

# Misconception Linked to Missing Information in Figures of a First Year Physics Textbook & How it was Uncovered

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This presentation will describe an example of, what turned out to be, a common student misconception that arose in delivering “Energy Quantisation” following the interesting treatment of this subject in the well-respected text “Matter and Interactions”, by Ruth Chabay and Bruce Sherwood [1]. The misconception was uncovered by using a different mode of assessment – descriptive writing. This textbook has been used for many years in the first-year physics units for students intending to continue in physics at Macquarie University, Sydney, Australia [2]. It was adopted at Macquarie University following Professor Craig Savage and colleagues, at ANU, enthusiastically promoting it within Australia for implementation. This was based on experience using it, and, evaluation of educational outcomes from its use, at ANU. What will be presented should not be seen as a criticism of the textbook. The text book is fine and is used in several countries around the world [1]. The treatment of energy quantisation is an excellent one for developing an integrated understanding of the topic across several physical systems – the Bohr hydrogen atom, the quantized mass spring oscillator, a diatomic molecule, vibrational and rotational energy levels in molecules, etc. The presentation will be an example of how a misconception can be linked back to the learning resources, and that this misconception can go undetected by standard, question-based assessment. Two main take home messages are listed below.

- I. It can be important to include assessment that requires descriptive writing to uncover student misconception. An emphasis on developing writing skill is recommended for inclusion in first year physics, as a key capability to be developed, in any case.
- II. We must be ever vigilant to adhere to basic principles when creating visual schematics to support learning. In this case “graphs require labeled axes” and this should not be lost when a graph is transformed into a figure.

[1] R. W. Chabay and B. Sherwood, *Matter and Interactions* (John Wiley & Sons, 4th edition, 2015). Also, <https://matterandinteractions.org/> (Accessed 1 July 2022).

[2] DMK has taught first year physics units for several different student cohorts, using different textbooks.