

Open-note examinations as opportunities for meaningful learning and assessment

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Problem solving and critical thinking are important graduate attributes, particularly in such STEM fields as physiology and chemistry. Development and evaluation of these skills can be supported by open-book and/or open-note assessments. While open-note assessments have been used in science education, the related literature is rather controversial, and guidelines are lacking in terms of their optimal implementation.

Overarching goal of this project is establishing guidelines, for students and educators, for effective implementation of open-note examinations. We are interested in how such assessments are perceived to influence approaches to learning, motivation and engagement, ability to manage students' mental/cognitive load, higher order cognitive skills development, ability to manage stress and anxiety, ability to manage study time, and overall learning experience. Furthermore, we aim to determine whether the development and use of open notes modifies students' learning behaviour and affects students' learning outcomes. Specifically, we are investigating whether there is a correlation (i) between students' regular development of their notes during the semester and examination performance and (ii) between the type, amount, and organisation of information on the notes and students' achievement outcomes.

For the last four years, several units within Bachelor of Pharmacy and Bachelor of Pharmaceutical Science have been assessed *via* open-note examinations, allowing student-prepared notes constructed during the semester. Similar arrangements are implemented in a range of units of study across the university, with majority coming from Science, Engineering, and Business and Economics faculties. A convergent parallel mixed-method design was used to investigate the impact of the open-note assessments on study strategies and academic achievements. Quantitative scores from the open-note coding and examination results were combined with qualitative feedback from students' reflections and focus groups and triangulated by incorporating input from academics' interviews from a range of disciplines.

Quantitative results demonstrated a range of student choices for material selection and organisation. Qualitative analysis demonstrated that regular note construction leads to successful study strategies of distributed revision and to meaningful learning. Drawing on the views of educators who have implemented open-note assessments across Monash University, we established that, while methods of implementation vary between units, common trends relate to positive influence of the practice of self-constructed notes on student engagement and learning in a range of subjects.