Threading Career Skills into Classrooms

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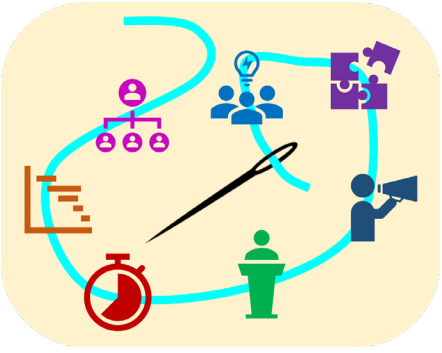
*Chemists make crucial contributions to society and are often found in broad range of workplaces. To sustain these impactful contributions, a diverse range of career skills must be embedded into the curricula.

When formulating a chemistry degree, the consideration of career skills is central to this process, as all courses aim to ensure graduates have exceptional employability prospects. The balance of packing the curricula with all the key theoretical and practical content that is fundamentally essential to a chemistry degree is often at the cost of neglecting the skills necessary for today's job market and that of the future [1]. This has led to career skills gaps between what students are learning and what employers are seeking in new graduates.

Employability Skills

Various studies engaged with employers have explored the essential career skills that can enhance employability of science degree graduates [2, 3]. Career skills such as communication, problem-solving, teamworking, practical and numerical skills are often widely found embedded within chemistry curricula. However, higher level diverse skillsets, are often lacking in BSc and MSc chemistry graduates such as, organisational skills, management skills, entrepreneurship, commercial awareness and multicultural/diversity awareness. It is vital to introduce such important skills as they could significantly enhance the career prospects for future chemists, but how to embed them into the curriculum is often puzzling.



Work-Integrated Learning

Work-integrated learning is the practice of combining traditional academic study with exposure to the world-of-work. Work-integrated learning can be delivered through a variety of educational approaches, with the goal of providing students an authentic work experience where they can apply/test their knowledge and skills. Examples of work-integrated learning include internships, field work, sandwich year degrees (a degree which involves a year in industry usually after the second year of study), job shadowing, experiential visits, invited talks and cooperative education [4].

These current widely used approaches to work-integrated learning provide limited hands-on experience, are time constrained and may only be able to accommodate small groups of students, making the experience less useful with lower accessibility across the student body [5, 6]. Current opportunities are very selective too, often requiring high grades and an interview, which further reduce their capacity to be inclusive. Therefore, a more creative structure that develops career skills in a way that it is inclusive to every student learning chemistry is required. This can be achieved by creating on-campus workplace activities.

A Case Study

For the past 10 years, we have run an analytical chemistry practical class, which we redesigned to embed organisational skills, management skills and commercial awareness. The main emphasis of this work-place activity was to build the students' awareness of marketing. Students worked in groups to establish a company whose main aim was to sell a new chromatography stationary phase. Groups would then compete against each other to secure a contract to lead the marketing campaign of their product. Students were given two different stationary phases: one was a new development; while the other was an existing commercial stationary phase, which they needed to compare against.

Students would have to manage their team through multiple interconnected tasks running throughout a single assessment week. Within the laboratory, students had to evaluate the key performance benefits of the new chromatographic stationary phase compared to its existing competitor. When in the laboratory, students were not given any laboratory instructions for what to measure and thus had to consider which experimental variables they would alter to assess the new stationary phase. This experimental data was then used to create a host of promotional communication tools such as marketing flyers and infomercials. Lastly, each group had to provide a brief pitch to a board of marketing and technical representatives. They were a mix of academic and industrialists in the field of separation sciences, who were contacted to assist in the activity. Each group were given feedback directly after they provided their pitch, and an overall winner was chosen from the performance in the pitch and assessment of the marketing materials. A final session with the entire class was also run to reflect on what was done well and where improvements could have been made by sharing best practices. This activity has layers upon layers of work-related skills, (such as teamworking, time-management, leadership, creativity, commercial awareness, organisational and various types of communication skills) challenging the students to think from varying perspectives, which are often overlooked in a classroom setting, and in a creative fashion to effectively promote new products.

For multiple years now, we have asked our graduates to reflect on the impact of

this work-integrated class. When reflecting on the impact of this single activity, graduates indicated that the real-life work-based content of this specific activity aided their employability and played a part in helping them secure a job [7]. Considering we rebranded what still is an analytical chemistry practical class, we were excited by the impact of our activity.

Implementing Change

It is clear we need to be more creative on how we develop career skills in the chemistry curricula. This encompasses providing more diverse skills and better immersive experiences of real-life work. Strategic creative design of existing classes and assessments to provide opportunities for chemists to develop and showcase career skills is something that should be considered. Examples include more diverse assessments such as product portfolios, pitches and videos, as well as focusing on activities that are time-limited to provide a competitive element. Considering change within practice sessions also can thread in new career skills. For instance, one can incorporate elements on workflow and time, which are critical to working efficiency and assessing the accuracy of results.

To thread a wider range of career skills into the classroom, work-integrated learning as a core process in this journey is vital, given this approach provides a unique and inclusive way to develop a vast array of career skills within classroom and practical classes.

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Competing interests
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