TNR315109, TQA Level 3, Size Value = 15

THE COURSE DOCUMENT

This document contains the following sections:

LEARNING STATEMENT

Knowledge and understanding of science, scientific literacy and scientific methods are necessary for students to develop the skills to resolve questions about their natural and constructed world.

The purpose of science education is to develop scientific literacy, which is a high priority for all citizens, helping them: to be interested in, and understand, the world around them; to engage in discourse about science; to be sceptical and questioning of claims made by others about scientific matters; to be able to identify questions and draw evidence-based conclusions; and to make informed decisions about the environment, about their own health and well-being and about issues arising as a result of the application of science and technology.

Scientifically literate students can therefore describe, explain and predict natural phenomena and can discuss the validity of their conclusions. This enables them to identify and understand the scientific and technological aspects underlying national and local issues and to form opinions which are reasoned and informed. It also leads to the proper evaluation of the quality of scientific information on the basis of course and on the methods used to generate it. The study of science raises awareness of the central role that science and technology can play both in encouraging life-long learning and in enabling a student to pursue a career path to this end.

Period of Accreditation: 1/1/2009 – 31/12/2010
Date of Publishing: 4 December 2008

COURSE SIZE AND COMPLEXITY

This course has been assessed as having a complexity level of TQA level 3.

At TQA level 3, the student is expected to acquire a combination of theoretical and/or technical and factual knowledge and skills and use judgment when varying procedures to deal with unusual or unexpected aspects that may arise. Some skills in organising self and others are expected. TQA level 3 is a standard suitable to prepare students for further study at the tertiary level. It is an approximate match to Tasmanian Certificate of Education (TCE) level 5 courses and VET competencies at this level are often those characteristic of an AQF Certificate III.

The TQA level 3 course has a size value of 15 (150 hours design-time).

PATHWAYS

This course is designed for students who have an interest in the sustainable use of Tasmanian resources and would like to understand the science involved in the development and management of resources. The course is an excellent general subject and a useful preparation for the tertiary study of science. Applied Science – Tasmanian Natural Resources is a desirable qualification for students planning to undertake careers in many areas such as Forestry, Agriculture, Mining, Geology, Aquaculture etc.

RESOURCES

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

ACCESS

Students enrolled in this course must be able to undertake practical work independently and safely.

COURSE OUTLINE

LEARNING OUTCOMES

Learners undertaking this course will:

- develop enjoyment and enthusiasm from learning in science, become self-directed, able to plan their study and persevere to complete tasks and meet deadlines
- engage in scientific enquiry, acquiring the skills to develop, interpret and evaluate experiments and communicate scientific information following accepted conventions
- develop critical thinking skills to examine issues, by analysing, interpreting and drawing conclusions to make socially responsible choices and create sustainable and optimistic futures
- develop an understanding of the applications and impact of science on society
- develop an understanding of the important basic science concepts and processes based on natural resources and its development
- develop discriminating research skills
- develop an understanding of technology related to the development of the resource
- develop an understanding of resource management of Tasmanian resources
- reflect on their personal futures and investigate pathways into further learning and employment.

COURSE CONTENT

1. OVERVIEW

The content of the course addresses the following questions:

1. What are the natural resources of Tasmania?
2. What is the role of research and innovation in the development and management of natural resources?
3. What is the relationship between production and management of a resource?
4. What scientific applications are used in the processing of natural resources in Tasmania?
5. What issues affect resource industries?

Students will develop an understanding of scientific method throughout the course.

A minimum of 30% of the course is to be spent on practical activities, which are an integral part of the course and should be used as a means of teaching and consolidating the course content as well as a means of assessment.

A Case Study is used to engage students into an in depth problem-solving activity using scientific method in an area of resource use and management. It should take about 25 hours to complete and is a substantial part of the course.

