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Characterising the underlying dysfunctional attitudes and stances students in biology and medicine adopt when faced with calculations

Day 1 – Parallel II (14.35-15.05)

In order to reinforce key concepts, undergraduate life science students (e.g. biology and medicine) are given opportunities to link the descriptions of phenomena presented in lectures to their own in-class or field observations. However, in our classes a proportion of our students disengage when the focus shifts to calculating biological parameters or to population studies (statistics). Our work to date has focused on characterising the underlying dysfunctional attitudes and stances our students adopt when faced with calculations that can preclude them from engaging in our discipline practices.

Not all students see the relevance of developing numeracy skills to their studies in science and medicine and need to be extrinsically motivated. Although there may be some elements in common (e.g. maths anxiety), the 'maths problem' as it manifests in science teaching and learning is different to the 'maths problem' as it is seen in maths teaching and learning. For biology and medical students learning science, encountering 'maths' can lead to disengagement; in these instances 'maths' is more akin to a "transferable anxiety" than a "transferable skill". In biology and medicine, being able to conceptually move between the phenomena and the abstracted figures or equations derived from experimental data requires the application (transference) of sound academic numeracy skills; developing and applying numeracy skills is the implicit learning objective, or hidden curriculum objective, of the undergraduate life science curriculum. Other implicit learning objectives are that our students are to be numerically competent and confident (or at the very least to develop competence and confidence) when 1. gathering, manipulating and presenting their own quantitative data sets and 2. critically appraising published data.

There are a raft of expectations and assumptions associated with student learning objectives that include the expectations that our students have reasonably well-developed numeracy skills from their previous studies in mathematics at secondary school, and that transferring and applying their numeracy skills into their science studies in other discipline contexts, such as the life sciences, will be relatively unproblematic. However, for a novice, there is a high degree of complexity of thought and critical thinking required to complete a single experiment and write it up as a report. Shifting from 'novice' to 'expert', developing skills and discipline sensitivities and building confidence requires students to be afforded opportunities to practice and to get feedback. There are insufficient opportunities for students to practice their skills (including numeracy and abstraction) particularly given the reduction in the number of assessment tasks our students now do, which is probably about a tenth of the assignments we were doing even a decade ago. Having a clearer understanding of when and how our biology and medical students disengage from learning when they encounter 'maths' when learning science will inform the best ways to offer them support.