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# Zoom combined with Virtual Reality (VR) to visualize chemical structures in organic chemistry

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Presentation

The ability to visualize chemistry and to move between two-dimensional (2D) representations presented in textbooks, and three-dimensional (3D) representations of the real molecular structures and mechanisms, is an important competence to master in university chemistry. In research, this is called spatial thinking or spatial ability (Hegarty, 2014). Through spatial thinking, chemists can predict how and why chemical compounds react. Chemistry experts are used to apply this spatial thinking, i.e., visualization through the move between 2D and 3D, without realizing it, whereas novices as students often find spatial thinking or spatial ability challenging (Harle & Towns, 2011). Spatial ability is a competence that is possible to develop through practice (Kozma & Russel, 2005), and in this project, chemistry students had the possibility to use virtual reality, VR, to visualize organic molecular structures and improve their spatial thinking. VR has a potential as a digital learning tool to explore 3D representation

During the last one and a half years, Covid 19 has influenced teaching strategies at universities, and Zoom has become the most common software to teach students. At a first-cycle chemistry course in biological chemistry within a bachelor programme in life science, students were given the opportunity to visualize 3D representations of chemical structures. Due to the Covid 19 restrictions, the teachers could not help students attending the course to be active VR users. Instead, one teacher applied the VR application, Oculus Rift combined with Nanome software (<https://nanome.ai>), and streamed the visualization over Zoom. The second university chemistry teacher, and the students, used simple VR glasses with their smartphones to visualize the 3D projected molecules, and the teacher explained what was presented.

This design-based research project (Anderson & Shattuck, 2012), where the university chemistry teachers collaborated with a chemistry education researcher and a digitalization researcher, will elaborate further on how Zoom as a digital teaching tool also can be applied to facilitate spatial thinking for students even post-Covid. The chemistry teachers and chemistry education researcher designed an intervention from where examples of the visualizations will be presented together with survey results on students' responses of the application of digital techniques as a way to practice their visualization competence and spatial ability. Preliminary results show that students find this visualization combining VR and Zoom valuable to practice their spatial thinking, and examples of teaching activities will be presented.

For more information about the project, see <https://www.umu.se/en/feature/vr-glasses-help-students-visualize-molecules/> or <https://www.umu.se/reportage/vr-glasogon-hjalper-student-visualisera-molekyler/>

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