



## Learning generic skills in first year chemistry

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### University generic attributes

Students entering first year University chemistry are, in general, focused on learning the chemistry content of the course, rather than the generic skills that they acquire along the way. In fact, students are generally unaware that generic skill development is occurring. In contrast, employers are often more interested in the generic skills of the graduates than their specific discipline knowledge.

The University of Sydney lists the generic attributes of its graduates include: knowledge skills; thinking skills; personal skills; personal attributes; and practical skills. The degree to which these skills are developed depend on the context (subject and level of study) but we believe that they all may be developed in the first year chemistry curriculum.

### Generic skills in chemistry

The lectures that are attended by all first year chemistry students will not only increase their knowledge base, they will enhance the students' ability to access and organise the information and knowledge obtained ('research' skills). These skills will be augmented further by the use of the course textbook(s) to retrieve extra information and supplement the learning accomplished in lectures. Laboratory classes are beneficial for many reasons; first and foremost the students will be required to work effectively in small groups or pairs, increasing their teamwork and interpersonal skills. They will also be able to obtain and reinforce information via experimental work, discussion with their peers, and by questioning their tutors; these are, as above, valuable research skills. Practical classes also require students to provide explanations for their results, thus allowing students to utilise skills such as critical and empirical thinking, providing evidence for assertions, logic, and problem solving ('independent thinking' skills). Also, in order to convey their results and understanding to their tutors, students must use communication skills, particularly in writing coherent responses to questions asked of them on their results sheet.

Assessment techniques – examinations, assignments, reports, presentations and the like – can be used to gauge the level of skill possessed by students. An end-of-semester examination may require students to use skills such as critical and theoretical thinking, logic, problem solving, and identifying, accessing and organising information and knowledge. For examinations where written responses (either in short answer or essay form) are required, communication skills such as coherent structuring of ideas and the use of accurate evidence and data are important. Self-management skills such as self-assessment, self-discipline, time management and stress management skills are of particular importance in the lead-up to an examination period, where students often make study their top priority. Students who have developed effective teamwork and communication skills during the year may be able to make use of study groups to assist in their study, and revision may also be supplemented by the use of other information sources (e.g. textbooks, the Internet, or information gathered in laboratory classes).

It is a concern, however, that students may concentrate on passing examinations using methods that emphasise short-term or limited understanding (Johnson, Herd and Tisdall 2002). 'Rote-

learning' or 'shallow learning' can be difficult to eliminate; even students who initially intend to understand the material might opt to 'take the easy way out' when it comes to the stressful period of end-of-semester study. However, a student's approach to learning can depend on how they perceive their studies – that is, their view of the quality of teaching, the clearness of their goals, the nature of the subject assessment, and other related factors. Therefore, the use of student-centred teaching strategies that emphasise critical thinking can encourage students to develop a more in-depth and long-term understanding of the subject content, with the added benefit of increasing the awareness of generic skills.

Surveys have shown that students often are not aware of generic skills, or report that their chosen degree has not enhanced their skills to the level required of them by employers (Paton 1996). To make students aware of their skill development, a number of initiatives have been introduced in first year chemistry this year:

- staff have been encouraged to highlight the skills being targeted within the context they are teaching;
- posters have been placed in the laboratories highlighting the skills that may be acquired through the laboratory program; and
- the First Year web site has been linked to a page of information and an illustrative cartoon on generic skills.

### References

- Johnson, E., Herd, S. and Tisdall, J. (2002) Encouraging generic skills in science courses. *Electronic Journal of Biotechnology*, **2**, 2.
- Paton, M.-A. (1996) *Generic Skills Survey*. Careers Advisory Board, The University of Western Australia. [Online] Available: <http://www.csd.uwa.edu.au/tl/skills/summary.rtf>.

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