2. COURSE DETAILS

1. What are the natural resources of Tasmania?

a) What is a resource?

i. Discussion and definition

b) What is the timeframe of resource formation?

i. An understanding of time scale is essential in the formation, use and replacement of resources

ii. Timeframes are specific to the context of the resources

c) Why is the resource valued?

i. What is valued?

ii. Who values the resource?

iii. Have values changed?

d) What accounts for the distribution of these Tasmanian resources?

i. Where are particular resources found in Tasmania?

ii. Role of geology and climate in the formation of soil resources

iii. Role of human impact, topography and weather on erosion of soil

iv. Role of soils and climate in different types of agricultural production

v. Role of geology, topography and climate on vegetation distribution

2. What is the role of research and innovation in the development and management of natural resources?

a) How do we undertake sustainable resource management?

i. How do we determine reserves?

ii. What reserves do we have?

iii. How quickly are we using it?

iv. Is the resource renewable?

v. How is it accessed or harvested?

vi. What are the criteria for wise use of the resource?

vii. How do we manage the resource for maximum benefit?

viii. What drives the use of the resource?

b) What is the role of research institutions in the improvement of management?

i. University

ii. Government Departments

iii. Industry

c) What does it mean to work scientifically in researching resources?

i. Formulate a working hypothesis based on observations of events

ii. Formulate a hypothesis which is testable and includes an independent and a dependent variable

iii. Design experiments to investigate a suitable working hypothesis

iv. Recognise controlled and uncontrolled variables in experimental design

v. Understand the need to minimise the impact of uncontrolled and sometimes unrecognised variables by the use of replicates within an experiment, repeating experiments and the need for experiments to be repeated by different groups of workers

vi. Recognise the sorts of ethical considerations that need to be taken into account in designing experiments

vii. Evaluate the strengths and weaknesses of an experimental design

viii. Design further investigations related to an area of scientific investigation

ix. State whether the results are consistent or inconsistent with the hypothesis being tested and if needs be state a new hypothesis which is consistent with the results obtained

d) How do research case studies guide management of natural resources?

i. In sustainable use of resources

ii. In developing new uses of resources

iii. As the basis of innovation

iv. In providing scientific careers

3. What is the relationship between production and management of a resource?

a) How has the resource use changed through history?

i. As technology changes so does access and use of resources

ii. Origins of the use of the resource

iii. Development of the use of the resource to current uses

b) What impact have principles of ecology had on resource production and management?

i. What is an Ecosystem?

ii. Energy and nutrient flow through the ecosystem

iii. Trophic levels, food chains, food web

iv. Stability of ecosystems

v. Natural versus managed ecosystems

vi. Inputs, processes, outputs, feedback

c) What key aspects describe the science of resource management?

i. Management of physical resources

ii. Management of biological resources

iii. What are the constraints of production?

d) How is sustainable production maximised?

i. Management of biotic and abiotic factors

ii. Environmental impacts

e) What is the nature of advances in technology and to what extent have they led to increased production and changes in management?

i. Increased pressure on the environment

ii. New uses of resources

iii. New styles of management of the resource

4. What scientific applications are used in the processing of natural resources in Tasmania?

a) To what extent has downstream processing impacted on local industries and what are the associated aspects?

i. Physical processes

ii. Chemical processes

iii. Biological processes

b) What is the nature and extent of value-adding with regard to Tasmanian resources industries?

c) What uses have been and can be made of waste products as a resource?

5. What issues affect resource industries?

a) What values lie in using Tasmanian resources?

i. Employment

ii. Developing infrastructure

iii. Controlling quality

iv. Quarantine

v. Availability

b) What external influences affect natural resource use?

i. Global markets

c) What are the ethical issues associated with resource management?

d) What are some of the issues that raise public debate in:

i. Agriculture?

ii. Marine resources/aquaculture?

iii. Energy?

iv. Forestry?

v. Mining?

e) What is the nature of government involvement in sustainable resource management?

i. Controlling use of resources

ii. Supporting community-based approaches influencing sustainable resource management

iii. Targeted research

iv. Supporting international marketing and global trade

v. Policies influencing sustainable resource management

ASSESSMENT

Criterion-based assessment is a form of outcomes assessment which identifies the extent of student achievement at an appropriate end-point of study. Although assessment in the classroom is continuous, much of it is formative, and is done to help students identify what they need to do to attain the maximum benefit from their study of the course. Therefore, assessment for summative TCE reporting should focus on what both teacher and student understand to reflect end-point achievement.

