Research to a Class

Undergraduate research is a high impact practice, and adding a research component to a class may provide better access to those experiences for those students or help meet other learning objectives. Implementing research in coursework (sometimes called a CURE, Course-based Undergraduate Research Experience) can be difficult, but often the biggest challenge is getting started. This document is a brief guide to some of the critical issues you may encounter in exploring this option, and some initial resources to help navigate those issues.

Learn from your peers

There are now many iterations of research-inclusive courses across disciplines. While there are a myriad of routes to develop these courses, one common pathway follows. There is a linearity to these tasks but they can be executed in the order that suits you best.

Initial stages

1. Select research objectives and develop learning objectives from these.
2. Identify the course (new or converted) that will be used.
3. Select problem(s) to be investigated and techniques to be employed.
4. Plan the scope and scale of the course.

Administrative work

1. Solicit buy-in from appropriate administrator (e.g., department chair).
2. Identify needs, if any, beyond a conventional course and make the ask.
3. Assemble the necessary resources for the course (space, TAs, instrument time, etc.).
4. Assemble the necessary personnel (trained TAs, stockroom, faculty, etc.)
5. Devise any non-learning metrics of success.

Educational work

1. Using your objectives, design the course details (activities, assessment, etc.).
2. Develop an explicit plan to instruct students on research as an activity.
3. Include features that ensure the work is research (iteration, discovery, risk assessment, etc.).
4. Test the plan with a smaller group of students to ensure they are engaged in the targeted activities.

Execution

1. Be flexible in running the course; let the learning outcomes drive the curriculum.
2. Solicit feedback from students and/or faculty.
3. Evaluate against your learning objectives and any metrics of success.
4. Be prepared to make choices between research progress and student learning with attention to both.
5. Iterate the course and run again.

Resources

These are a few starting points to get documents and help for your planned course.

- CUREnet is a network dedicated to this practice: https://curenet.cns.utexas.edu/
- CIRTL supports development of new practices: https://www.cirtl.net/

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4. What do you need?

Research costs money and time. A 400-seat general chemistry course cannot get synchrotron time for each student, but those students can have infinite Spec-20 time, for example. Most CUREs require instructional support, which may be the faculty member and/or teaching assistants, appropriate space, supplies, and access to necessary equipment. These needs may be met by converting a pre-existing course that has the requisite resources. At the same time, resources you have may determine the choice of project.

5. Do you have the time?

Converting all of the E&M laboratories for 1000+ students to a CURE is a tremendous operation. However, converting a single experiment is a more manageable step toward a larger goal for a course. Additionally, a shift from traditional experiments to inquiry, for example, may be another way to make larger changes more manageable.

6. Will the research element introduce greater hazards in a lab course?

More consideration may need to be given to additional hazards and increased risk when adding discovery elements into experiments. Complexity and novice workers, combined with agents, chemicals, equipment, and processes having greater hazards can all increase risk in any laboratory.