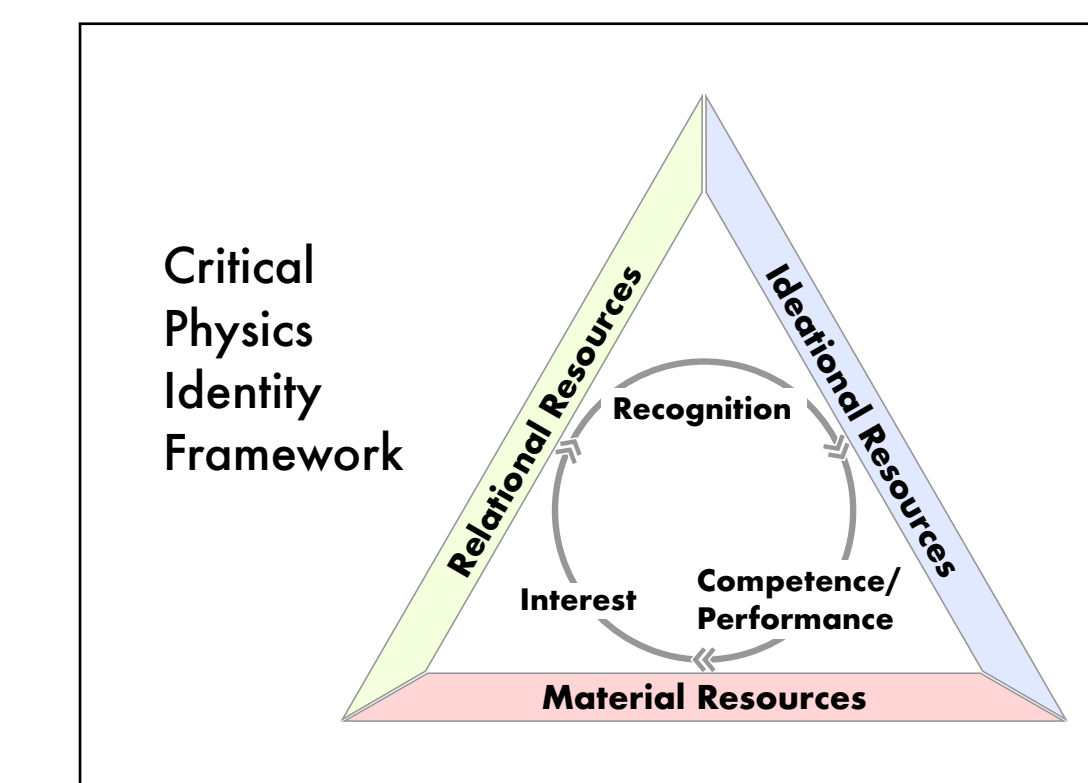
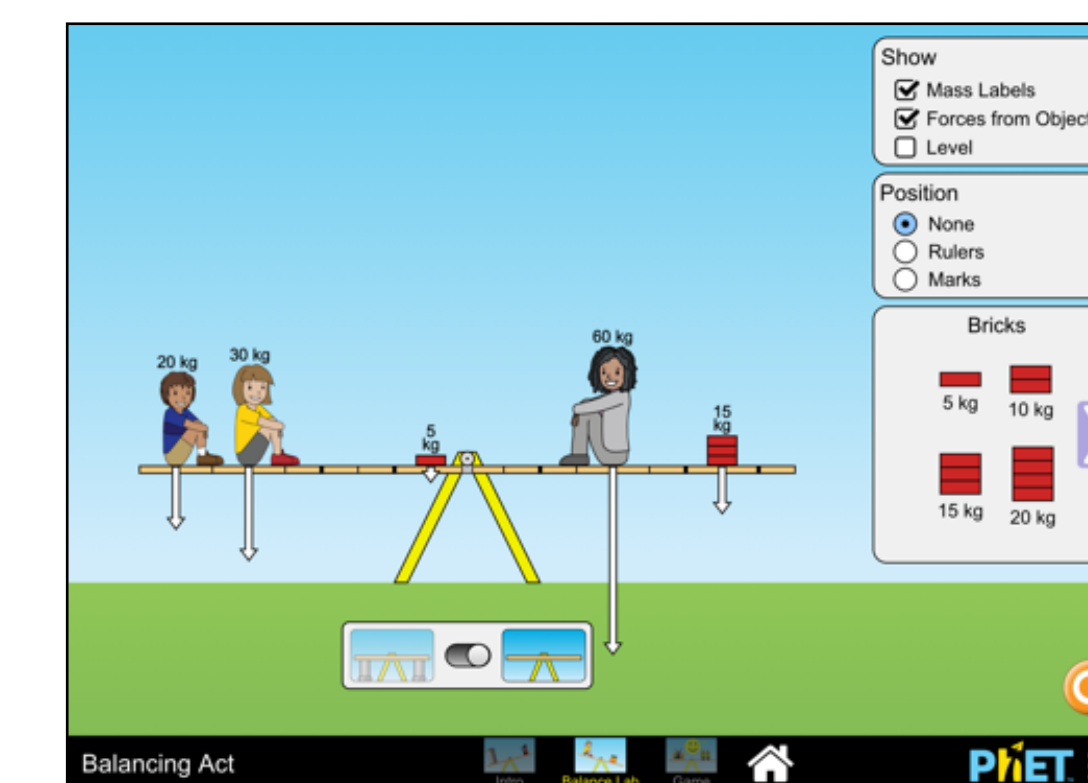