The primary audience for assessment is the student and the teacher, but may also include parents when appropriate.

The standard of achievement each student 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 student demonstrates any achievement against a criterion less than the standard specified for the 'C' rating. The 't' notation is not described in the course standards.

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

Providers offering this course must participate in quality assurance processes specified by the Tasmanian Qualifications Authority to ensure provider validity and comparability of standards across all awards. Further information on quality assurance processes, as well as on assessment, is available in the TQA Senior Secondary Handbook Manual or on the website at http://www.tqa.tas.gov.au.

Internal assessment of all assessment criteria will be made by the school. Schools will report the student's rating for each criterion to the Tasmanian Qualifications Authority.

The Tasmanian Qualifications Authority will supervise the external assessment of designated criteria (*). The ratings obtained from the external assessments will be used in addition to those provided from the school to determine the final award.

QUALITY ASSURANCE PROCESSES

The following process will be facilitated by the TQA to ensure there is:

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

Process – the Authority gives course providers feedback about any systematic differences in the relationship of their internal and external assessments and, where appropriate, seeks further evidence through audit and requires corrective action in the future.

EXTERNAL ASSESSMENT REQUIREMENTS

The external assessment of this course consists of:

A) a 2 hour written examination used to assess criteria 2, 4, 7 and 8.

B) a Case Study used to assess criteria 2, 3, 5 and 8.

COURSE CRITERIA

The assessment for Applied Science – Tasmanian Natural Resources, TQA level 3 will be based on the degree to which the student can:

1. demonstrate personal skills to organise and complete activities
2. *develop, interpret and evaluate science experiments
3. *collect, process and communicate information
4. *demonstrate understanding of the application and impact of science in society
5. *demonstrate knowledge and understanding of science relevant to the resource and its development
6. demonstrate knowledge and understanding of technology relevant to the development of the resource
7. *demonstrate knowledge and understanding of resource management
8. *analyse, interpret and draw conclusions

* = externally assessed criteria

STANDARDS

CRITERION 1 DEMONSTRATE PERSONAL SKILLS TO ORGANISE AND COMPLETE ACTIVITIES

Rating 'C'	Rating 'B'	Rating 'A'
A student can:	A student can:	A student can:
• use techniques and equipment safely, competently and methodically	• use techniques and equipment safely, competently and methodically	• use techniques and equipment safely, competently, methodically, applying them to new contexts
• follow instructions accurately	• follow instructions accurately	• follow instructions accurately adapting to new circumstances
• demonstrate time management skills to negotiate or meet deadlines	• demonstrate self-direction and time management skills to negotiate or meet deadlines	• consistently demonstrate self-direction and time management skills to negotiate or meet deadlines
• undertake and complete a range of activities	• undertake and complete most activities	• persevere independently to undertake and complete most activities
• participate in group activities.	• participate actively in group activities.	• participate actively and show initiative in group activities.

CRITERION 2 DEVELOP, INTERPRET AND EVALUATE SCIENCE EXPERIMENTS

Rating 'C'	Rating 'B'	Rating 'A'
A student can:	A student can:	A student can:
• formulate a hypothesis to explain observations, meeting most of the criteria of a testable hypotheses	• formulate a hypothesis to explain observations, meeting all the criteria of testable hypotheses	• formulate a hypothesis to explain observations, meeting all the criteria of testable hypotheses with a full explanation
• design a controlled experiment, identifying the main variables	• design a controlled experiment, identifying the main variables and including all the accepted elements of good experimental design	• design a controlled experiment, identifying all the accepted elements of good experimental design, demonstrating an understanding of their influence on outcomes
• draw a conclusion, based on the results, which relates to the hypothesis and has some validity	• draw a valid conclusion, based on a sound interpretation of the results, which relates to the hypothesis	• draw a valid conclusion, based on a detailed interpretation of the results, which relates to the hypothesis
• identify some limitations and sources of error in the method and suggest some improvements.	• identify the main limitations and sources of error in the method and suggest some improvements.	• identify the main limitations and sources of error in the method and suggest appropriate improvements.

