

THE WORLDS SIMPLEST ELECTRIC TRAIN: A TOOL FOR PROGRESSIVE UNDERSTANDING IN ELECTROMAGNETISM

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ABSTRACT

This activity is the basis of a 'lab' session run with first year students at ANU, who are learning about the Lorentz Force and electromagnetism more generally. Using just 4 simple objects, the goal is to build the world's simplest electric train, and then explain its operation using a physics model. The fantastic aspect of this system is that it can be understood using everything from very simple conceptual models introduced in high school as early as year 9-10, through to a full analysis using Maxwell's Equations (2nd/3rd year university). The opportunity to use this system as a way to revisit concepts and build a progressively deeper understanding of electromagnetism over several years is profound. It also incorporates an understanding of mechanics, friction, and is quite frankly, very cool and a lot of fun.

The session will first give everyone the chance to undertake the challenge themselves (no Google!). Afterwards we'll explain its operation using several models and share how the theoretical description can be anything from conceptual, to back of envelope, and finally a full analytic calculation.

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