

# Australian Engineering & ICT Education Support Network

Final Report Part 1 2013

Lead organisation: Australian Council of Engineering Deans

Partner organisation: Australian Council of Deans of Information  
and Communications Technology

Network leaders: Professor Robin King and Dr Tony Koppi

Report authors: Tony Koppi and Robin King

Project website: [www.arneia.edu.au](http://www.arneia.edu.au)



## Network summary

### Network objectives

The Network project built on the four themes of the previous discipline support strategy project that arose from the studies of Engineering and ICT higher education in Australia (King, 2008; Koppi and Naghdy, 2009; Godfrey and King, 2011, Koppi et al, 2013). In summary, the proposed activities were:

- (i) **Educational leaders forums:** including Associate Deans (L & T) and others from amongst the institutional membership of ACDICT and ACED. The objective of these forums was to share educational experiences in key areas, and develop ideas for future forums and workshop topics, and scope collaborative project proposals.
- (ii) **Workshops on “Learning to Teach in Engineering and ICT”:** in the form of short workshops, principally for new academic staff, and to train a network of facilitators.
- (iii) **Dissemination workshops:** seminars, forums and workshops to disseminate the outcomes of ALTC and OLT-funded and other education projects addressing the needs of both Engineering & ICT.
- (iv) **Resource portal usage:** promote the use of resources and tools provided via the Academic Resources Network for Engineering and ICT Australia ([arneia.edu.au](http://arneia.edu.au)).

In addition, options for sustaining these developments were to be developed by the relevant Deans Councils (ACED and ACDICT).

### Deliverables and outcomes

As noted above, the Network funding was used to support **activities**. These were intended to underpin enduring **outcomes** in improvements in teaching practice, including its conceptualisation, leadership and management. Tracking classroom teaching improvements resulting from the Network activities was, however, beyond the scope of the funding and its duration. Individuals’ and institutions’ teaching improvements are measurable by student surveys and other instruments. Both ACED and ACDICT may also track and publish aggregated data, such as that from graduate surveys and course experience questionnaires, that are indicative of improvements in teaching. Brief comments on the activities and outcomes are provided below

**Annual education leaders forums** were held in Engineering (as satellite events of the Australasian Association for Engineering Education Conference: AAEE) and in ICT (as events (of the ACDICT Learning and Teaching Academy: ALTA Forum). These forums typically disseminate the outcomes from other education projects that address the needs of Engineering and ICT, and plan collaborative work for future OLT Project Grants and other educational initiatives. A **systemic outcome** is the expectation of having regular activities and action-oriented national forums for the key individuals responsible for leading educational improvements.

**Teaching & learning workshops** of 1 – 2 days duration were held in **fifteen institutions** in each state, with a total of 263 participants. Their response was overwhelmingly positive. The **outcomes** of the workshops on participants’ teaching practice should also be positive, but it was beyond the scope of the Network funding to explore this. .

To enhance the sustainability of these workshops beyond the Network funding period, **three regional workshops on sustaining improvements** were held in Melbourne, Sydney and Brisbane for staff responsible for the quality of staff teaching in Engineering and ICT. A **manual** for these staff was produced and is available on the website. Tracking participants' (and others) use of this resource was beyond the scope of the Network funding, but could be followed up in leaders' forums and other events run by ACED and ACDICT.

**Three ALTA Fellows** ran a number of Network events (including revival and expansion of computing Conventicles), that are strengthening the ICT higher education community. Their work and influence will extend beyond the Network funding period.

The **resource portal** ([arneia.edu.au](http://arneia.edu.au)) provides access to resources used in all of the network events, a wide range of Engineering and ICT education projects, and exemplary teaching practices and materials. The use of the portal is widely promoted, and its future has been secured by funding commitments from ACDICT and ACED. The emergence of MOOCs (often from computer science), remote laboratories (in Australia, being led in engineering), and other contextual factors influencing higher education, is leading engineering and ICT academics teachers towards more effective sharing of materials, that in turn, provide an impetus for maintaining the portal to a high standard.

## Contribution to learning and teaching

The Network leaders have taken the view that students' learning in Engineering and ICT requires educators to focus both on improving pedagogy and on embracing emerging issues of program focus and content. As a program of the two dean's councils, the Network has also been inclusive of all of the universities that offer Engineering and ICT programs. Events have been provided at many smaller and regional campuses, as well as in the capital cities. The apparent bias towards supporting individuals and activities in the ICT discipline reflects relative need, engineering having stronger positions in the scholarship and practice of education and more robust support systems in Australia, most visibly the appointment of several 'professors of engineering education' and the Australasian Association for Engineering Education (AAEE), now in its 25th year. Nevertheless, there is considerable need in both Engineering and ICT to improve and spread understanding and adoption of contemporary educational knowledge and good practice.