CRITERION 3 COLLECT, PROCESS AND COMMUNICATE INFORMATION

Rating 'C'	Rating 'B'	Rating 'A'
A student can:	A student can:	A student can:
• use a variety of relevant, up to date resources	• use a variety of relevant, up to date and reliable resources	• use a variety of relevant, up to date resources and critically evaluate their reliability
• attempt to document sources of information using the recognised scientific format	• correctly document sources of information using the recognised scientific format	• correctly document sources of information using the recognised scientific format
• attempt to reorganise information	• reorganise information in a logical sequence	• reorganise information in a clear, logical sequence
• attempt to select and use the appropriate scientific format for communication of information, raw data and processed data.	• correctly select and use the appropriate scientific format for communication of information, raw data and processed data.	• independently and correctly select and use the appropriate scientific format for communication of information, raw data and processed data.

CRITERION 4 DEMONSTRATE UNDERSTANDING OF THE APPLICATION AND IMPACT OF THE USE OF RESOURCES ON SOCIETY

Rating 'C'	Rating 'B'	Rating 'A'
A student can:	A student can:	A student can:
• demonstrate an understanding of the resource background to the issue	• demonstrate a good understanding of the resource background to the issue	• demonstrate a significant understanding of the resource background to the issue
• identify the main components of the issue and present a balanced discussion	• demonstrate a clear understanding of most of the components of the issue and present a balanced discussion	• demonstrate clear understanding of all the significant components of the issue and present a detailed and balanced discussion
• describe the connections between some of the relevant influences (ethical, political, cultural, social, economic) on the issue	• clearly describe the tensions and connections between most of the relevant influences (ethical, political, cultural, social, economic) on the issue	• clearly describe the tensions and connections between all of the significant relevant influences (ethical, political, cultural, social, economic) on the issue, showing an appreciation of the complexity of the issue
• form a reasoned conclusion, based on relevant evidence	• form a reasoned conclusion, linked to relevant evidence.	• form a reasoned conclusion, linked to relevant evidence, assessing the relative impact of influences on decision making.

CRITERION 5 DEMONSTRATE KNOWLEDGE AND UNDERSTANDING OF SCIENCE RELEVANT TO THE RESOURCE AND ITS DEVELOPMENT

Rating 'C'	Rating 'B'	Rating 'A'
A student can:	A student can:	A student can:
• describe the basic concepts involved in the science relevant to the resource and its development	• describe in detail the concepts involved in the science relevant to the resource and its development	• describe extensively the concepts involved in the science relevant to the resource and its development
• demonstrate understanding enabling them to explain the science relevant to the resource and its development	• demonstrate understanding enabling them to explain the science relevant to the resource and its development	• demonstrate understanding enabling them to explain the science relevant to the resource and its development
• demonstrate some application of their knowledge and understanding of the concepts involved in the science relevant to the resource and its development	• apply their knowledge and understanding of the concepts involved in the science relevant to the resource and its development	• apply their knowledge and understanding extensively to the concepts involved in the science relevant to the resource and its development
• discuss their knowledge and understanding of the science relevant to the resource and its development.	• analyse and discuss in detail their knowledge and understanding of the science relevant to the resource and its development.	• analyse and discuss extensively their knowledge and understanding of the science relevant to the resource and its development.

CRITERION 6 DEMONSTRATE KNOWLEDGE AND UNDERSTANDING OF TECHNOLOGY RELEVANT TO THE DEVELOPMENT OF THE RESOURCE

Rating 'C'	Rating 'B'	Rating 'A'
A student can:	A student can:	A student can:
• describe basic concepts used in technology relevant to the use of resources	• describe concepts involved in technology relevant to the use of resources	• demonstrate comprehensive knowledge of concepts involved in technology relevant to the use of resources
• demonstrate basic understanding enabling them to explain technology relevant to the development of the resource	• demonstrate understanding enabling them to explain in detail the technology relevant to the development of the resource	• demonstrate understanding enabling them to comprehensively explain technology relevant to the development of the resource
• demonstrate some application of their knowledge and understanding of technology relevant to the development of the resource	• apply their knowledge and understanding technology relevant to the development of the resource	• apply their knowledge and understanding of technology relevant to the development of the resource
• evaluate the impact of technology relevant to the development of the resource.	• evaluate and discuss the impact of technology relevant to the development of the resource.	• evaluate and discuss fully the impact of technology relevant to the development of the resource.

