, critically analyse and manage their own learning within a scientific inquiry
2. design and conduct ethical and safe processes for the collection and analysis of data within a specific application of science to inquire into a system
3. analyse and discuss concepts and processes from scientific theories and models to inquire into a system
4. communicate data and information using standard scientific conventions for qualitative and quantitative representation, and evaluate its reliability
5. apply the context of their inquiry locally, nationally and globally and explore relationships between technology, science and the broader community for a particular scientific application
6. analyse information they have researched to implement and refine processes and trial methodologies while inquiring into a system
7. analyse, adapt and finalise experimental design for an inquiry as they collect and analyse data, undertake further research and monitor progress

8. collate, represent, analyse and communicate the key data and findings from an extended scientific inquiry and make recommendations for further study.

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 Description

Transdisciplinary Science Level 3 enables learners to investigate applications of science in Tasmania. Students will undertake a deep inquiry, within a scientific focus available to them with the support of their school.

Learners will inquire scientifically to design, plan, and undertake investigations across scientific disciplines using a range of methodologies. They will respond to relevant local and global context. They will gain expertise in inquiry processes and creating knowledge.

Learners will apply skills to create evidence-based scientific knowledge. Skills include observation, application of science and critical thinking. Through this process they will be prepared for an increasingly wide range of contemporary and valued pathways.

Pathways

- *Transdisciplinary Science* Level 3 builds on Australian Curriculum: Science F-10 and other TASC Science courses and a pathway from TASC HASS, HPE, Technologies and Mathematics courses.
- As the study of all life, *Transdisciplinary Science* Level 3 is a clear pathway to some TASC courses and a large range of tertiary and vocational learning.

Course Requirements

Access

Learners enrolled in this course are required to be able to work responsibly and safely in practical situations.

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 Structure and Delivery

Structure

This course consists of three 50-hour modules.

- Core Module 1: Research, trial and plan
- Core Module 2: Conduct, monitor and refine
- Core Module 3: Review, represent and recommend

Delivery

The three modules should be delivered in order (1, 2, 3).

Course Content

Module 1 - Research, trial and plan

Science is indispensable in Tasmania – now and into our future. Module 1 of *Transdisciplinary Science* Level 3 taps into a wide range of fields where science is applied in our State, and the prior knowledge of learners, to engage with and ideate a focus that is relevant to our community. Learners will discover that in practice science draws from many scientific disciplines.

Learners will research, make connections and iteratively inquire into this focus. They will begin to understand its place in Tasmania, nationally and globally, and analyse the theories, models and methodologies that are key to creating knowledge. This may include interrelationships with First Nations Peoples understanding.

The application of science through inquiry, evaluation and refinement of understanding at every stage is key to this module. Learners should always be prepared to analyse their work and return to previous work to ensure that they build their knowledge. In this module trialling and analysing 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 of this module:

1. collaborate with others and monitor, critically analyse and manage their own learning within a scientific inquiry
2. design and conduct ethical and safe processes for the collection and analysis of data within a specific application of science to inquire into a system
3. analyse and discuss concepts and processes from scientific theories and models to inquire into a system
4. communicate data and information using standard scientific conventions for qualitative and quantitative representation, and evaluate its reliability
5. apply the context of their inquiry locally, nationally and globally and explore relationships between technology, science and the broader community for a particular scientific application
6. analyse information they have researched to implement and refine processes and trial methodologies while inquiring into a system.

Module 1 Content

Within 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 analyse 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 this science is applied. In parallel with this, learners will become familiar with and iteratively practice methodologies used in Tasmania 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.

Key Knowledge

Science as a human endeavour

Within science that is valued, applied or researched in the Tasmania, learners will research and analyse the interrelationships between the broad context and the scientific inquiry focus, referring to 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, cultural or sustainability considerations are a factor in Tasmania
- First Nations Peoples knowledge may be valuable.

Science understanding

Within their chosen focus, learners will research and apply:

- the specialist knowledge required across more than one scientific discipline and not restricted to Australian Curriculum Senior Secondary Science course content
- the inter-relationships between models, theories, phenomena, systems, and concepts that need to be referenced and analysis of their limitations
- science understanding at a similar level of complexity to other TASC Science Level 3 courses.

Key Skills

Science inquiry skills – design and implementation of inquiry

Learners will have to discover what is possible to measure and analyse within their scientific inquiry. They will have to explore data collection, analysis and representation methodologies together with other restrictions and possibilities. This requires a process of trial and error to find what can be done.

Within science that is valued in the Tasmanian context, learners will:

- identify, research and construct questions for a complex investigation
- design, implement, trial, evaluate and refine methodologies to collect valid and reliable primary data and to evaluate and refine procedures
- analyse and mitigate against risk and ethical considerations
- trial, analyse and refine ways to meaningfully organise and represent interrelationships within data
- trial, analyse and refine other processes to support inquiry – for example, the logistics of field work.

Science inquiry skills – evaluation of inquiry

What is found to be possible for a scientific inquiry through trial and error will have to be further analysed for additional limitations and possibilities. This analysis will ensure that valid conclusions will be reached through what is planned for the extended inquiry. Through this process the inquiry question will be resolved enough to proceed with Module 2 and will likely change as the extended inquiry progresses.

