Evaluation through Curriculum Mapping

Context

Quantitative skills refers to the ability to apply mathematical thinking and statistical reasoning. The Australian Council of Deans of Science recognises the importance of quantitative skills, and designated a proficiency in quantitative skills as an essential outcome for science graduates.

In biology, a discipline which accounts for 45% of university courses taken by science students, quantitative skills are minimally embedded, and our graduates appear lacking in quantitative skills proficiency. Achieving success in this area is hampered by a lack of consensus as to which quantitative skills should be taught. This evaluation developed a methodology for curriculum mapping quantitative skills, and piloted it in the biological sciences.

Identifying which quantitative skills are taught and how is essential before for the curriculum can be redesigned to provide multiple opportunities for practice. This evaluation is significant as few studies on curriculum mapping of quantitative skills exist in biology, and those performed do not describe the pedagogies used.

Tool

I developed this tool to evaluate how quantitative skills are taught in the curriculum. The quantitative skills list used was complied by Reid and Wilkes (2016) as part of a curriculum mapping exercise conducted as the University of New England across STEM courses. It was developed in consultation with the literature and other resources, including the NSW HSC curriculum, and academics across the sciences.

The template used for recording each occasion for learning and the pedagogical context where individual quantitative skills are present in the curriculum. The student-centred RASE pedagogical model is used as the theoretical framework for categorising this (Churchill, King, & Fox, 2013). The RASE model has four components: resources, activities, support and evaluation. The RASE model thereby enables a pedagogical description of how each quantitative skills is taught in the curriculum across time, an improvement on previous.

Results

This methodology was piloted in first year biology courses in the School of Biotechnology and Biomolecular sciences at UNSW. The pilot demonstrated the methodology is useable, and data collection can be performed quickly. The output does not require additional processing, is in a format easily communicable, and comparable between courses. This is an improvement on the limited curriculum mapping studies performed on quantitative skills in

biology, which are either not comparable, or in a simple and easily shared format.

Impact

The methodology is original, improving on the limited number in use to date, as it describes the pedagogies to teach each quantitative skills, using the RASE model as a framework. The methodology is fast and simple to perform, and allows results to be easily represented in a visual format for simple communication and sharing. Demonstrating viability, I applied this methodology in a pilot study to audit quantitative skills within the first year biology curriculum in the School of Biotechnology and Biomolecular sciences at UNSW.

This work was undertaken for a project in the Masters of Education (higher education) I completed, supervised by Professor Stephen Marshall, School of Education, UNSW.

References

Churchill, D., King, M, & Fox, B. (2013). Learning design for science education in the 21st century. Journal of the Institute for Educational Research, 45 (2), 404-421.

Reid J & Wilkes J (2016) Developing and applying quantitative skills maps for STEM curricula, with a focus on different modes of learning, International Journal of Mathematical Education in Science and Technology, 47:6, 837-852, DOI:10.1080/0020739X.2016.1144814

Recommendations

Watch video

Scholarly approach to evaluate teaching

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Evaluation of student feedback

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A discussion of transformation in teaching through reflection on feedback

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Closing the loop - adapting and changing teaching in response to student feedback

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An 8 step evaluation cycle to improve pharmaceutical courses

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Flipping Student and Teacher Led Evaluations