

Employability and lifelong learning: education in a rapidly changing world

Incorporating Reaxys® into curricula fosters skills to find, validate, process and communicate information



The University of Queensland, Brisbane City, Australia



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Universities around the world must prepare the next generation of scientists with the skills to manage today's pace and volume of information. Working together, librarians and faculty explore ways to give students access to digital information assets and experience with search engines to refine their proficiency in querying documented knowledge. Librarian Kellie Ashley and Professor Jack Clegg at the University of Queensland (Australia) describe the relevance of using platforms like Reaxys to foster an understanding of how information is found and validated.

In 2020, David Peetz wrote the following about predicting the jobs of the future: “The further you look ahead, the less useful the present is as a guide. This is especially the case in employment because, in a quickly changing world, technology is hard to predict and changing consumption patterns even harder.”¹ More than any other generation, today’s graduates enter a high-turnover market where some jobs are quickly cast aside while demand for unforeseeable new jobs explodes. Preparing students to succeed despite this volatility is a priority at the University of Queensland. So, educators focus on equipping students with transferable skills that make them job-ready for any path — corporate, academic or government. Chemistry Professor Jack Clegg and Librarian Kellie Ashley use Reaxys to train these skills and promote information literacy. Modern libraries, they highlight, house the tools for the lifelong learning that make their graduates desirable job candidates.



Professor Jack Clegg
School of Chemistry &
Molecular Biosciences



Kellie Ashley
Librarian, University
of Queensland Library

Libraries as indispensable portals to today’s information

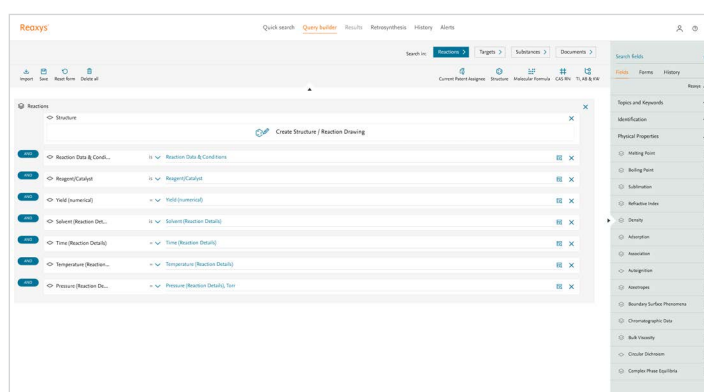
Ms. Ashley explains that academic libraries are in transition as the digital environment expands. “Also, the traditional role of a library liaison in the academic arena is changing as a different model of outreach and engagement is being adopted. In the past, librarians may have been assigned to a school or faculty and you immersed yourself in assisting them. Now, we are less specialized to support researchers in many disciplines.” Ms. Ashley and her colleagues increasingly create digital instruction and guiding materials that can be accessed on-demand. Library facilities are also changing. Gone are the banks of card catalogs. Rare is the person scanning Dewey decimal or Library of Congress numbers on endless rows of book spines. “Libraries are morphing into spaces where students study, rather than places where information is stored,” adds Dr. Clegg.

This transition is fueled in part by digitization and initiatives to democratize information access. Where information is housed — a computer or a book stack — plays a role in its effective use. More important, however, is understanding how information is organized and indexed, how to assess its quality, and how to determine if it serves the intended use. Both Ms. Ashley and Dr. Clegg believe that helping students master the latter is the indispensable directive of libraries. “If a student can’t work out how to find information through a library, all they are going to do is move their search to Google. But there, they are blindly relying on an algorithm to decide the source and quality of their results,” says Dr. Clegg. Ms. Ashley adds: “Students come with varied exposure to libraries and some fumble initially to learn to evaluate materials. But the right instruction and context — especially with faculty involvement — translates into sustained use of databases and other resources. Because no matter how hard you try, certain things you just can’t do in Google.” Reaxys has played a key role in this instruction for 30 years at the University of Queensland. Incorporated into curricula, Reaxys is used to guide students, novices and experienced, in learning how to find, assess and validate chemical information.

Bringing libraries into the classroom

Ms. Ashley has been an academic librarian for 25 years. Though not a chemist herself, Ms. Ashley has learned to use the Reaxys Query Builder to help students and faculty interrogate chemical properties and reaction data. “Reaxys is different to the more common indexing and abstract databases. The excerpted data and the options to search substance structures set it apart and also challenge students to think differently about their query,” she shares. Her assessment is that Reaxys is easy to use, especially in helping students become well-versed in chemistry terminology. More importantly, she’s confident that by using Reaxys along with other databases, students develop transferable skills for any job, especially the habit of validation via evidence.

