EXPLORATION OF STUDENTS' REPRESENTATIONAL FLUENCY IN TRANSLATING BETWEEN MULTIMODAL REPRESENTATIONS OF MOLECULE STRUCTURES

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BACKGROUND
Chemistry instructors adopt a range of representations that can be shared with students using multiple modalities. It is tempting to assume students, who typically have experience using online media, can translate between modalities however representational competencies in chemistry require careful scaffolding in terms of formalisms and representational cues.

AIMS
As students are often expected to be self-directed learners, we aim to identify which combinations or sequences of representations are important in scaffolding student learning and representational fluency.

DESIGN AND METHODS
In this study, 11 semi-structured, stimulus response interviews explored individual students' visual and connectional understanding and their fluency with formalisms and cues across different modalities. Students' fluency in translating between 2D and 3D (static and dynamic) representations was analysed to consider their conceptual and perceptual representational competencies.

RESULTS AND CONCLUSIONS
Several insights into inaccurate mental models were gained in regard to the spatial arrangement of atoms and bonds in structures, as well as the features in representations that help determine molecular shape. It was observed that engagement with the dynamic, interactive 3D virtual structures in particular supported adjustment of incorrect mental models. The results have informed the instructional design of blended learning interventions in 2019 to scaffold first year Chemistry students in their independent learning and development of representational fluency. The findings of this research can also translate to inform the development of students' representational competencies across science disciplines in terms of recommendations for sequencing and scaffolding multimodal representations.

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