CRITERION 7 DEMONSTRATE KNOWLEDGE AND UNDERSTANDING OF RESOURCE MANAGEMENT

Rating 'C'	Rating 'B'	Rating 'A'
A student can:	A student can:	A student can:
• demonstrate basic knowledge of the role of science in resource management	• demonstrate detailed knowledge of the role of science in resource management	• demonstrate extensive knowledge of the role of science in resource management
• demonstrate basic understanding enabling them to explain the sustainable management of resources	• demonstrate understanding enabling them to explain in detail sustainable management of resources	• demonstrate extensive understanding enabling them to explain sustainable management of resources
• describe basic ways in which historical aspects of resource use may impact on resource management	• describe in detail ways in which historical aspects of resource use may impact on resource management	• comprehensively describe ways in which historical aspects of resource use may impact on resource management
• identify, discuss and recommend some basic scientific research needed to benefit future management of resources.	• identify, discuss in detail and recommend fully some scientific research needed to benefit future management of resources.	• identify, justify, recommend and extensively some scientific research needed to benefit future management of resources.

CRITERION 8 ANALYSE, INTERPRET AND DRAW CONCLUSIONS

Rating 'C'	Rating 'B'	Rating 'A'
A student can:	A student can:	A student can:
• describe relationships between variables presented in data in a variety of formats	• describe detailed relationships between variables presented in data in a variety of formats	• extensively describe complex relationships between variables presented in data in a variety of formats
• draw relevant, conclusions from analysing first and second hand data	• draw relevant, detailed, logical conclusions from analysing first and second hand data	• draw relevant, significant, logical conclusions from analysing first and second hand data
• provide some basic explanations from interpreting and analysing first and second hand data.	• provide detailed analysis , interpretation and evaluation of data from multiple sources.	• provide extensive analysis, interpretation and evaluation of data from multiple sources.

QUALIFICATIONS AVAILABLE

Applied Science – Tasmanian Natural Resources TQA 3 *(with the award of):*

PRELIMINARY ACHIEVEMENT

SATISFACTORY ACHIEVEMENT

COMMENDABLE ACHIEVEMENT

HIGH ACHIEVEMENT

EXCEPTIONAL ACHIEVEMENT

AWARD REQUIREMENTS

The final award will be determined by the Tasmanian Qualifications Authority from the 14 ratings (8 ratings from the internal assessment and 6 ratings from the external assessment).

The minimum requirements for an award in Applied Science – Tasmanian Natural Resources, TQA Level 3 are as follows:

EXCEPTIONAL ACHIEVEMENT (EA)

11 ‘A’, 3 ‘B’ ratings (5 ‘A’, 1 ‘B’ from external assessment)

HIGH ACHIEVEMENT (HA)

6 ‘A’, 6 ‘B’, 2 ‘C’ ratings (2 ‘A’, 3 ‘B’, 1 ‘C’ from external assessment)

COMMENDABLE ACHIEVEMENT (CA)

9 ‘B’, 4 ‘C’ ratings (3 ‘B’, 2 ‘C’ from external assessment)

SATISFACTORY ACHIEVEMENT (SA)

12 ‘C’ ratings (4 ‘C’ from external assessment)

PRELIMINARY ACHIEVEMENT (PA)

7 ‘C’ ratings

A student 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

Formal evaluation of the course will be undertaken during the second year of the accreditation. An evaluation report will be provided by the TQA.

The evaluations will focus on identifying any issues in regard to:

- the match between standards for achievement specified in the course and the standards demonstrated by students
- community confidence in the integrity and meaning of the qualifications
- access delivery and resources

and, if appropriate make recommendations regarding changes to the course.

COURSE DEVELOPER

Department of Education.

ACCREDITATION

The accreditation period for this course is 1st January 2009 – 31st December 2010.

VERSION HISTORY

Version 1 – Accredited 1st October 2008 for use in 2009 – 2010.