Teaching and Learning Physics:
an introduction to Physics Education Research

This folder contains a variety of course materials for Phys4810/7810, an upper-division / graduate course on Physics Education Research. The course has been taught for over 20 years at CU Boulder, typically a small-ish (dozen to 30+) class. This is a good mix of undergrad and graduates, mostly from Physics but sometimes e.g. School of Ed.

A formal prerequisite is to have completed the standard first 2 years of undergraduate physics content courses (though exceptions can be made, but basic physics content understanding is implicitly understood)

Summary: A course on how people learn and understand key concepts in physics. Readings in physics, physics education research, education, psychology and cognitive science, plus opportunities for teaching and evaluating college and K-12 students. Useful for all students, especially for those interested in physics, teaching and education research. The class will largely depend upon student input.

Learning Objectives: Course-scale. By the end of the course participants will have:

- Engaged as members of the physics education research (PER) community
- Demonstrated (and externalized) a foundational understanding of the span of the field (PER theory, practices, curricula and key studies)
- Enacted their skills at putting theory and experimental work into practice (in real educational settings)
- Analyzed curricula and foundational studies in PER
- Conducted original scholarly work
- Defined areas of their own interest in the field

The course practice is divided into roughly three components, on a weekly basis:

- Basic theories, models, and framing of ideas in PER (e.g. Knowledge in Pieces)
- Interventions / approaches that apply these ideas (e.g. Studio Physics)
- Implementation / Practicum - student engaging these ideas in practice.

Resources in this compendium:

- Weekly schedule / readings - (folder)
- Slides and activities, for daily meetings (folder)
- Fieldwork & Final Project framing (folder)
- Syllabus summarizing the approach taken, underpinning philosophy, and logistics such as grading.

This class was first developed in 1998, while I was a postdoc / instructor at UCSD and served since then as a mechanism to develop scholars in PER, and recruit and prepare future physics teachers (primarily high school, but also K-8 and college level). I have greatly enjoyed the course and opportunities it has provided every time that I've taught it ... (most recently Spring 2023).

Feel free to contact me if you have questions.
- Noah

Noah Finkelstein, Professor, Univ. of Colorado Boulder noah.finkelstein@colorado.edu