ENGAGING WITH PHYSICAL MODELS, COMPUTER SIMULATIONS, AND IMMERSIVE VIRTUAL REALITY TO UNDERSTAND MOLECULAR INTERACTIONS

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Various technologies have been used to assist students in understanding molecular interactions and structures. With a plethora of learning media available, it is often challenging to choose suitable platforms to achieve the desired learning outcomes. We investigated how first-year university chemistry students learned the concepts of molecular interactions and structures when engaging with three learning media: magnetic physical models, computer simulations, and immersive virtual reality. Twenty-two pairs of students' hand-drawn diagrams, videos of learning sessions, and pre- and post-interviews were analysed. The results indicated that students' understanding became richer as they progressed with each learning task, but they learned different aspects of the concepts of molecular interactions and structures in each learning medium. When experiencing the magnetic forces in the physical models, students felt the attraction and repulsion to understand intermolecular forces. With computer simulation, students were able to manipulate the angle and distance between water molecules to form a strong hydrogen bond. With immersive virtual reality, students built a lattice structure of ice crystals to demonstrate how hydrogen bonds contribute to the six-fold symmetry of snowflakes. By considering each medium's affordances and limitations, we identified the most effective learning approaches to promote a comprehensive understanding of molecular interactions and structures.

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