

# **four seasons in one day –**

**literacies in changing climates**

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## **Science Literacy For All - the CSA and SciWeb**

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"The journey for bringing science to the people is a marathon relay. The torch needs to be passed on regularly as the participants run their leg of the race. They pass on their wisdom, share experiences and take the torch one step further to its destination."

It is time to gather together adults who are teaching science, would like to teach science or are students of science and ask ourselves where to from here? What have we been doing? Has it worked? What can we do next to improve the science literacy of adults in our communities?

This is an opportunity to relate details of three new developments that are designed to assist literacy and science teachers alike in delivering science to adult learners, but more importantly to share experiences from the classrooms and workplaces and to use this feedback as a guide to formulating what we do next and how best to do it.

## Background

Science education has suffered over the last few decades with less and less students studying science subjects, from school level through to tertiary level. There is little science content delivered as part of adult basic education within either the TAFE or adult community education sectors. Investigations and reports have criticised school science practices and are recommending that action needs to be taken to address this poor state of science education. [For example, refer to the 2001 DETYA report "The Status and Quality of Teaching and Learning of Science in Australian Schools: A Research Report prepared for the Department of Education, Training and Youth Affairs," by Goodrum and Hackling, Edith Cowan University, and Rennie, Curtin University of Technology, DETYA, Canberra, 2001].

As well, the growing need for understanding science and technology in the workplace and community requires that adults have a broad understanding of science concepts. Many adults want a better grasp of science to understand, and to make informed decisions about their lifestyle, their environment and the kind of society and world they live in. Science and technology is often a key driver of change and adults often want a greater understanding of scientific advances effecting every area of their lives. Knowledge and understanding in science can help adults follow a broader range of further education and employment pathways. The Australian and global economy relies increasingly on scientific and technological developments and on a workforce skilled in these areas.

However, there are major issues to overcome in introducing and supporting increased science education into ACE and VET and in trying to address the problems facing science education and the level of scientific literacy in Australia:

- lack of awareness of the importance of science and technology
- the lack of PD and/or training for interested teachers (lack of trained and confident teachers of science means that at the lower AQF levels, the teachers most likely to introduce and teach science or aspects of science to students will be literacy or numeracy teachers.
- the lack of science materials written to support the learning and teaching of basic science or scientific literacy to adults.

We have been involved in the following three projects that we hope will help to address this situation:

- **Certificates in Science for Adults Framework-** including Certificates I, II and III for Adults,
- **SciWeb** - a scientific literacy site for adults.
- **CSA Website.**

## **The Certificates in Science for Adults Curriculum Framework**

During 2001 and into 2002, an innovative science curriculum was written in Victoria. Funded by the Adult, Community and Further Education, Victoria, a team of five people from CAE, ARIS and NMIT (Leonie Barber and Barbara Gleeson, Jan Hagston and Dave Tout, and Maria Santburn) came together to undertake the mammoth task of setting up a science curriculum framework for adults.

The flavour and philosophy aimed at in the curriculum was to make science relevant, interesting and fun and emphasise the need to understand and be critical about how science has impacted on our way of life, and, to encourage individuals and communities to engage in debate on scientific issues.

The *Certificates in Science for Adults* (CSA) are certificates primarily designed for adults who left school early and/or who did not pursue science at school and who now want to improve their knowledge, understanding and skills in science. The certificates can be delivered in TAFE Institutes, community based providers of education or schools. Some of the ideas behind the curriculum are that:

- "Scientific questions, issues and investigations should be derived from curiosity about everyday experiences
- adults should be able to read with understanding articles about science in the popular press
- adults should be able to identify scientific issues and activities within their own personal and local communities, including at work, as well as on a national and international basis
- adults should be able to express opinions that are scientifically and technologically informed and to engage in social conversation about scientific issues
- adults should be able to think about and question the quality of scientific information on the basis of its source and the methods used to generate it
- adults should know and understand scientific concepts and processes at the level needed for their everyday lives and experiences." (CSA framework p. xii)

## **Structure of the Certificates in Science for Adults**

The framework has a series of modules at each of the first three levels of the AQF. The science modules at each of the three levels are:

- Science in the Community
- Exploring Science
- Reading and Writing for Science (from the CGEA)
- Numeracy and Maths for Science (from the CGEA).

The aim is that science content be taught in a holistic manner, where aspects of learning outcomes from across all the modules are integrated. In this way the Reading and Writing and Numeracy and Maths modules are seen as underpinning the learning of the scientific content. Exploring Science modules give the scientific explanation of much of the science content that will be covered through the Science in the Community modules.