## Workshops on improving learning and teaching in Engineering & ICT

### 'Institutional improvement' workshops

Our earlier experience indicated that these workshops would be more successful if they were adapted to the specific needs of institutions. Between June 2012 – July 2013, and after negotiating their duration and focus, fifteen 15 institution workshops (12 one day, 3 two day) were held for local teaching staff, sometimes including tutors. The workshops were facilitated by Dr Sue Wright and assisted by Dr Tony Koppi.

The workshops explored improving teaching in Engineering and/or ICT, usually with a focus on staff with little or no teaching experience or formal knowledge of pedagogy. One workshop also focussed on preparation of students for professional practice experience.

Staff were mostly from Engineering and ICT, but because many schools in smaller universities include other disciplines, but they sometimes included individuals from related disciplines. In total there were 263 participants.

The 263 participants' evaluation revealed that each workshop was found 'useful' or 'very useful' (4-5 out of 5) and extremely rarely (only 2 participants) was their workshop rated as 3 out of 5. They also declared that the workshops provided benefit from working with like-minded colleagues in a discipline contextual workshop that provided an environment not usually available to them at their local institution. Each workshop facilitated the development of a local support group (community of practice) that may continue to network. It was beyond the scope and timeframe of the network funding to follow up whether participants have subsequently networked, and exploited their learning from the workshops in their teaching practice.

### 'Sustaining improvement' workshops

To underpin sustaining the institutional improvement workshops, and toward the end of the funding period, Dr Wright and Dr Koppi presented further three workshops designed to assist participants to become workshop facilitators within their institutions. These aimed specifically at individuals with responsibilities for the quality of learning and teaching in their discipline. The workshops were held in Sydney, Melbourne and Brisbane and attracted a total of 26 participants from 10 universities. Almost all of the participants rated the value of these workshops at 5 out of 5.

These sustaining improvement workshops responded to the requests for topics and issues from each participant (they were surveyed in advance). A key outcome for each participant was the development of a plan for a workshop that they intended to hold at their local institution. The titles of these workshops developed by the participants (working in pairs, and critiqued by all participants) demonstrates the wide breadth of interest:

1. Training industry software professionals as mentors for students
2. Efficacious approaches for online teaching of remote students
3. Use of ePortfolios to promote student responsibility for learning
4. Development of research methodologies and graduate attributes for capstone projects
5. Issues and challenges in discipline-based education research
6. Improving transnational teaching
7. Effectively training support staff to assist student learning
8. Developing an online presence to support learning
9. Integrating work integrated learning with business analysis and design
10. Flipping the classroom to help with the equivalence of overseas teaching
11. Exploring the flipped classroom model
12. Effective aligned assessment for higher order thinking
13. Implementing PBL for higher order learning
14. Improving student responsibility for learning
15. Making it attractive for students to attend classes
16. Identifying optimal blended learning approaches
17. Understanding the generation gap

18. Implementing flipped classrooms by flipping workshops
19. Use of Mazur ConcepTest to improve learning in large classes

To help the intending workshop facilitators develop and run their own workshops in future, Dr Wright has prepared a manual with rationale, strategies and templates. This is available on [arneia.edu.au](http://arneia.edu.au). A key piece of advice is not to go it alone, rather find a partner and mentor amongst peers to help with development and dissemination.

## Conventicles to improve learning and teaching in computing and ICT

A 'Conventicle' is a one-day annual conference that aims to bring together and support academics who are researching learning and teaching in the computer science and information technology disciplines, or who are using computer technology in their teaching. Conventicles provide opportunities for sharing of ideas and innovations; for discussion of research directions; and for development of collaborations. The Melbourne Conventicle has been in existence for nine consecutive years (9<sup>th</sup> Conventicle in 2012) but in other capital cities they had ceased or were non-existent. Supported by the Network project, one of the ALTA Fellows (Dr Simon, University of Newcastle) revived or started the conventicles in Sydney, Brisbane, Perth and Adelaide, during November and December 2012, with 78 participants. (The Melbourne event had 66.) Conventicles have been planned for the summer 2013/14 in these five capital cities.