Within science that is valued in the Tasmanian context, learners will:

- analyse the limitations of primary and secondary data to find interrelationships and how critical issues can be addressed
- research and analyse the interrelationships between processes, claims, conclusions and other relevant information within a field of science
- draw valid and reasoned conclusions through analysing the interrelationships between data, systems, concepts, theories and models
- analyse processes, data and conclusions, and plan to conduct the inquiry.

Module 1 Work Requirements Summary

The work requirements of a course are processes, products or performances 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.

This module includes one (1) investigation work requirement.

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 3 will provide an opportunity for the learner to engage more deeply with their chosen focus. Through further targeted research, analysis 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 and analyse the connections they have already made to support their extended inquiry.

The application of science through inquiry, evaluation and refinement of understanding at every stage is key to this module. Learners should always be prepared to analyse their work and return to previous work to ensure that they are able to build their knowledge and narrow the focus of their inquiry. Through this process learners will largely finish conducting 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, critically analyse and manage their own learning within a scientific inquiry
2. design and conduct ethical and safe processes for the collection and analysis of data within a specific application of science to inquire into a system
3. analyse and discuss concepts and processes from scientific theories and models to inquire into a system
4. communicate data and information using standard scientific conventions for qualitative and quantitative representation, and evaluate its reliability
5. apply the context of their inquiry locally, nationally and globally and explore relationships between technology, science and the broader community for a particular scientific application
7. analyse, adapt and finalise experimental design for an inquiry as they collect and analyse data, undertake further research and monitor progress.

Module 2 Content

Within this module learners will investigate and analyse their chosen focus, 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 the knowledge required and how it is applied. In parallel with this, learners will implement, evaluate, and iteratively refine methodologies identified for their extended inquiry to ensure data and information is valid and reliable, allowing learners to finalise their inquiry question and plan for evaluation, presentation, and recommendations in Module 3.

Key Knowledge

Science as a human endeavour

Within a chosen scientific focus, learners will independently investigate, analyse and evaluate the interrelationships between the context and the scientific focus and where it can be refined and finalised to best support the inquiry, including where:

- theories of interest have been refined or replaced as new evidence, models or theories have emerged
- there are opportunities to refine theories, gather more data or question the interpretation of data
- improved technology has assisted in greater scientific understanding
- social, economic, cultural or sustainability considerations are a factor
- there is collaboration to improve knowledge
- First Nations Peoples knowledge may have been valuable.

Science understanding

Within their chosen focus, learners will independently research, refine and apply:

- specialist knowledge required across more than one scientific discipline and not restricted to Australian Curriculum Senior Secondary Science course content
- the interrelationships between the models, theories and concepts being used (including mathematical modelling) and analysis of their limitations
- the different methodologies and specific terminology used in different scientific disciplines
- science understanding at a similar level of complexity to other TASC Science Level 3 courses.

Key Skills

Science inquiry skills – design and implementation of inquiry

Within a chosen scientific focus, learners will independently conduct and refine investigations to develop and support an extended inquiry. This process of analysing methodologies for continual improvement of data collection, analysis and representation within the extended scientific inquiry ensures that there will be sufficient evidence for evaluation of the inquiry in Module 3. These processes include:

- analysing, refining and finalising the inquiry question
- analysing, adapting and refining methodologies to collect valid and reliable primary data
- monitoring to improve procedures and adapt risk assessment and ethical documentation including mitigation strategies
- analysing and refining ways to organise and represent interrelationships within data usefully.

Science inquiry skills – evaluation of inquiry

Within a chosen scientific focus, learners will independently analyse and refine investigations to develop and support the extended inquiry. This requires consistent analysis of the quality of the data, what can be interpreted, and what further needs to done. This includes:

- analysing the limitations of primary and secondary data to find interrelationships and how critical issues can be addressed
- drawing valid and reasoned conclusions through analysing the interrelationships between data, theories and models
- analysing processes, data and conclusions for interrelationships and gaps to finalise plans to complete the inquiry.

Module 2 Work Requirements Summary

The work requirements of a course are processes, products or performances 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.

This module includes one (1) investigation, one (1) product and one (1) performance work requirement.

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

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

As with previous modules –application of science through inquiry, analysis and refinement of understanding at every stage is key. At this stage learners should do this to ensure that their analysis, communication and presentation reflects their inquiry question. Through this process possible answers will crystallise to be evaluated. Learners will have the opportunity to demonstrate 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, critically analyse and manage their own learning within a scientific inquiry
2. design and conduct ethical and safe processes for the collection and analysis of data within a specific application of science to inquire into a system
3. analyse and discuss concepts and processes from scientific theories and models to inquire into a system
4. communicate data and information using standard scientific conventions for qualitative and quantitative representation, and evaluate its reliability

5. apply the context of their inquiry locally, nationally and globally and explore relationships between technology, science and the broader community for a particular scientific application
8. collate, represent, analyse and communicate the key data and findings from an extended scientific inquiry and make recommendations for further study.

Module 3 Content

Within this module, learners will distil only the most relevant context for their inquiry. They will inquire into the development and limitations specific to their extended investigation and its interrelationships with technology and sustainability. Learners will then evaluate their understanding and experience to produce a poster and a folio representing their work and what they have found.

