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| Name | Dylan Herdan | Subject | SCDL1991 Science Showcase | Date Completed | 30/08/2023 |
| Working title | | Effectiveness of virtual reality in strengthening students understanding of chirality in organic chemistry | | | |
| Basic research question | | Can the use of virtual reality aid in the teaching of structural concepts in organic chemistry such as chirality? | | | |
| Key paper(s) | | 1. Stockwell BR., Stockwell MS., Cennamo M, Jiang E (2015) Blended Learning Improves Science Education, Cell 162, Issue 5, 933-936. 2. Miller, M.D., Castillo, G., Medoff, N. et al. Immersive VR for Organic Chemistry: Impacts on Performance and Grades for First-Generation and Continuing-Generation University Students. Innov High Educ 46, 565–589 (2021). 3. Jonathon B. Ferrell, Joseph P. Campbell, Dillon R. McCarthy, Kyle T. McKay, Magenta Hensinger, Ramya Srinivasan, Xiaochuan Zhao, Alexander Wurthmann, Jianing Li, and Severin T. Schneebeli *Journal of Chemical Education* 2019 *96* (9), 1961-1966 | | | |
| Motivation | | Rudimentary two-dimensional models of molecules such as Lewis structures fail to convey vital information about structure and are often difficult to interpret. While basic 3 dimensional models such as molymod kits are known to be effective tools in education, they are limited by physical restrictions such as static bond length, availability of materials and manual construction. | | | |
| Ideas | | Virtual reality has been found to yield significant improvements to students fundamental understanding as well as their motivation to learn complex ideas in chemistry (Ferrel et al), offering a unique and engaging way to convey complex structural concepts in 3-dimensions.  Hypothesis: When presented with a lesson implementing virtual reality, students will show measurable increases in enthusiasm towards the material as well as performance on a test of their knowledge than those presented with a lesson using 2-dimensional models or molymod kits. | | | |
| Data | | This experiment will be completed at the university of Sydney with the chemistry faculty as part of the SCDL1991 unit.  Students undertaking the quiz will also be from the university of Sydney. The sample size is not yet clear but will be restricted by the time frame available to perform the lesson and subsequent tests.  A quiz will be completed before and after the lesson is completed testing of students’ knowledge to compare progress from the lesson. In addition, a survey will also be completed before and after the lesson to gather students’ enthusiasm towards the material as well as their opinion on the mode of lesson delivery.  Pre exposure to the material as well as quiz medium is likely to have an impact on the validity of the data. | | | |
| Tools | | Three lesson plans will be constructed. One using 2-dimensional images and diagrams, another using a moly mod kit and a final lesson using a virtual reality simulation implemented in Unity. A common quiz and survey will also be constructed. | | | |
| What’s new? | | In previous years, virtual reality has not been found to increase student understanding of chemical reactions. It is possible that the changing molecules in virtual reality confused students. Hence this project will focus on chirality a purely structural concept. | | | |
| Implications | | Sufficient evidence of the efficacy of virtual reality in teaching complex structural chemical concepts may lead to widespread implementation in curriculums. Furthermore, unique methods of education can increase students enthusiasm towards material and consequently their motivation to continue learning. | | | |
| Contribution | | The chemistry faculty of the University of Sydney when designing course curriculum and lesson plans. | | | |
| Other Considerations | | This project is a continued effort from previous science showcases. Collaboration with experienced personnel such as prior students and Unity experts is essential to success. As such they must be credited for their foundational work. It is a possibility that the time frame in which the lessons are taken is too short to gather enough meaningful data for meaningful comparisons between the test groups. Futher, the student participation may be a limiting factor and the target demographic of the lesson may need to be expanded from exclusively students at the University of Sydney | | | |