



Australian Government



Office for  
Learning & Teaching

# Chemistry Discipline Network

Final Report 2013

Queensland University of Technology

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**Chemistry**  
DISCIPLINE NETWORK

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Funding for the production of this report has been provided by the Australian Government Office for Learning and Teaching. The views expressed in this report do not necessarily reflect the views of the Australian Government Office for Learning and Teaching.

## Network summary

The Chemistry Discipline Network was formed to improve the teaching of chemistry at Australian Universities through the creation of a community of practice among chemistry academic staff. In addition, we were tasked with overseeing the implementation of the Threshold Learning Outcomes (TLOs) for Chemistry, which were published at the time of our formation (late 2011). We have close links to the Royal Australian Chemistry Institute (RACI) and our members have worked on linking the TLO process to the RACI accreditation process for chemistry degrees.

### Network Outputs and Deliverables

- A landscape profile of the entire chemistry curriculum taught across 12 institutions around Australia in 2011. This profile reveals both similarities and important differences in content taught and provides a starting point to inform discussion of what content should be taught, within TLO 2.1. An updated map is being completed for 2014.
- A detailed map of the whole chemistry degrees at three Australian institutions in 2011 against the chemistry TLOs. This map shows that work needed to be done to ensure that all TLOs are taught and assessed, and some TLOs seem to be particularly problematic, such as 1.1 (nature of science) and 5.3 (ethics).

These two outputs are described in detail in a paper in the *International Journal of Innovation in Science and Mathematics Education*.<sup>1</sup>

- A website including a calendar of upcoming events, discussion fora and a resource repository. The website has both public areas (for the calendar and released reports) and login areas (for minutes of meetings, discussion fora and internal information).
- Seed funding of seven small projects (\$1 K) at seven different Australian institutions to help chemistry academics conduct and publish the results of chemistry education projects, our Catalyst Grants. The funded projects were diverse in scope, aims and institutions and are still in progress; short reports are included as an appendix.

### Outcomes resulting from these deliverables include

- Significant progress in defining and clarifying the nature and extent of the chemistry-specific TLOs, TLO 2.1 (principles and concepts of chemistry) and TLO 3.3 (laboratory practice). These outcomes resulted from a series of face to face meetings of chemistry academics held during 2012 and 2013 and are published as the Chemistry Academic Standards Statement by the Office for Learning and Teaching. One of our members, Kieran Lim from Deakin University, wrote an article about this process for the magazine of the RACI, *Chemistry in Australia*.<sup>2</sup> The mapping output informed further discussion, particularly on the TLOs found to be problematic. The TLO implementation effort is

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<sup>1</sup> Schultz, M., Mitchell Crow, J., & O'Brien, G. (2013). Outcomes of the Chemistry Discipline Network Mapping Exercises: Are the Threshold Learning Outcomes met? *International Journal of Innovation in Science and Mathematics Education*, 21, 81-91.

<sup>2</sup> Lim, K. F. (2013). Threshold Learning Outcomes. *Chemistry in Australia*, Mar, 35.

continuing through a 2014 OLT Innovation and Development grant to a team of Network members led by Siggie Schmid at the University of Sydney.

- Multiple connections between individual academics around Australia that will outlast the Network. These are difficult to quantify but will be evident in future chemistry education publications and OLT grants, including the TLO grant mentioned above.
- Increased awareness of the scholarship of learning and teaching among Network members and their colleagues, as results and findings are disseminated through the Network. The modifications to teaching strategies, including use of peer instruction, clickers and active learning techniques due to Network influences are also difficult to quantify but real.
- Creation of an inclusive, cooperative and open community of practice within the chemistry education community in Australia.

The final outcome represents the core achievement of the network, it has been described in an article in the newsletter of the Higher Education Research and Development Society of Australasia<sup>3</sup> and in two Chemistry in Australia articles.<sup>4,5</sup> The outcomes of our first year were also described in a paper published in a special issue of the Australian Journal of Education in Chemistry, on Networks in Chemistry Education.<sup>6</sup>

## Contribution to learning and teaching

The Network has contributed in many ways to the learning and teaching of chemistry at Australian universities, including providing fora for discussion among chemistry academics. These fora include monthly skype meetings, online discussion fora and multiple face to face meetings, both at the Australian Conference on Science and Mathematics Education and three dedicated working group meetings. Through the exchange of ideas in these fora, individuals have modified both their teaching strategies (eg using POGIL or clickers or lecture demonstrations) and content (eg using different laboratory experiments).

The Network has also encouraged research in the Scholarship of Teaching and Learning in the area of tertiary chemistry, both by enabling people with similar interests to connect formally and informally, and through funding eight small Catalyst grants for members to complete and publish their projects.

