

Building Bonds: The Role of Undergraduate Textbooks in Teaching and Learning Chemistry

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Abstract

In our project funded by the Swedish Research Council (VR 2022-03125), we are interested in the representation of scientific phenomena that cannot be seen. The question we pose is: How is scientific knowledge mediated when we cannot directly interact with the phenomena in question through our senses?

In the part of the study reported here, we adopted a social semiotic approach (Airey & Linder, 2017; van Leeuwen, 2005), to investigate the ways in which chemical bonds are presented to undergraduate chemistry students in their textbooks. We carried out a semiotic audit (Airey & Erikson, 2019) of the ways in which three undergraduate textbooks represent bonding.

We first documented the range of resources used in each textbook, observing that visual resources were the most frequent. We then selected one such central resource—the molecular bonding diagram—for closer analysis. Our analysis began by identifying the disciplinary relevant aspects (Fredlund et al. 2015) of the bonding phenomena that the diagram represents. Thereafter, we analysed the diagram in terms of these disciplinary relevant aspects, attempting to identify semiotic material that did not contribute to making these aspects visible. Finally, based on our analysis, we constructed an idealized teaching sequence, which we suggest could potentially help students to better understand molecular bonding. Going forward we intend to test the usefulness of this sequence with undergraduate chemists.

References

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