Physics Education Research is a subfield of physics that studies and advances learning and engagement in physics



Quantum Mouse Lab

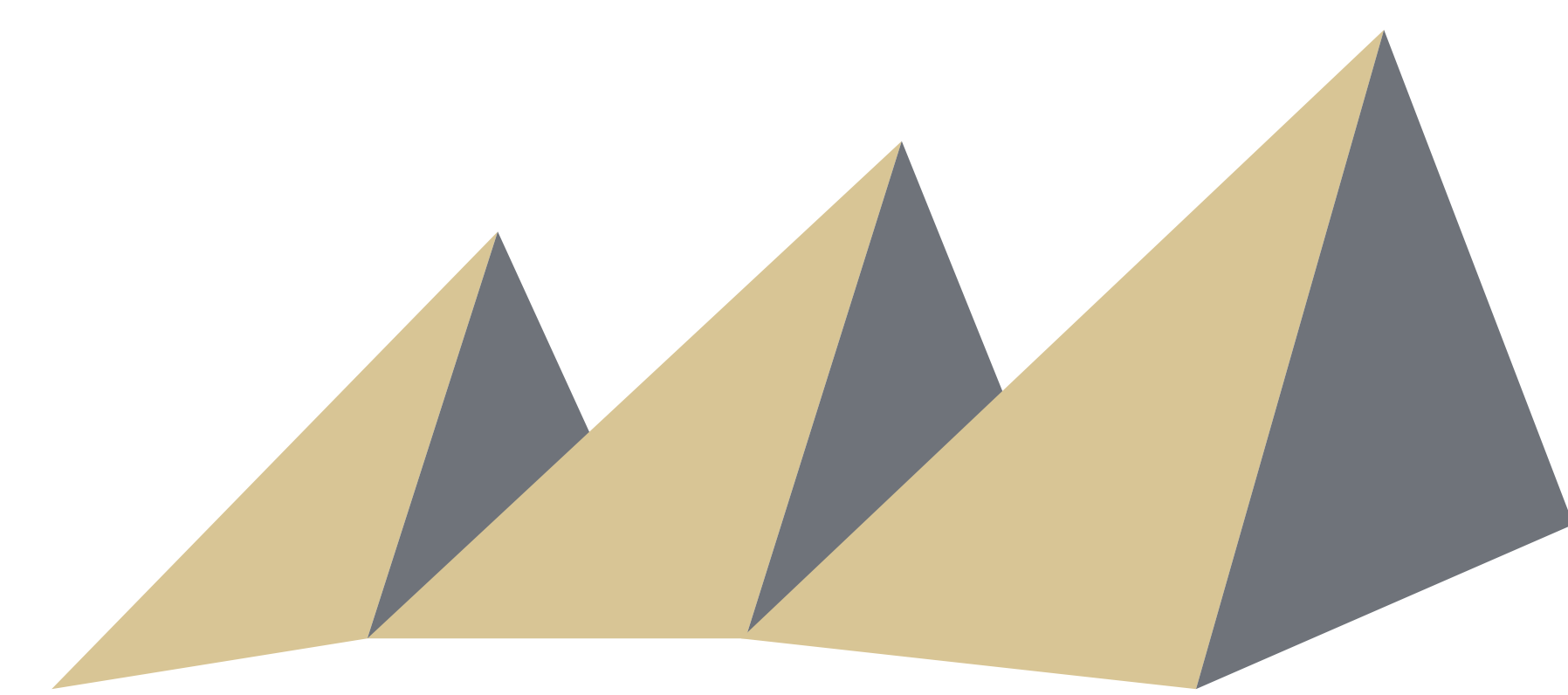
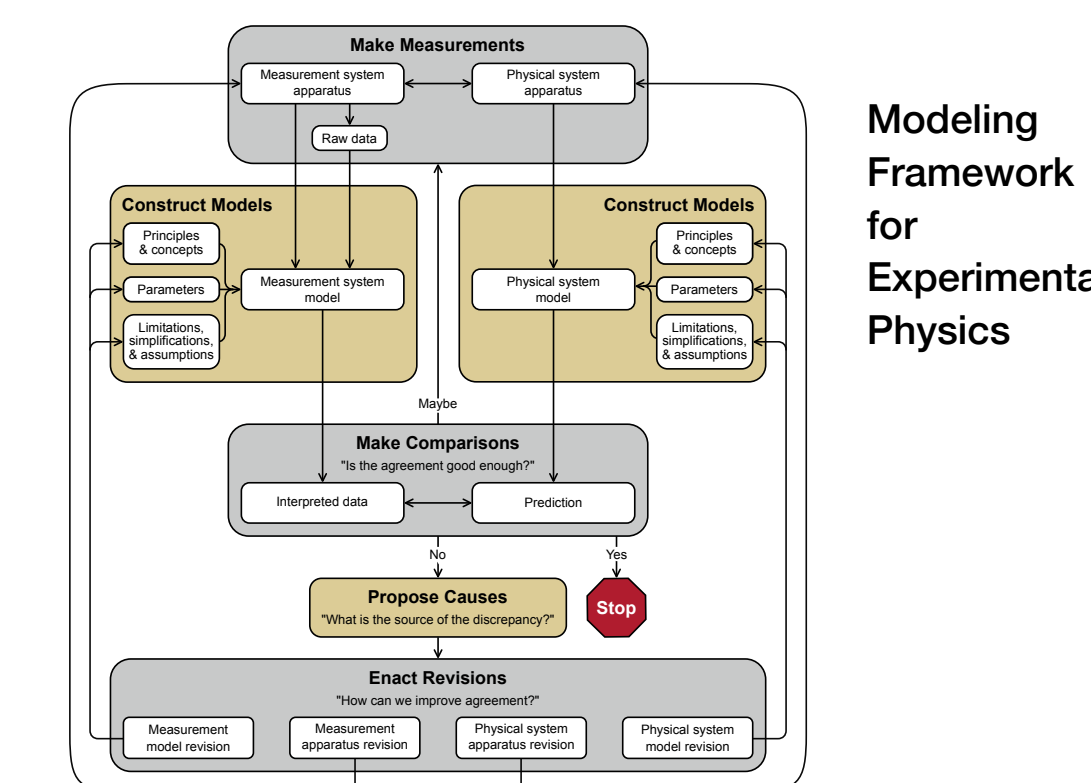
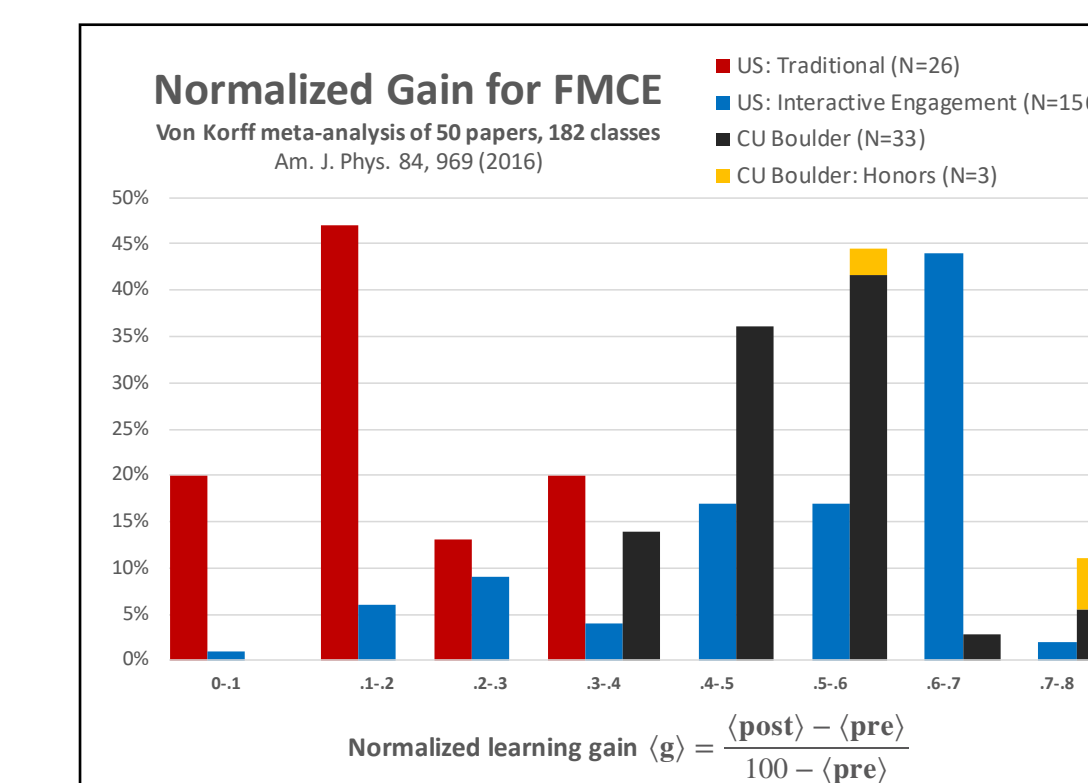
1. Consider a quantum object (a quantum mouse) and some new properties we can measure. For example, suppose "eye size", S , is a Hermitian (observable) operator. The corresponding physical measurement is "measure the opening size of the pupil". Interestingly, the scale reads either 1 mm (tiny eyes) or 2 mm (wide-eyed, but nothing else).