**Table 1. Structure of the Certificates in Science for Adults**

<b>Cert I in Science for Adults</b> 400 hrs	<b>Reading and Writing I</b> (from CGEA) 100 hrs	<b>Numeracy and Maths I</b> (from CGEA) 100 hrs	<b>Science in the Community I</b> 100 hrs	<b>Exploring Science I</b> 100 hrs	
<b>Cert II in Science for Adults</b> 400 hours	<b>Reading and Writing II</b> (from CGEA) 100 hrs	<b>Numeracy and Maths II</b> (from CGEA) 100 hrs	<b>Science in the Community II</b> 100 hrs	<b>Exploring Science II</b> 100 hrs	
<b>Cert III in Science for Adults</b> 500 hours	<b>Reading and Writing III</b> (from CGEA) 100 hrs	<b>Numeracy and Maths III</b> (from CGEA) 100 hrs	<b>Science in the Community III</b> 100 hrs	<b>*Exploring Science III.</b> (Module 1) 100 hours	<b>*Exploring Science III.</b> (Module 2) 100 hours

\*Exploring science level III has 5 modules from which the providers/learners choose 2

### Inside the Certificates - the science modules

**Science in the Community** is about the concepts, processes and skills that are needed to understand and be critical about how science has impacted on our way of life, and, as individuals and communities, to engage in debate on scientific issues.

**Exploring Science** is about the concepts and processes of science and using appropriate scientific language to express their understanding. At all levels the aim in these modules is to investigate science in context, not in isolation or out of context. It is meant to encourage the understanding and use of science in our everyday lives. At the top level of the certificate, AQF level III, five Exploring Science modules are offered, namely Earth and Space, Biodiversity and the Environment, Matter, Motion and Energy, Physical and Chemical Reactions, and The Living World. Learners/providers choose two of the five.

The learning outcomes in each module, cover a range of purposes and areas of scientific literacy and science content, and allow for a number of possible contexts to be investigated.

The assessment criteria within each learning outcome have been deliberately designed to describe what is required to be learned, in a way that emphasises the concept of scientific literacy. The assessment criteria in each learning outcome are organised into four categories:

- Scientific thinking and/or ethics
- Language and representation
- Practical scientific skills
- Scientific knowledge and understanding.

The first of these (Scientific thinking and/or ethics) is what sets the different tone of these certificates. The focus is on interpreting and questioning the meaning and relevance of science: its personal and community implications and social or ethical responsibilities and consequences. These criteria incorporate the ability to develop arguments, and participate in discussions surrounding scientific issues.

A range of supporting ideas to assist teachers is provided beside each learning outcome. This includes descriptions of possible assessment tasks, and more ideas for content and contexts that could be used in teaching the certificates. This section became affectionately known as 'the right hand stuff' and it sits on the right hand page of all the officialdom.

### Discussion in Science

One of the very clear intentions was to find a way of ensuring that the expectation, directive and the opportunity for discussion of science thinking and ethics was part of the certificates.

As a result the *first* assessment criteria in *each and every* learning outcome directs teachers to provide time and opportunity to discuss, argue and debate as well as *assess* the competency involved in doing so.

### Science, Mathematics and Technology

The framework and its certificates reflect the acceptance of these three disciplines as parts of an interrelated whole, forming a network that needs to be accepted both in the way we teach and learn about Science.

Now there is national recognition of these certificates, it is time for all teachers, enthusiasts and experts to find resources, partners and opportunities in their own community and join the science literacy journey.

### SciWeb: [www.aris.com.au/sciweb](http://www.aris.com.au/sciweb)

This site was funded under the ANTA Adult Literacy National Project by the Commonwealth government through the Department of Education, Science and Training. Two facilitators (Maria Santburn with support from DaveTout) worked with a small group of interested teachers (who were teaching science to adults), to develop and document examples of good science teaching activities (forty in all) that integrated and emphasised science literacy. This resulted in web pages with a bank of teaching ideas at different levels. The activities are also aligned to both the *Certificates in Science for Adults* and the *Certificates in General Education for Adults* (CGEA).

This science literacy site aims to:

- increase awareness of the place and importance of science, technology and scientific literacy for adults
- provide a range of freely available science teaching ideas and activities that support literacy, numeracy and ESL (and science) teachers and trainers in teaching science and technology through *science activities which integrate science concepts, literacy and numeracy*
- provide information about and links to other useful and related websites (e.g. museums, relevant associations and organisations, etc.)
- increase awareness of, and information about, the new *Certificates in Science for Adults*.

The site has three major components/sections:

**Adult Science Literacy**, which looks discusses the importance of science literacy, the role of science and making the scientific method clearer and more amenable to adult learners, so as to encourage more informed debate and discussion.

**Tried and True** houses the sample teaching activities. They are organised under the following categories:

- *Science Branch* (Biology, Chemistry, Earth and Space, Environment, Physics)
- *Themes* [How and Why, Senses to Instruments (Technology), Health & Well-being, Requirements of life, Environment and Heritage (Conservation), and Ten minute Science].
- *Templates* for developing your own activities.

**Connections** has information about appropriate and available:

- Educational Institutions
- Associations (e.g. Field Naturalists, Astronomy Society of each state, etc.)

- Places & Science (e.g. Museums, Science centres, Recycling plants, etc.)
- Relevant Web Sites.

**CSA Website: : [www.aris.com.au/csa](http://www.aris.com.au/csa)**

This website has been set up to promote and introduce the *Certificates in Science for Adults* (CSA) framework and to support teachers in delivering the modules of the certificates. This site offers examples of themes, topics, tasks and more importantly *sample assessment tasks* complete with documentation and record keeping templates.

The site has four main sections:

- [About the CSA](#)
- [Inside the certificates](#)
- [Resources and teaching activities](#)
- [Assessment](#)