Science understanding

In response to their inquiry question, learners will independently conclude their extended inquiry, applying and analysing:

- specialist knowledge across more than one scientific discipline and not restricted to Australian Curriculum Senior Secondary Science course content
- the interrelationships between theories and concepts that are used (including mathematical modelling) and analysis of their limitations
- the different methodologies and specific terminology used
- science understanding at a similar level of complexity to other TASC Science Level 3 courses.

Key Skills

Science inquiry skills – design and implementation of inquiry

In response to their inquiry question, learners will finalise and document with sufficient detail to enable replication of their inquiry:

- a summary of the analysis of findings
- an analysis of the design, data and procedures used
- analysis of the risk assessments, ethical considerations and migration strategies applied.

Science inquiry skills – evaluation of inquiry

In response to their inquiry question, learners will finalise and document with sufficient detail to enable replication of their inquiry:

- the limitations of primary and secondary data for interrelationships and how critical issues were addressed
- evaluation of the research and analysis processes, claims and conclusions
- valid and reasoned conclusions through evaluation of the interrelationships between data, theories and models
- an evaluation of processes, data and conclusions, recommending further investigation to verify interrelationships identified and gaps within the inquiry.

Module 3 Work Requirements Summary

The work requirements of a course are processes, products or performances 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.

This module includes (one) 1 investigation, (one) 1 inquiry and (one) 1 performance work requirement.

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 teacher 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.

TASC will supervise the external assessment of designated criteria which will be indicated by an asterisk (*). The ratings obtained from the external assessments will be used in addition to internal ratings from the provider to determine the final award.

Criteria

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

The assessment for *Transdisciplinary Science* Level 3 will be based on the degree to which the learner can:

1. work independently and collaboratively to set and achieve goals
2. collect, analyse and evaluate data within a scientific inquiry
3. analyse concepts, processes and interrelationships between scientific models and theories*
4. analyse and communicate scientific data and information*
5. analyse the interrelationships between local, national, and global contexts within a scientific inquiry*
6. research, trial, analyse and refine within the process of an inquiry
7. analyse and adapt experimental design within an inquiry*
8. analyse, synthesise and represent scientific inquiry to make valid conclusions*

*denotes criteria that are both internally and externally assessed.

Standards

Criterion 1: work independently and collaboratively to set and achieve goals

This criterion is only internally assessed.

Standard Element	Rating C	Rating B	Rating A
E1 – self-manages to work within timeframes	uses planning strategies to ensure completion of key elements of tasks within agreed time frames	uses planning strategies to ensure successful completion of tasks within agreed time frames	uses a range of planning and self-management strategies to ensure the effective completion of tasks within agreed time frames
E2 – analyses timelines and makes modifications	examines timelines, and makes minor modifications to improve outcomes	analyses timelines, making modifications to improve outcomes	critically analyses timelines, making modifications to improve outcomes
E3 – collaborates to complete activities	initiates, performs and examines tasks to ensure the completion of individual and collaborative activities	initiates, performs, monitors and analyses tasks to ensure the completion of individual and collaborative activities	initiates, performs, monitors and evaluates tasks, guiding others to ensure the completion of collaborative activities
E4 – describes own contribution to complete activities.	monitors and explains own and other learners' contributions to the successful completion of collaborative activities.	monitors and analyses own and other learners' contributions to the successful completion of collaborative activities.	monitors and critically evaluates own and other learners' contributions to the successful completion of collaborative activities.

Criterion 2: collect, analyse and evaluate data within a scientific inquiry

This criterion is only internally assessed.

Standard Element	Rating C	Rating B	Rating A
E1 – assesses safety and ethical issues	plans and monitors progress to mitigate key safety and ethical issues within investigations	predicts, analyses and monitors progress to mitigate safety and ethical issues within investigations	predicts, evaluates and monitors progress to mitigate safety and ethical issues within investigations

Standard Element	Rating C	Rating B	Rating A
E2 – designs and conducts investigations	designs and conducts investigations that collect valid data in response to a question or problem	designs, conducts and improves investigations that collect valid, reliable data in response to a question or problem	designs, conducts and improves investigations that efficiently collect valid, reliable data in response to a complex question or problem
E3 – selects and uses data	organises and represents data to identify a trend, pattern or relationship	organises and represents data to identify trends, patterns or relationships, and discusses the validity and reliability of data	organises and represents data to correctly identify trends, patterns or relationships, and evaluates the validity and reliability of data
E4 – analyses evidence and processes	uses evidence to make and justify a valid conclusion.	interprets and analyses evidence to make and justify a valid conclusion.	interprets and evaluates evidence to make and justify a valid conclusion.

Criterion 3: analyse concepts, processes and interrelationships between scientific models and theories*

This criterion is both internally and externally assessed.