At the University of Queensland, undergraduate students may have a first introduction to academic library resources as they access material for their first-year courses. “In chemistry,” says Ms. Ashley, “faculty invite us back semester after semester from second year on to teach research skills classes and share knowledge, even though the movement is toward videos or on-demand, bite-sized chunks of instructional material.” A more detailed explanation of Reaxys occurs in third-year classes, including organic and synthetic chemistry. “The course has very specific requirements that are met by Reaxys. We go through an example, show them how to use Query Builder, and we post supplementary resources on our library subject guide for chemistry (guides.library.uq.edu.au/chemistry.)” Ms. Ashley emphasizes that faculty encouraging students to use Reaxys within the context of classes and their own research drives the strong usage statistics they observe. “The long tenure of Reaxys within our library resources reflects its ease of use, value for money based on usage statistics, and the fact that it does not duplicate something we already have.”



View of the Query Builder feature in Reaxys

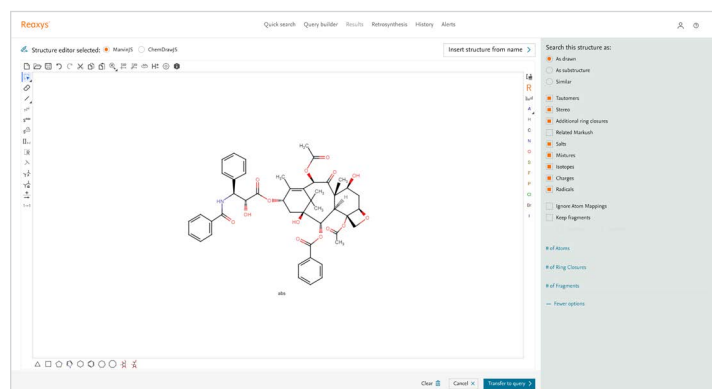


Transferable skills for scientists, no matter the job

Dr. Clegg himself is someone who embodies the concept of transferable skills. In addition to his Ph.D. in chemistry, he studied history, German, and holds a degree in law. He did a lot of library research during those pursuits and wishes all students could walk away from university with similar experiences. “I would hope that by the time people finish an undergraduate degree, they’re proficient enough at library research that they no longer need guidance to find and digest information on any topic. So, we use different subjects — like chemistry — as a way of demonstrating those transferable skills.”

Reaxys is also a “first point of call” for students working in his lab. Dr. Clegg’s research is in metallo-supramolecular chemistry and molecular recognition, a research area he describes as “a cross between playing with Lego and cooking.” The lab builds molecular structures that selectively encase smaller entities. “You have to think about how you’re going to build it and that’s where the Lego idea works,” he explains. “Then, you go back into the lab and make the molecule, which is like cooking.” Students working on designing and making these structures turn to Reaxys. “They’re looking at property data that help them characterize how the structure will look like in three-dimensional space. Once they have a target for what they want to make, they use Reaxys to explore synthetic routes. These are some of the real benefits of Reaxys.” In a second area of research, Dr. Clegg and his students engineer crystals with novel properties. “We’ve developed crystals that are so flexible you can tie them into a knot. Reaxys has been particularly helpful in finding measured mechanical properties for crystals, like nanoindentation, hardness and other parameters.”

Dr. Clegg recognizes that most students will go on to jobs in a broad range of sectors. For all of them, the ability to process and communicate information in a way that advances projects is more valuable than specialized techniques they may learn to complete an experiment. From his perspective, students using Reaxys gain much more than answers to specific research questions. “Independent of the fact that Reaxys is a chemistry database, ultimately it supports learning the skills of searching and finding information, evaluating whether it’s the right information, and following it to its source.”



View of the structure editor feature in Reaxys

Reaxys document search results with abstract, keywords and substances

The future: processing a lot more data

“Tens of thousands of new chemicals are made and characterized every day,” says Dr. Clegg when asked about the future of chemistry. “We’re at a point where we can generate 12 terabytes of data in a 24-hour experimental session and the only way we can possibly deal with those data is by developing our own software tools. So, we also encourage students to be literate in programming and statistics so they can wrangle those data the right way. This is the reality of chemistry, and we need to be teaching those skills.” The extracted and curated data in Reaxys are relevant to this reality and a quality source of material to train computational skills.

Whether in the lab, a classroom or at a computer, Ms. Ashley and Dr. Clegg use Reaxys as an instrument of lifelong learning. They arm students with transferable skills to manage their own development at any time and in any context they encounter. This is education for the future.

View of the Reaxys Retrosynthesis module

1. Peetz, D. 2020. Can government actually predict the jobs of the future? <https://theconversation.com/can-government-actually-predict-the-jobs-of-the-future-141275> (Accessed 23 June 2022)

Decision support for academic chemistry research

Reaxys speaks the language of chemistry. Reaxys is a highly-curated, easy-to-use chemical information solution built on validated data. It harnesses the power of machine learning to help researchers, teachers and students to find, connect and utilize chemistry literature, property and reaction data, patents and experimental procedures.

For more information about Reaxys, visit:

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