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Concrete thinking in chemistry for engineering students

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Abstract

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CONCRETE THINKING IN CHEMISTRY FOR ENGINEERING STUDENTS

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ABSTRACT

We strategically use an everyday material to promote engagement of engineering students in their compulsory First Year Chemistry subject. This activity is centred on a semester-long investigation of the progress of carbonation of concrete, carried out during fortnightly lab classes through the whole semester. Students make "mini" slabs of concrete in their first practical class, and examine their slabs at each subsequent lab class, taking about 15 minutes of lab time each class. The concrete theme is carried through lectures as example material in acid base and precipitation equilibria, thermochemistry, kinetics, and materials concepts such as types of solids, interfaces, gas permeation, porosity.....this is surprisingly rich territory to mine.

BACKGROUND

The student cohort presents a wide range of backgrounds in chemistry, and the perennial issues of engagement of students who find it difficult to see where chemistry fits into their degree programme and their profession.

DESIGN

Within this context we have developed a module, which is centred on a fundamentally important engineering material and requires application of the chemical principles and concepts developed over the session. In the laboratory classes, students work in teams of four, each team making and investigating their own "mini-slab", then writing assessed group and individual responses at the end of session. The lab activity provides for visual, auditory, read/write and kinaesthetic learning styles. The familiarity of the concrete provides a stepping stone to encourage students to think in the abstract, to consider molecular scale matter and processes on the basis of their macroscale observations. On a practical note, running the lab-based activity is also inexpensive, relatively simple, and does not generate major chemical disposal issues. Your hands-on concrete active learning experience will happen at the poster session.

OUTCOMES

Each student includes a brief reflection within their end of session individual written assessment, and these provide the best indication of the students' awakening to the importance of the chemical principles underlying the construction and use of concrete. This heightened awareness is not confined to the issues of carbonation of concrete, but a series of issues, which have been explored in various ways throughout the session, and are highlighted by the assessment. The developing appreciation is borne out in informal surveying and staff anecdotal experience. But more than considering this particular circumstance, the broader outcome is to provide an example of generating interest in the chemical principles underlying professional practice. There are bound to be other particular materials or processes, which have been / can be adapted to straightforward, extended, lab investigations and achieve similar engagement.

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