$S|e_1\rangle = 1|e_1\rangle$, but $S|e_2\rangle = 2|e_2\rangle$

(Because I'm no artist, I will simplify the lots for multi-eyed and big-eyed mice to $|+\rangle$ and $|0\rangle$ respectively.) **Note:** Being either small-eyed or big-eyed is totally normal. In fact, let us assume it is orthonormal (and complete).

Look at the eigen-equations above, and make sure your group understands the notation:

a) Which symbols are the eigenvectors here, what are the eigenvalues, in those equations? Do any numbers have "hidden" units? (Is that ok? Have we ever seen that before?)



Give a brief outline of the **EASIEST** method you would use to solve the problem.

DO NOT SOLVE the problem, we just want to know:

(1) The general strategy (half credit) and
 (2) Why you chose that method (half credit)

Q3: A solid, neutral, non-conducting cube as in the figure, with side length a and $\rho(z) = kz$.

Find \vec{E} (or V) outside, at point P , where P is off-axis, at a distance $50a$ from the cube.



You might join our group to...

- Study *reasoning and understanding* in physics
- Improve *curricular materials and teaching approaches*
- Design *assessments* to reliably measure learning
- Investigate the development of *scientific practices, identity, and views about science and learning*
- Examine *physics culture* and work to promote *inclusive environments* that foster learning and engagement
- Move on to a career in research, teaching, informal education, policy, industry, and more

Any student is welcome to...

- Join our group meetings
- Take the PER class It counts towards your degree
- Do a side-project in PER Or Comps 2
- Mentor young scientists with PISEC
- Use research-based curricula and practices when teaching

CU PER collaborates with Astrophysics, Engineering, Psychology, the School of Education, and others on campus – visit colorado.edu/per and be in touch