Project Goals
(1) Create a really spiffy lab.
(2) Study how students learn in lab courses.
(3) Provide resources for faculty to develop their own transformed labs.

Existing Advanced Optics and Modern Physics Lab
- 15 students per instructor
- Mostly seniors.
- Broad content:
  - Nuclear physics (gamma ray spectroscopy)
  - Particle physics (cosmic ray muon lifetime)
  - Condensed matter physics (scanning tunneling microscope, NMR)
  - AMO physics (saturated absorption spectroscopy, magneto-optical trapping)
  - Physical optics (diffraction, interferometry, polarization).
- 4-6 labs in a semester.
- Not linked with any lecture course.
- Associated lecture period not coordinated with lab.
- "Cookbook" lab guides.
- Minimal emphasis on applications of physics.
- 5 week long final project allows for creativity and independence.
- The formal assessments are written lab reports and oral presentations.

Methodology
Input from CU Faculty
15 faculty interviews (example questions)
"What is the purpose of a good lab course?"
"What is the goal of communication in the lab?"
"What abilities do you look for when hiring a new student in your lab?"

A draft set of learning goals was produced
Two working group meetings to develop consensus.

What's the relevance of Physics Education Research to the Advanced Lab?
Transforming the Advanced Lab: Part 1 – Learning goals
Benjamin Zwickl1, Noah Finkelstein1, Heather Lewandowski2
Department of Physics, University of Colorado Boulder (1) Physics Education Research Group and (2) JILA
benjamin.zwickl@colorado.edu