Standard Element	Rating C	Rating B	Rating A
E1 – explains the interrelationships between system components	explains the relationships between scientific system components, describes their functions and identifies interrelationships	explains the interrelationships of scientific system components and their functions	analyses how scientific system components function, are interrelated and change
E2 – analyses theories and models	discusses aspects of a theory or model used to explain system processes, and phenomena to which it can be applied	analyses theories and model or models used to explain a system, supporting evidence, and limitations	evaluates theories or models used to explain a system, the supporting evidence, limitations and assumptions
E3 – analyses observable change	discusses the ways in which observable processes and phenomena change	analyses the ways in which observable processes and phenomena change	evaluates the ways in which observable processes and phenomena change

Standard Element	Rating C	Rating B	Rating A
E4 - applies theories and models	applies theories or models of systems and processes to explain phenomena, interpret problems and make valid predictions in familiar and some unfamiliar contexts	applies theories and models of systems and processes to explain phenomena, analyse problems and make valid predictions in familiar and unfamiliar contexts	applies theories and models of systems and processes to explain phenomena, critically analyse complex problems and make reasoned, valid predictions in familiar unfamiliar contexts
E5 – applies mathematical modelling	applies mathematical modelling of systems and processes to make valid predictions in familiar and unfamiliar contexts.	applies and analyses mathematical modelling of systems and processes to make valid predictions in familiar and unfamiliar contexts.	Applies and evaluates mathematical modelling of systems and processes to make valid predictions in familiar and unfamiliar contexts.

Criterion 4: analyse and communicate scientific data and information *

This criterion is both internally and externally assessed.

Standard Element	Rating C	Rating B	Rating A
E1 - represents of data and information	represents data and information to clearly communicate concepts and ideas selected from a variety of relevant sources	represents data and information to clearly and accurately communicate concepts and ideas selected from a variety of sources and analyses relevance	represents data and information to effectively, accurately and concisely communicate concepts and ideas selected from a variety of sources and evaluates relevance
E2 – analyses the reliability of data and information	discusses the validity and reliability of data and information	analyses the validity and reliability of data and information	evaluates the validity and reliability of data and information
E3 - uses appropriate formats, units and terminology	selects and uses appropriate scientific formats, units and terminology to communicate data and information	selects and uses appropriate scientific formats, units and terminology to clearly and accurately communicate data and information	selects and uses appropriate scientific formats and units to effectively, accurately and concisely communicate data and information

Standard Element	Rating C	Rating B	Rating A
E4 – differentiates own work	differentiates the information, images, ideas and words of others from the learner's own	clearly differentiates the information, images, ideas and words of others from the learner's own	clearly and accurately differentiates the information, images, ideas and words of others from the learner's own
E5 – uses referencing techniques	creates appropriate, structured reference lists and generally follows referencing conventions and methodologies correctly.	creates appropriate, structured reference lists and follows referencing conventions and methodologies correctly.	creates appropriate, well-structured reference lists and follows referencing conventions and methodologies with a high degree of accuracy.

Criterion 5: analyse the interrelationships between local, national, and global contexts within a scientific inquiry*

This criterion is both internally and externally assessed.

Standard Element	Rating C	Rating B	Rating A
E1 - analyses broader context of science	explains interrelationships between local, national and global contexts and a scientific inquiry	analyses interrelationships between local, national and global contexts and a scientific inquiry	evaluates interrelationships between local, national and global contexts and a scientific inquiry
E2 - analyses collaboration and use of evidence in the development of science	discusses the role of collaboration and new evidence in the development of specific scientific knowledge	analyses the role of collaboration and new evidence in the development of specific scientific knowledge	evaluates the role of collaboration and new evidence in the development of specific scientific knowledge
E3 – analyses the role of technology in science	discusses the role of technologies in the development of specific scientific knowledge	analyses the role of technologies in the development of specific scientific knowledge	evaluates the role of technologies in the development of specific scientific knowledge
E4 – analyses how science meets needs in society	discusses ways in which science meets specific needs in society, and the implications of these applications.	analyses ways in which science meets specific needs in society, and the implications of these applications.	evaluates ways in which science meets specific needs in society and the implications of these applications.

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

This criterion is only internally assessed.

Standard Element	Rating C	Rating B	Rating A
E1 – accesses and analyses information	accesses, selects compares and adapts information relevant to an inquiry	accesses, selects, analyses and adapts information relevant to an inquiry	accesses, selects, evaluates and adapts information relevant to an inquiry
E2 - accesses and analyses methodologies	accesses, compares and adapts methodologies to plan an inquiry	accesses, selects, analyses and adapts methodologies to plan an inquiry	accesses, selects, evaluates, and adapts methodologies to plan an inquiry
E3 - trials and refines methodologies and processes	trials, compares and refines methodologies and processes while planning an inquiry	trials, analyses and refines methodologies and processes while planning an inquiry	trials, evaluates and refines methodologies and processes while planning an inquiry
E4 - refines inquiry	compares trials and information to refine the inquiry question and processes.	analyses trials and information to refine the inquiry question and processes.	evaluates trials and information to refine the inquiry question and processes.

Criterion 7: analyse and adapt experimental design within an inquiry*

This criterion is both internally and externally assessed.

Standard Element	Rating C	Rating B	Rating A
E1 – analyses context for suitability	reviews the suitability of local, national and global contextual information to provide an appropriate background for a scientific inquiry	analyses the suitability of local, national and global contextual information to provide an appropriate background for a scientific inquiry	evaluates the suitability of local, national and global contextual information to provide an appropriate background for a scientific inquiry
E2 – reviews methodologies	reviews and adapts to refine or add methodologies to improve experimental design and implementation	reviews and analyses to refine and add methodologies to improve significant elements of experimental design and implementation	reviews and critically analyses to refine and add methodologies to improve the effectiveness of experimental design and implementation

Standard Element	Rating C	Rating B	Rating A
E3 – finalises the inquiry question	discusses scientific inquiry processes, data collected and appropriate information to finalise the inquiry question.	analyses scientific inquiry processes, data collected and appropriate information to finalise the inquiry question.	evaluates scientific inquiry processes, data collected and appropriate information progress to finalise the inquiry question.