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<sup>3</sup> Schultz, M. (2012). The chemistry discipline network: background, benefits and challenges. *HERDSA News*, 35, 4-5.

<sup>4</sup> Schultz, M., & Mitchell Crow, J. (2012) Networking for the next generation. *Chemistry in Australia*, Feb, 38.

<sup>5</sup> Schultz, M. (2013) Mixing research and teaching, *Chemistry in Australia*, Jul, 30-31.

<sup>6</sup> Mitchell Crow, J., O'Brien, G., & Schultz, M. (2012). The Chemistry Discipline Network: One Year on. *Australian Journal of Education in Chemistry*, 72, 6-8.

One of our goals was to engage with and improve communication between academics at smaller, regional universities who are often isolated and in small chemistry departments. Academics from UNE, JCU (Cairns), Ballarat and SCU joined the network, attended several of our meetings and discussed their teaching with others, evidencing the impact of the Network in this area. Three of the seven Catalyst grant holders are at regional universities.

## Factors contributing to productive networking

The Network achieved an unprecedented level of inclusiveness, with a final total of 130 Network members, all of whom hold chemistry academic positions around Australia. All of our face-to-face meetings included members from at least 12 different institutions and several meetings had over 30 attendees, representing over half of the Australian universities at which chemistry is taught. This excellent turnout allowed the Network to discuss issues for regional universities, non-research intensive universities, as well as research-intensive (including Go8) institutions. This level of engagement reflected a need for some mechanism to bring academics together to share ideas and perspectives, which the Network met.

Crucial to the success of the Network was an active and energetic champion who was able to progress Network goals, host skype meetings and keep things running even during busy teaching periods. Communication, and particularly sharing information obtained through a wide variety of channels, via monthly emails, kept the Network moving. Although all academics receive many emails, we are also adept at prioritising and replying to important messages. Keeping the emails to the whole Network monthly meant that they were neither too long nor too frequent.

## Barriers to productive networking

There were two major factors that represented significant barriers to networking in Australia and the Network enabled opportunities to overcome these with mixed success.

### ***Distance***

The sheer scale of Australia is a challenge for arranging face-to-face meetings but this hurdle was evident even within the same city. Combined with the hectic academic calendar it was difficult to have virtual or face-to-face meetings with a large number of members simultaneously. This meant that some members had to rely on second hand information about the outcomes rather than contributing directly to the workshop meetings.

Our attempts to breach the distance included regularly scheduled skype meetings, with a reminder sent the day before, so that anyone who was available could attend. This resulted in turnouts up to 18 people. We also held multiple face-to-face meetings and covered travel costs for some of these to ensure a representative turnout. Finally, we scheduled our general meetings to coincide with the Australian Conference on Mathematics and Science

Education, to which a reasonable number of our members were already travelling. In addition, at each of those meetings, a list was prepared of all chemistry academics in the host city (2011: Melbourne, 2012: Sydney, 2013: Canberra) and a personal invitation was sent to each of those people. This allowed people who had previously had no contact with the Network to participate in a meeting and become involved in the Network and in all cases a number of locals did attend.

### ***Time***

The monthly skype Network meetings provided an opportunity to overcome the issues with distance; however, the fluctuations in numbers reflect the demands on academics' time and the difficulty in establishing a common time that is valid across a 12 month academic calendar. Participants engaged when they were not teaching, and feedback indicated that they valued the opportunity to have this option for discussion. Detailed minutes and other notes covering the outcomes of all of our meetings (including minutes of the skype meetings) were made available on the website for those unable to attend.

Activity on our website was much less than originally envisioned; although 60 members registered for log in and password access, the discussion fora were used by less than 15 members in total. It seems with all the other calls on their time, academics do not have time to engage in such asynchronous discussion of their teaching issues.

## **What the network offers**

The Chemistry Discipline Network can be a mentor and matchmaker to people new to educational research. It includes a massive repository of experience in the members who are senior in the Australian chemical education community and who have been publishing in the Scholarship of Teaching and Learning (SoTL) for many years. For academics who are new to SoTL and for those who have already been working in the field, the Network has proved to be a way to generate fruitful discussions and to get to know people (in person and virtually).

The Network also offers a central point of contact to the large group of Australian chemistry academics who are interested in improving their teaching. This group includes research-intensive and teaching-focussed academics at all levels. Using the Network as an organiser has allowed the process of elucidating the TLOs to be inclusive and representative. The Network has been recognised both by the Royal Australian Chemical Institute and the Australian Council of Deans of Science as the key player in establishing standards and assessment of threshold learning outcomes, and helping develop new accreditation standards.