## Networking events by ALTA Fellows

The Network funded ACDICT Learning and Teaching Academy (ALTA) Fellows to lead activities to promote learning and teaching in ICT. One such planned activity was for a program of visiting remote institutions because local staff often miss out on capital city-based networking opportunities. Only one such event materialised with two ALTA Fellows (Dr Nick Falkner, University of Adelaide and Dr Simon) visiting CDU in July 2012 to talk with local staff about initiatives and advances in computing education.

Dr Falkner also networked and consulted with ICT staff about the future strategies for furthering ICT education in several locations including Swinburne, RMIT, Tasmania and CDU (as noted above). A common finding was that research in learning and teaching would be greatly assisted by the use of a targeted Field of Research code in ICT education (08XX).

The third ALTA Fellow, Dr Elena Sitnikova (University of South Australia) held several workshops in 2012 and 2013 particularly concerned with preparing students for work-integrated learning. These increased their impact by being attached to the Australasian Association for Engineering Education (AAEE) and the Australasian Computer Science Week (ACSW). Dr Sitnikova also presented at various events promoting the participation of women in ICT and Engineering, and has recently been awarded a UniSA Citation for Outstanding Contributions to Student Learning.

## Educational Leaders Forums

The Network has promoted and supported meetings of Associate Deans for Learning and Teaching (and other Educational leaders) in both Engineering and ICT. For several years the

annual Engineering meeting has been held as a one-day satellite event of the annual conference of the Australasian Association for Engineering Education Conference (AAEE). The corresponding 2-day meeting for ICT leaders is held under the auspices of the ACDICT Learning and Teaching Academy (ALTA), as the annual ALTA Forum.

These meetings enable their participants to share and discuss system-wide issues that are impacting on learning and teaching. Topics discussed at recent meetings include:

- The higher education environment and the impact of ERA
- Massive Open Online Courses (MOOCs)
- The flipped classroom
- Enhancing L&T through industry engagement
- Meeting the requirements of the AQF (e.g. meeting the research component of 4-year Bachelor Honours degrees in Engineering)
- Benchmarking
- Development of best-practice guides for program coordinators, associate deans, etc.

Emphasis at these events is showcasing exemplary practices with presentations to act as triggers and identification of key issues. Progress reports and outcomes of national or local educational projects are also featured. These projects may have been funded by the OLT, local university grants or through grants from ACED and ACDICT for enhancing learning outcomes or educational practice (such as constructive alignment and program mapping).

Looking specifically to emerging demands on graduate engineers, the Network also provided support for a symposium on leading Sustainability Education Engineering (in December 2012) and provided subsequent support for a 2-day event for educators and industry practitioners to establishing a national network of educators in Sustainability Engineering. As for other topics, this featured a current OLT Project, and may, in turn, lead to a future OLT Project Grant application. Network funding was also used to provide partial support for specific workshops on important educational issues and activities at national engineering and ICT conferences.

## arneia.edu.au

The Academic Resource Network for Engineering and ICT Australia (ARNEIA) website was originally designed to support educators and enhance learning and teaching in Engineering and ICT by providing convenient access to:

- A directory of contacts with discipline-based learning and teaching champions
- Resources created by academics
- Academic projects that are in progress or have been completed
- Funding opportunities from various organisations
- News of recent significant developments
- A calendar of learning and teaching events
- Exemplary teaching practices

This last feature was added in the last year with the intention of showing how local practitioners overcame specific teaching problems in a way that would enable others in the same discipline to adapt the solutions utilised.

During the last year (since October 2012) there were 1,268 visits to ARNEIA.edu.au of which 909 were unique visitors, i.e. 28% were returning visitors. A total of 4,339 pages were viewed during that year. While the numbers could always be larger, the data indicate a steady usage with a reasonable proportion of return visits. ACDICT has committed to continue to provide the initial funding to support the website.

## Factors contributing to productive networking

### Network achievements

The network achievements can be summarised as follows:

- Providing more network opportunities through workshops, forums and conventicles.
- Bringing together discipline-based academics to reflect and talk about learning and teaching.
- Demonstrating the implementation of learning theories into everyday practices.
- Providing of a manual for peer-based learning and teaching improvements.
- Providing education resources for the academic Engineering and ICT community through arneia.edu.au and at face-to-face events.
- Contributing to a community of practice in ICT education.
- Facilitating collaboration between like-minded academics.
- Raising awareness of common teaching issues across the disciplines.
- Providing exemplary teaching practices in an adaptable format.
- Including tutors as part of the academic community.
- Providing sustainable improvement capabilities by empowering academics responsible for the quality of learning and teaching.
- Ensuring that ACED and ACDICT continue to support arneia.edu.au

### Methods of networking that worked well

The methods of networking that worked particularly well were concerned with addressing the issues and challenges faced by discipline-based teaching academics within a supportive environment. The 'free to participants' (Network supported) institutional workshops facilitated by cognate external 'experts' proved to be a draw card for improving learning and teaching in engineering and ICT.