Criterion 8: analyse, synthesise and represent scientific inquiry to make valid conclusions*

This criterion is both internally and externally assessed

Standard Element	Rating C	Rating B	Rating A
E1 – analyses and represents data across the inquiry	selects, explains and represents data to demonstrate major trends, the reliability of the data and sources of error across a scientific inquiry	selects, analyses and represents data to demonstrate major trends, the reliability of the data and sources of error across a scientific inquiry	selects, critically analyses and represents data to demonstrate major trends, the reliability of the data and sources of error across a scientific inquiry
E2 – synthesises scientific models and theories	selects and explains appropriate scientific models and theories to synthesise, with data analysis, to come to valid conclusions across a scientific inquiry	selects and analyses appropriate scientific models and theories to synthesise, with data analysis, to come to valid conclusions across a scientific inquiry	selects and evaluates appropriate scientific models and theories to synthesise, with data analysis, to come to valid conclusions across a scientific inquiry
E3 – analyses methodologies and conclusions to make valid recommendations	discusses methodologies and conclusions across a scientific inquiry to make valid recommendations for further inquiry.	analyses methodologies and conclusions across a scientific inquiry to make valid recommendations for further inquiry.	evaluates methodologies and conclusions across a scientific inquiry to make valid recommendations for further inquiry.

Quality Assurance

- This will be determined by TASC at time of accreditation.

Qualifications and Award Requirements

Level 3

The final award will be determined by the Office of Tasmanian Assessment, Standards and Certification from 13 ratings (8 from the internal assessment, 5 from external assessment).

The minimum requirements for an award are as follows:

EXCEPTIONAL ACHIEVEMENT (EA)
10 'A' ratings, 3 'B' ratings (3 'A' ratings, 2 'B' rating from external assessment)

HIGH ACHIEVEMENT (HA)
5 'A' ratings, 5 'B' ratings, 3 'C' ratings (1 'A' ratings, 3 'B' ratings, 1 'C' rating from external assessment)

COMMENDABLE ACHIEVEMENT (CA)
6 'B' ratings, 6 'C' ratings (2 'B' ratings, 3 'C' ratings from external assessment)

SATISFACTORY ACHIEVEMENT (SA)
11 'C' ratings (3 'C' ratings from external assessment)

PRELIMINARY ACHIEVEMENT (PA)
6 'C' ratings

A learner who otherwise achieves the ratings 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

- This will be confirmed by time of accreditation.

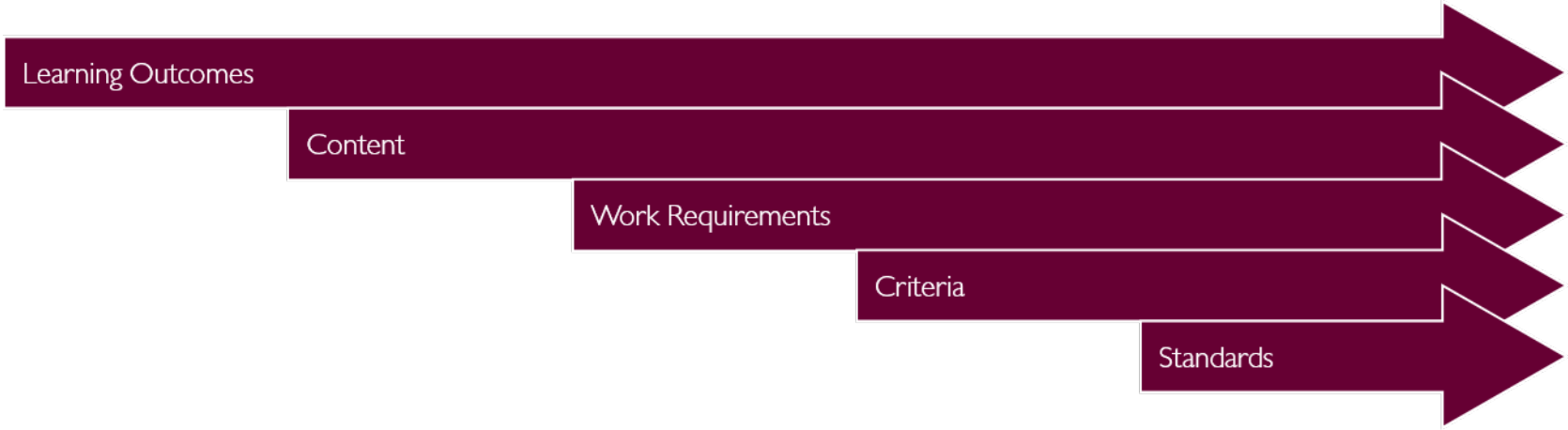
Course Developer

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 and Version History

- Details to be determined by TASC at time of accreditation.

