Making Nuclear Magnetic Resonance Resonate With Students

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The City College of New York
WHY NMR?

- Important Research Tool
- Cross-Disciplinary
- Bridge to 21st Century Careers
- Accessible
PROJECT GOALS

Developed curricular materials are interdisciplinary and make use of current pedagogical best practices for an engaged and inclusive science learning environment.

Curricular materials provide students with class-based undergraduate laboratory experiences that introduce research skills and emulate experimental research in a lab (with or without direct access to an NMR system).

Curricular materials are designed to be easily adapted and adopted for use in a wide array of educational environments.
WHAT WE HAVE DEVELOPED

Module 1: Why Magnetic Resonance?

Module 1 - PDF
Module 1 - Student Worksheet

Module 1 Instructional Materials

Module 1 - Instructor's Manual
Module 1 - Instructional Slides with Links to Supplemental Materials and Module Assessments
Module 1 - Student Worksheet Answers
Module 1 - Feedback Form

MODULES CONTAIN:

- Expected learning outcomes
- Real-world examples
- Featured scientists
- Hands-on activities, simulations, videos of experiments for those without access to equipment
- Research-based pedagogy
The 2023 summer crew visiting the NMR facility at CCNY.
Where we are now

**Implementations:** Implemented all the modules at Sarah Lawrence College, and 4 modules at City College of New York.

**Revising** the materials and creating instructional materials.

**Disseminating** our work online as well as leading professional development workshops for faculty to learn how to best adapt the material for their particular needs.

**OVERALL** based off instructor and student feedback

- Most of the desired learning objectives are being met
- Students enjoyed using the modules
- Instructors noticed that students were engaged and had increased confidence in answering questions and explaining their reasoning
- Instructors had a very positive experience using the modules and felt that they helped students develop skills in the techniques or procedures of science
LESSONS LEARNED FROM EVALUATION

Students spend a LOT of time sense making (not a lot writing)

Content assessments have strong scores for all students

No notable identity shifts - their identities as scientists started and remained strong

Unsurprisingly, no notable ECLASS shift

* these are VERY small N results
**FLOW**: mental state in which a person performing some activity is fully immersed in a feeling of energized focus, full involvement, and enjoyment in the process of the activity.

*Named by Csíkszentmihályi in 1970*
LESSONS LEARNED FROM EVALUATION

25 Ranked Statements:

Teachers > Students: Laboratory experiments develop skill in the techniques or procedures of physics.

BOTH: Students discuss their data and conclusions with each other.

Students > Teachers: Students follow the step-by-step instructions in the laboratory guide.
This project is designed to benefit all undergraduate science programs but will have the most impact at primarily undergraduate institutions with limited access to research experiences and historically underserved student populations.

**Scan the QR code** to be contacted when the materials are available and/or to provide suggestions of potential resources to include!