### Recommended network methods

Ensuring that people realise there is a personal gain in attending a Network event by clearly answering at the outset the perennial question: "what's in it for me?" Success breeds success; successful outcomes from an event can be used to advertise the next event, and

ensure positive word of mouth recommendations. The credibility and perceived worth of a Network event is enhanced by external support and authority of sponsors such as the OLT.

## Barriers to productive networking

### Challenges experienced by the Network

Challenges experienced by the Network are very much governed by general challenges outlined below. In addition there are local and personal issues affecting academic attention to teaching improvements. The 'institutional workshops' to improve learning and teaching in engineering and ICT conducted at 15 universities as well as the 'sustaining improvements' workshops at a further 3 universities gave the workshop facilitators a unique perspective of teaching in these disciplines. Observations include:

- Voluntary attendees at workshops are 'the converted' who are already engaged in reflections on teaching.
- Attendees often remarked that the people who would benefit the most from the workshop being conducted were not present.
- While innovations are employed, the majority teach as they were taught whilst recognising that improvements are needed.
- Education theory that should underpin practice is mostly fragmented, and imperfectly understood and implemented.
- Collective educational knowledge by workshop attendees is high and group work enabled peer sharing and teaching.

It is clear that learning about teaching within the engineering and ICT disciplines would continue to benefit and improve by facilitated workshops that built on collective knowledge that address personal challenges.

As making major improvements in learning and teaching is not a top priority for many academics (see below), the usage of learning and teaching resources afforded by ARNEIA.edu.au is modest.

### Challenges of networking in general

A general challenge for an individual academic to engage in a Networking event is the perceived return on the time invested. Whilst those who participate in physical events usually gain value from the event and the networking experiences, there are time and priority barriers to participation. This prevents many academics from participating in activities to improve their teaching. A low priority for learning and teaching prevails in the current higher education environment.

Currently universities (and most of their leadership) are focused on ERA and improving their research profile. In this environment, teaching quality is less of a priority. This does not help improvements in practice or education research to inform teaching.

In both the Engineering and ICT sectors, educational research has no Field of Research within the discipline codes (08XX/03XX). As found by consultations in the sector by an ALTA Fellow, research in learning and teaching in ICT would be greatly assisted by the use of a



targeted Field of Research code in ICT education. Similar points have been made by the Engineering education community.

## Solutions to the challenges experienced

A reasonable number of teaching staff was attracted to attending the learning and teaching improvement workshops. Apart from the attraction of 'free' externally facilitated workshops, invitations were targeted at the Associated Deans for Learning and Teaching (ADLT or their equivalent) who are responsible for the quality of teaching. It was clearly in their interest to encourage local participation. In addition, the workshop topics offered were recognised as being of local concern, e.g. group work in a multicultural environment; and methods of engaging a diverse range of students. Cultural aspects of teaching were always popular topics because they are problematic.

The website, [arneia.edu.au](http://arneia.edu.au), was always featured at workshops where workshop resources could be found, such as the manual for running your own workshop. This manual will gain currency in time. The challenge of maintaining [arneia.edu.au](http://arneia.edu.au) has been met by ACED and ACDICT.

Apart from offering network opportunities, the Educational Leaders forums (at AAEE conferences and ALTA Forums) included topical and higher education environmental issues that were useful to the ADLTs .

## What the network offers

The Network offers on-going benefits to stakeholders through:

1. The established annual L&T Conference in Engineering (AAEE) and ALTA Forum for ICT both of which the network project has helped consolidate
2. The development (training) of discipline-based workshop facilitators in improving L&T in Engineering and ICT
3. The resources and facilities offered by [ARNEIA.edu.au](http://ARNEIA.edu.au), including:
4. A directory of contacts with discipline-based learning and teaching champions
5. Resources created by academics
6. Academic projects that are in progress or have been completed
7. Funding opportunities from various organisations
8. News of recent significant developments
9. A calendar of learning and teaching events
10. Exemplary teaching practices

Ongoing support provided by ACED and ACDICT, as their funding permits, will enable the Network and its activities to progress and evolve in response to changing community needs.

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