Appendix 1 - Line of Sight



Learning Outcomes	Course Content	Work Requirements	Criteria	Standards	General Capabilities (GC)
1. collaborate with others and monitor, critically analyse and manage their own learning within a scientific inquiry	Module 1, 2, 3	Module 1, 2, 3	C 1	All	GC:
2. design and conduct ethical and safe processes for the collection and analysis of data within a specific application of science to inquire into a system	Module 1, 2, 3	Module 1, 2, 3	C 2	All	GC:
3. analyse and discuss concepts and processes from scientific theories and models to inquire into a system	Module 1, 2, 3	Module 1, 2, 3	C 3	All	GC:
4. communicate data and information using standard scientific conventions for qualitative and quantitative representation, and evaluate its reliability	Module 1, 2, 3	Module 1, 2, 3	C 4	All	GC:

Learning Outcomes	Course Content	Work Requirements	Criteria	Standards	General Capabilities (GC)
5. apply the context of their inquiry locally, nationally and globally and explore relationships between technology, science and the broader community for a particular scientific application	Module 1, 2, 3	Module 1, 2, 3	C 5	All	GC: 
6. analyse information they have researched to implement and refine processes and trial methodologies while inquiring into a system	Module 1	Module 1	C 6	All	GC: 
7. analyse, adapt and finalise experimental design for an inquiry as they collect and analyse data, undertake further research and monitor progress	Module 2	Module 2	C 7	All	GC: 
8. collate, represent, analyse and communicate the key data and findings from an extended scientific inquiry and make recommendations for further study	Module 3	Module 3	C 8	All	GC: 

Appendix 2 - Alignment to Curriculum Frameworks

Links to Foundation to Year 10

Progression from the F-10 Australian Curriculum: Science

This course component continues to develop student understanding and skills from across the three strands of the F-10 Australian Curriculum: 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 students studying Transdisciplinary Science

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

Within the Science Inquiry Skills strand, students 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, students are required to make measurements using appropriate units to an appropriate degree of accuracy.

Students 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.

It is assumed that students will be able to competently:

- perform calculations involving addition, subtraction, multiplication and division of quantities
- perform approximate evaluations of numerical expressions
- express fractions as percentages, and percentages as fractions
- calculate percentages
- recognise and use ratios
- transform decimal notation to power of ten notation
- change the subject of a simple equation
- substitute physical quantities into an equation using consistent units so as to calculate one quantity and check the dimensional consistency of such calculations
- solve simple algebraic equations
- comprehend and use the symbols/notations $<$, $>$, Δ, $\approx$, , $\leq$, $\geq$, $\sum$
- translate information between graphical, numerical and algebraic forms
- distinguish between discrete and continuous data and then select appropriate forms, variables and scales for constructing graphs
- construct and interpret frequency tables and diagrams, pie charts and histograms
- describe and compare data sets using mean, median and inter-quartile range
- interpret the slope of a linear graph
- calculate areas of right-angled and isosceles triangles, circumference and area of circles, areas and volumes of rectangular blocks, cylinders and spheres
- use Pythagoras' theorem, similarity of triangles and the angle sum of a triangle.

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.

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.

Appendix 3 - Work Requirements

Module 1 Work Requirements Specifications

Focus Area: Transdisciplinary Projects
Title of Work Requirement: Logbook
Mode /Format: Investigation
Description:
Learners will use a logbook (or an electronic equivalent) to document:

- research notes and progress
- emerging interrelationships and system analysis with reference to the scientific disciplines applied
- ongoing evaluation
- planning
- observations and data
- time on tasks
- peer and self-assessment of progress
- their contribution to collaboration with others.

Learners should spend approximately 10 hours throughout Module 1 organising this information in preparation for the Research and plan work requirement.
Size: 10 Hours
Timing: Throughout Module
External agencies: Engagement with scientists and their institutions is optional
Relevant Criteria:

- Criterion 1
- Criterion 2
- Criterion 3
- Criterion 4
- Criterion 5

Focus Area: Transdisciplinary Projects
Title of Work Requirement: Research and plan
Mode /Format: Investigation
Description:
Learners will produce an experimental research outline, including:

- an inquiry question justified through analysis
- analysis of background research with reference to the scientific contexts applied
- an annotated bibliography of relevant sources
- an experimental proposal – design outlined
- an analysis of trials of experimental design for their extended inquiry
- analysis and evaluation of interrelationships within data collected and the system of study
- the future focus of experiments including plan for Module 2.

Size: 1500 words (max) for the research outline
Timing: This is a culminating performance for Module 1
External agencies: Engagement with scientists and their institutions is optional

Relevant Criterion/criteria:

- Criterion 1
- Criterion 2
- Criterion 3
- Criterion 4
- Criterion 5
- Criterion 6

Module 2 Work Requirements Specifications

Focus Area: Transdisciplinary Projects
Title of Work Requirement: Logbook
Mode /Format: Investigation
Description: Learners will continue their logbook (or electronic equivalent) to document

- research notes and progress
- emerging interrelationships and system analysis with reference to scientific disciplines applied
- ongoing evaluation
- planning
- observations and data
- time on tasks
- peer and self-assessment of progress
- their contribution to collaboration with others.

