

A taste of crystallographic research for undergraduate students via a problem-based approach.

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We have previously presented a practical exercise designed in response to the need for increased hands-on experience with technical analytical instrumentation for undergraduate students as an “advanced practical”. The resulting practical, described in *J. Chem. Educ.*<sup>1</sup>, provides independent ‘hands-on’ experience with single crystal and powder diffractometers and a number of other novel elements. However, the practical requires a set of instructions that lead the student through the exercise and hence doesn’t really provide an accurate reflection of research.

A requirement for an increased educational return led to a review of the practical, which concluded that the “cookbook” style practical could be superseded by a problem-led exercise. This led to a significant redesign of the practical, run within the same logistical constraints, where students are trained to use the instrumentation and then presented with a problem to solve. The problem is one of co-crystal design where students are given a list of compounds and asked to use these to modify the properties of an “API”, via co-crystallisation, to develop a new product with particular (pharmaceutical) properties – such as stability, safety and solubility. The problem can only be addressed using a combination of the various analytical techniques available in the laboratory. Using a novel software platform (Labdog), designed specifically to support practical-based education, the students must plan and justify a set of experiments that they then go on to perform. The student plans, observations and conclusions are recorded, assessed and given feedback within the Labdog system.

We will present details of the implementation and evaluation of this novel practical.

1. Coles, S.J. and Mapp, L.K., Conducting Reflective, Hands-On Research with Advanced Characterization Instruments: A High-Level Undergraduate Practical Exploring Solid-State Polymorphism, *J. Chem. Educ.*, 2016, 93, 131–140.