# Feather-chem: An alternative approach to teaching instrumental methods

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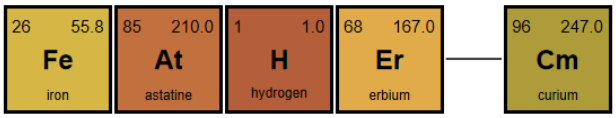
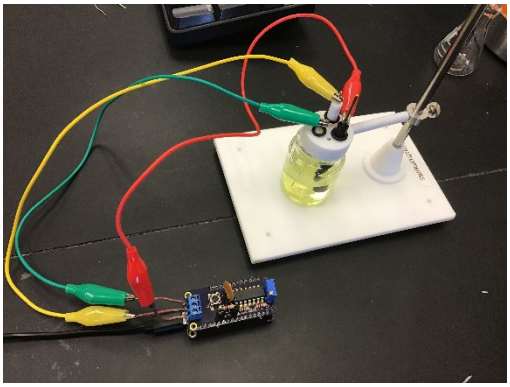
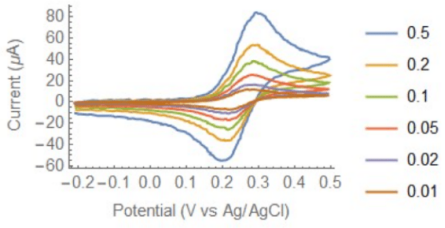



**The problem:** Most instructors who have taught instrumentation-based courses have run in to the problem of poor instrument to student ratios. Even small class sizes often necessitate a round-robin style of instruction that makes it difficult to create a collaborative and equitable learning environment. With faculty having to divide their time between multiple instruments in this setting, experiments often become cookbook button-pushing experiences which are not aligned with the desired learning outcomes.

**The vision:** An entire class of students should be able to explore the same technique at the same time, resulting in a teaching environment that promotes teamwork and allows the instructor to provide appropriate just-in-time feedback. Further, students should be allowed to explore how an instrument converts chemical information into electrical signals and visualizations; thus avoiding the trap of pushing buttons on a black box. Finally, students and faculty should be able to take risks with scientific instrumentation without the fear of breaking the one instrument used by the entire department.

**The solution:** Feather-chem is an electronics kit consisting of hardware, software, and guided inquiry lesson plans that helps students understand how scientific instrumentation works. The idea is to provide students with a problem-based learning environment through the design and use of rudimentary instruments from the core areas of electrochemistry, spectroscopy, chromatography and clinical diagnostics. Software, hardware, and instructional content are published using open-access principles to increase accessibility and foster collaboration among a community of practitioners.






**Example application:** After exploring the electronic components (operational amplifiers, resistors and capacitors) needed to create a voltage waveform and read an electrode current, students build their own potentiostat and collect cyclic voltammetric data on a test compound such as potassium ferrocyanide. Since their instrument contains no autorange feature, students learn how changing a particular resistor alters the current-to-voltage setting of the instrument.

**Get involved:** Visit the project page (feathercm.readthedocs.io) to explore currently available content. The electrochemistry module – where students build a potentiostat and perform cyclic voltammetry measurements – is ready for beta testing. Funding is available to provide a few new collaborators with hardware to incorporate the project into their curriculum. Let me know of your interest by filling out this form and consider joinging [OK, help starting] the conversation on discord: https://discord.gg/GGQzMWPZUt.

## THANKS FOR READING