Size: 35 hours
Timing: Throughout Module 2
External agencies: Engagement with scientists and their institutions is optional
Relevant Criteria:

- Criterion 1
- Criterion 2
- Criterion 3
- Criterion 4

Focus Area: Transdisciplinary Projects
Title of Work Requirement: Finalised inquiry question and context
Mode /Format: Product
Description:

- Learners will finalise their inquiry question and context for inclusion in their external assessment portfolio containing: the inquiry question justifying their choice with reference to:
  - data collected
  - processes undertaken
  - any other relevant information, including but not limited to: data analysis, and scientific theories or models
- a summary and analysis of local, national and global context to provide an appropriate background for their inquiry, which may include analysis where:
  - theories of interest have been refined or replaced as new evidence, models or theories have emerged
  - there are opportunities to refine theories, gather more data or question the interpretation of data

- technology has assisted in greater understanding
- social, economic, cultural or sustainability considerations are important
- there is collaboration
- First Nations Peoples knowledge can be applied.

Size: 1500 words or equivalent (max)
Timing: This is a culminating performance
External agencies: Engagement with scientists and their institutions is optional
Relevant Criteria:

- Criterion 4
- Criterion 5
- Criterion 7 Elements 1 and 3

Focus Area: Transdisciplinary Projects
Title of Work Requirement: Quad chart and future plans presentation
Mode /Format: Performance
Description:
Learners will complete an A2 quad chart referring to the:

- inquiry question
- method
- results
- reasoned conclusions up until the end of Module 2 with reference to the scientific disciplines applied.

Note: An A2 document can be produced using two (2) A3 or four (4) A4 pages that can be assembled into a A2 document. This matches the structure of a standard Quad Chart.

Learners will complete a presentation explaining their quad chart and their plans for Module 3
Size: 5 minute presentation and 5 minutes for questions
Timing: This is a culminating performance
External agencies: Engagement with scientists and their institutions is optional
Relevant Criteria:

- Criterion 3
- Criterion 4
- Criterion 7

Module 3 Work Requirements Specifications

Focus Area: Transdisciplinary Projects
Title of Work Requirement: Logbook
Mode /Format: Investigation
Description: Learners will complete a logbook (or electronic equivalent)

- research notes and progress
- emerging interrelationships and system analysis with reference to scientific disciplines applied
- ongoing evaluation
- planning
- observations and data
- time on tasks
- peer and self-assessment of progress
- their contribution to collaboration with others.

Size: 20 hours
Timing: This is a culminating performance
External agencies: Engagement with scientists and their institutions is optional
Relevant Criterion/criteria:

- Criterion 1
- Criterion 2
- Criterion 3
- Criterion 4

Focus Area: Transdisciplinary Projects
Title of Work Requirement: Scientific paper
Mode /Format: Inquiry
Description: Learners will finalise and document a scientific paper including:

- an analysis of findings (including changes since the end of Module 2)
- risk assessments, ethical considerations and mitigation strategies applied
- the design, data and procedures used
- analysis of research, processes and systems
- interrelationships between data, theories and models
- the limitations of the primary and secondary data their interrelationships and how critical issues were addressed
- valid and reasoned conclusions with supporting evidence from scientific disciplines applied
- analysis of processes, data and conclusions recommending further investigation to verify interrelationships identified and gaps within the inquiry
- a detailed bibliography.

Size: 3000 words or equivalent (max) for the scientific paper
Timing: This is a culminating performance
External agencies: Engagement with scientists and their institutions is optional
Relevant Criterion/criteria:

- Criterion 3
- Criterion 4
- Criterion 8

Focus Area: Transdisciplinary Projects
Title of Work Requirement: Poster
Mode /Format: Performance
Description: Learners will complete a poster (A1) that represents:

- the inquiry question
- a summary of the findings
- analysis of the interrelationships between data, theories and models with reference to scientific disciplines applied
- the limitations of the primary and secondary data, their interrelationships and how critical issues were addressed
- valid and reasoned conclusions with supporting evidence from scientific disciplines applied
- analysis of processes, data and conclusions and recommending opportunities for further investigation to verify interrelationships identified and gaps within the inquiry.

Learners will present this A1 poster within the External Assessment process.
Size: 10 Hours
Timing: This is a culminating performance
External agencies: Engagement with scientists and their institutions is optional
Relevant Criterion/criteria:

- Criterion 3
- Criterion 4
- Criterion 8

Relationship to External Assessment: The "Finalised inquiry question and context" (Module 2) and "Scientific paper" (Module 3) work requirements are proposed as folio-based evidence for External Assessment in conjunction with "Poster"† (Module 3) as a culminating performance. This will form the evidence to assess Criteria 3, 4, 5, 7 and 8.

† A clear photographic image or screenshot of the Presentation Poster ONLY is required for the Folio and will be submitted electronically to TASC.

Individual providers/learners are responsible for providing a physical printed A1 poster that will be referred to as part of their Practical External Assessment. Learners will be required to bring this with them to the practical assessment. As the Poster is assessed internally only it is acceptable for the A1 poster to be printed as four (4) A3 or eight (8) A4 pages that can be assembled as an A1 poster.

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 

Appendix 5 – Glossary

Term	Definition	Source Acknowledgement	Course Context
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.	ACARA	Modules 1, 2 and 3
experiment/experimental investigation	an investigation that involves carrying out a practical activity.	ACARA	Modules 1, 2 and 3
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.	ACARA	Modules 1, 2 and 3
field study / 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.	ACARA	Modules 1, 2 and 3
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.	ACARA	Modules 1, 2 and 3
formal measurement	measurement based on an agreed standard unit (metre, second, gram).	ACARA	Modules 1, 2 and 3
graph	a visual representation of the relationship between quantities plotted with reference to a set of axes.	ACARA	Modules 1, 2 and 3
guided investigation	an investigation partly directed by a teacher.	ACARA	Modules 1, 2 and 3

Term	Definition	Source Acknowledgement	Course **Context**
informal measurement	measurement that is not based on any agreed standard unit (for example, hand spans, paces, cups).	ACARA	Modules 1, 2 and 3
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.	ACARA	Modules 1, 2 and 3
law	a statement of a relationship based on available evidence.	ACARA	Modules 1, 2 and 3
material	a substance with particular qualities or that is used for specific purposes.	ACARA	Modules 1, 2 and 3
matter	a physical substance; anything that has mass and occupies space.	ACARA	Modules 1, 2 and 3
model	a representation that describes, simplifies, clarifies or provides an explanation of the workings, structure or relationships within an object, system or idea.	ACARA	Modules 1, 2 and 3
natural materials	products or physical matter that come from plants, animals, or earth and have undergone very little modification by humans.	ACARA	Modules 1, 2 and 3
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.	ACARA	Modules 1, 2 and 3
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.	ACARA	Modules 1, 2 and 3
property	an attribute of an object or material, normally used to describe attributes common to a group.	ACARA	Modules 1, 2 and 3

Term	Definition	Source Acknowledgement	Course **Context**
qualitative data	information that is not numerical in nature.	ACARA	Modules 1, 2 and 3
quantitative data	numerical information.	ACARA	Modules 1, 2 and 3
relate	to identify connections or associations between ideas or relationships or between components of systems and structures.	ACARA	Modules 1, 2 and 3
relationship	a connection or association between ideas or between components of systems and structures.	ACARA	Modules 1, 2 and 3
report	a written account of an investigation.	ACARA	Modules 1, 2 and 3
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.	ACARA	Modules 1, 2 and 3
senses	hearing, sight, smell, touch and taste.	ACARA	Modules 1, 2 and 3
system	a group of interacting objects, materials or processes that form an integrated whole.	ACARA	Modules 1, 2 and 3
echnology	a development of products, services, systems and environments, using various types of knowledge, to meet human needs and wants.	ACARA	Modules 1, 2 and 3
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.	ACARA	Modules 1, 2 and 3

Appendix 6 – 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 and, in practice, within contemporary science almost all research requires elements than 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 of directly related to science (see below). The Divisions are reflected Australian Curriculum Senior Secondary and TASC science courses that 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
Biomedical and clinical sciences	Cardiovascular medicine and haematology, Clinical sciences, Dentistry, Immunology, Medical biochemistry and metabolomics, Medical biotechnology, Medical microbiology, Medical physiology, Neurosciences, Nutrition and dietetics, Oncology and carcinogenesis, Ophthalmology and optometry, Paediatrics, Pharmacology and pharmaceutical sciences, Reproductive medicine, Other biomedical and clinical 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

Divisions	Groups
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 – Learning Design

Each provider offering this course will develop an annual ***learning design*** using the template provided. The ***learning design*** will be submitted to TASC for approval before the end of March each year.

A ***learning design*** will be approved if it demonstrates that the provider's implementation of the course framework will meet the content, processes and assessment requirements, and have a coherent assessment program, consistent with the learning outcomes and standards given in the course document.

The ***learning design*** will specify over what period the program will be conducted, subject to meeting TASC requirements for procedures that ensure state-wide comparability of standards and assessment for end of year reporting.

The ***learning design*** will ensure entry/access requirements are met. The ***learning design*** will also specify any limits to the range of studies, in particular the contexts for the scientific inquiries undertaken.

The ***learning design*** will name staff allocated to the program and ensure that appropriate expertise is available for each context identified.

The ***learning design*** will ensure that *Transdisciplinary Science* Level 3 inquiries will:

- have two or more scientific disciplines
- have a focus defined by the provider (or can be supported by the provider)
- lead to scientific understanding new to the learner
- provide opportunities for significant data collection and analysis using a range of methodologies
- provide opportunities for learners to draw evidence-based conclusions using a range of data-sets
- meet TASC requirements for providers with quality assurance processes in place
- not duplicate content from existing TASC accredited courses
- be sufficient and challenging enough to provide the evidence described in the Work Requirements
- adhere to the principles of academic integrity.

Appendix 8 – Content depth and Level 3 Science

Science Content

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/s 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 and 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, and investigate and apply their understanding of these concepts through the 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 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, using technological tools effectively. After critically 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 and/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.

Depth of inquiry at Level 3

Within *Transdisciplinary Science* Level 3 the focus is on exploring, applying, critically analysing and critically evaluating interrelationships and systems within science. These complex interrelationships may be within or between the three interrelated strands (described above) identified within Australian Curriculum: Science (F-12) and:

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