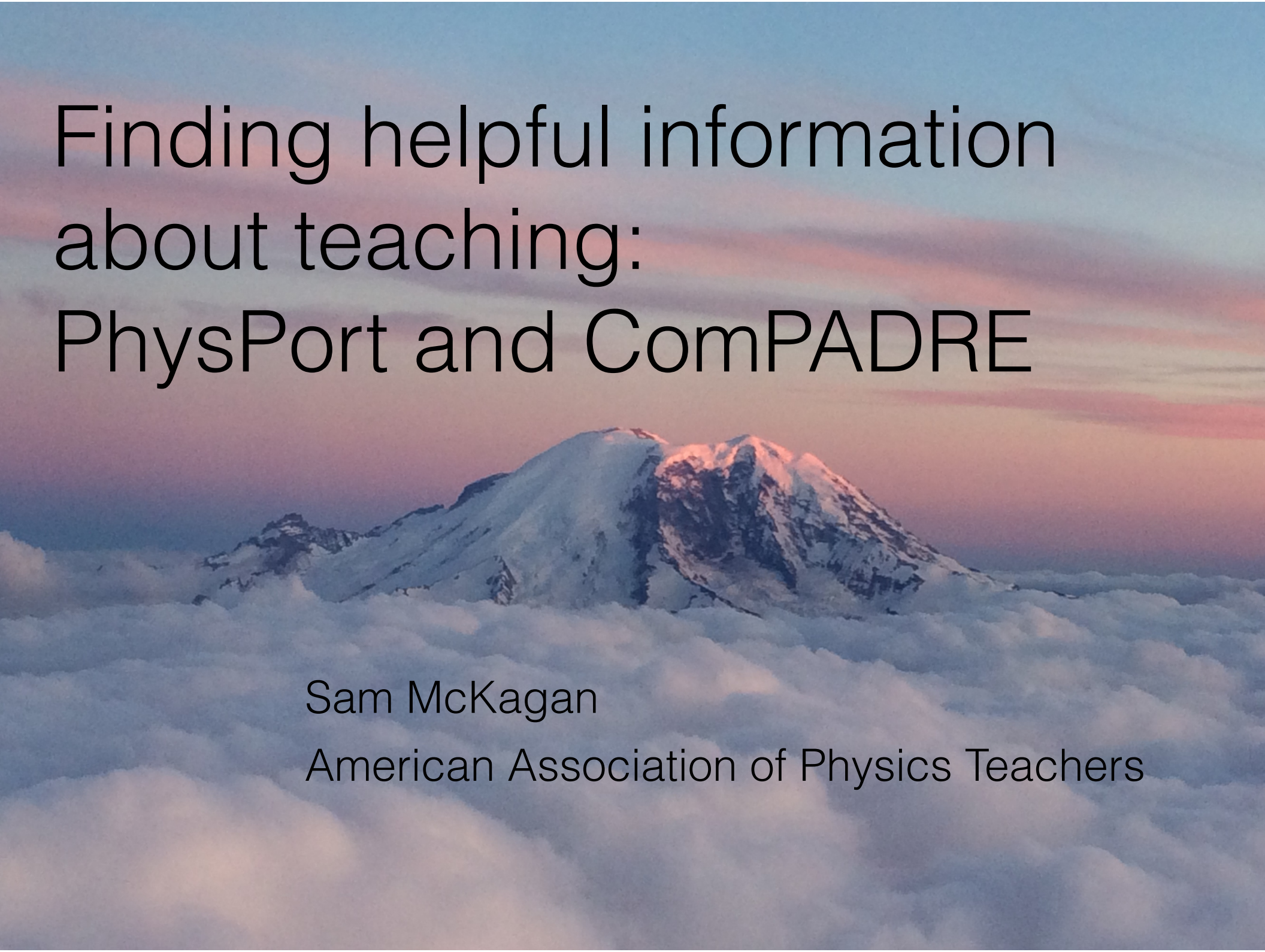
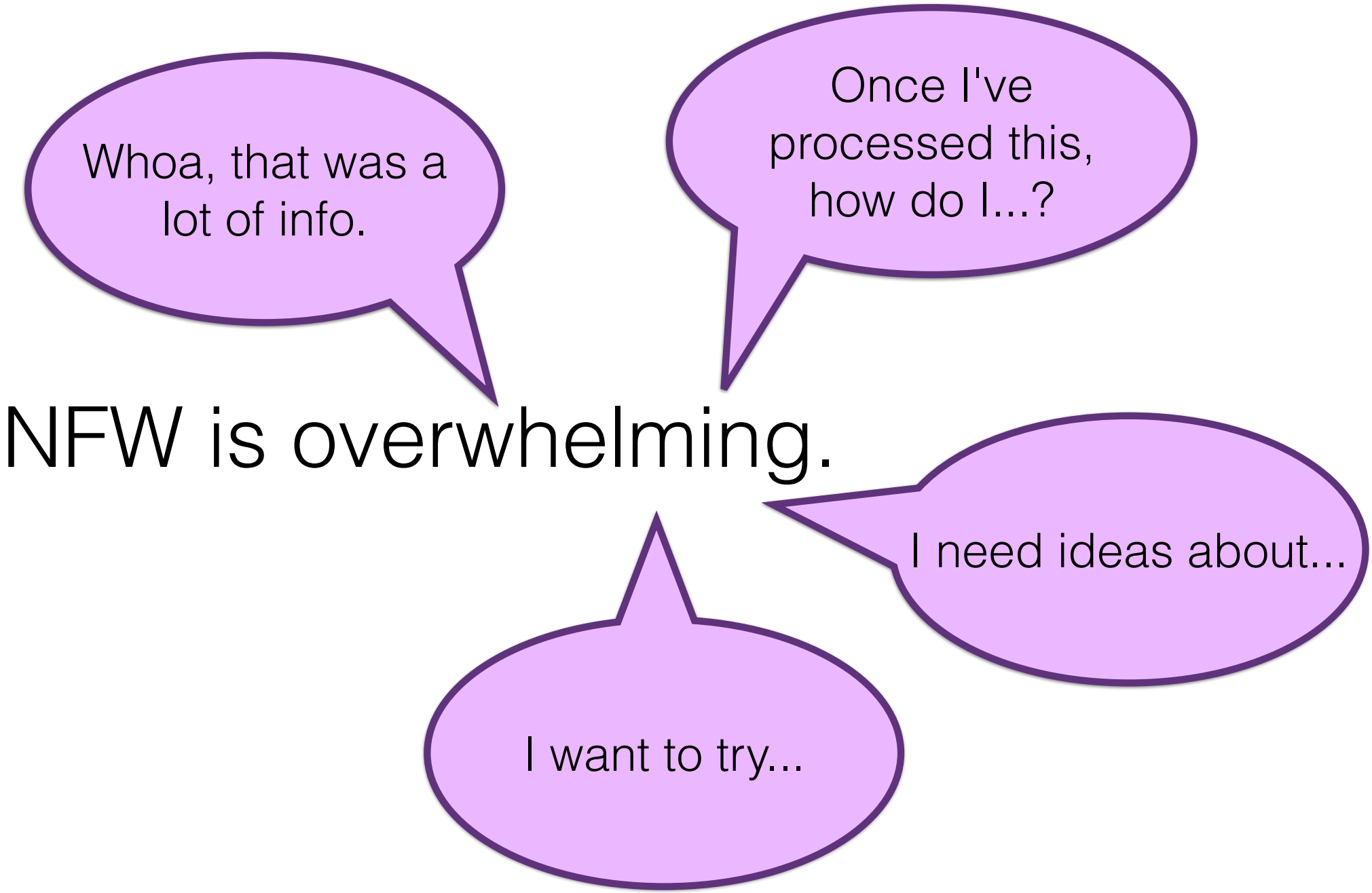


Finding helpful information about teaching: PhysPort and ComPADRE

Sam McKagan

American Association of Physics Teachers


Whoa, that was a lot of info.
Once I've processed this, how do I...?
NFW is overwhelming.
I need ideas about...
I want to try...

PhysPort

Supporting physics teaching with research-based resources

A web resource to support physics professors in using research-based teaching and assessment in their classes

www.physport.org

go here now!

Applied research into faculty needs
Synthesis research into best practices
Enable research into student learning

AAPT PHYSICS EDUCATION SUPER comPADRE

You have questions about teaching.

How to best support students' learning?

How do you know if students are learning?

PhysPort can help.

Find information and advice

Change your teaching

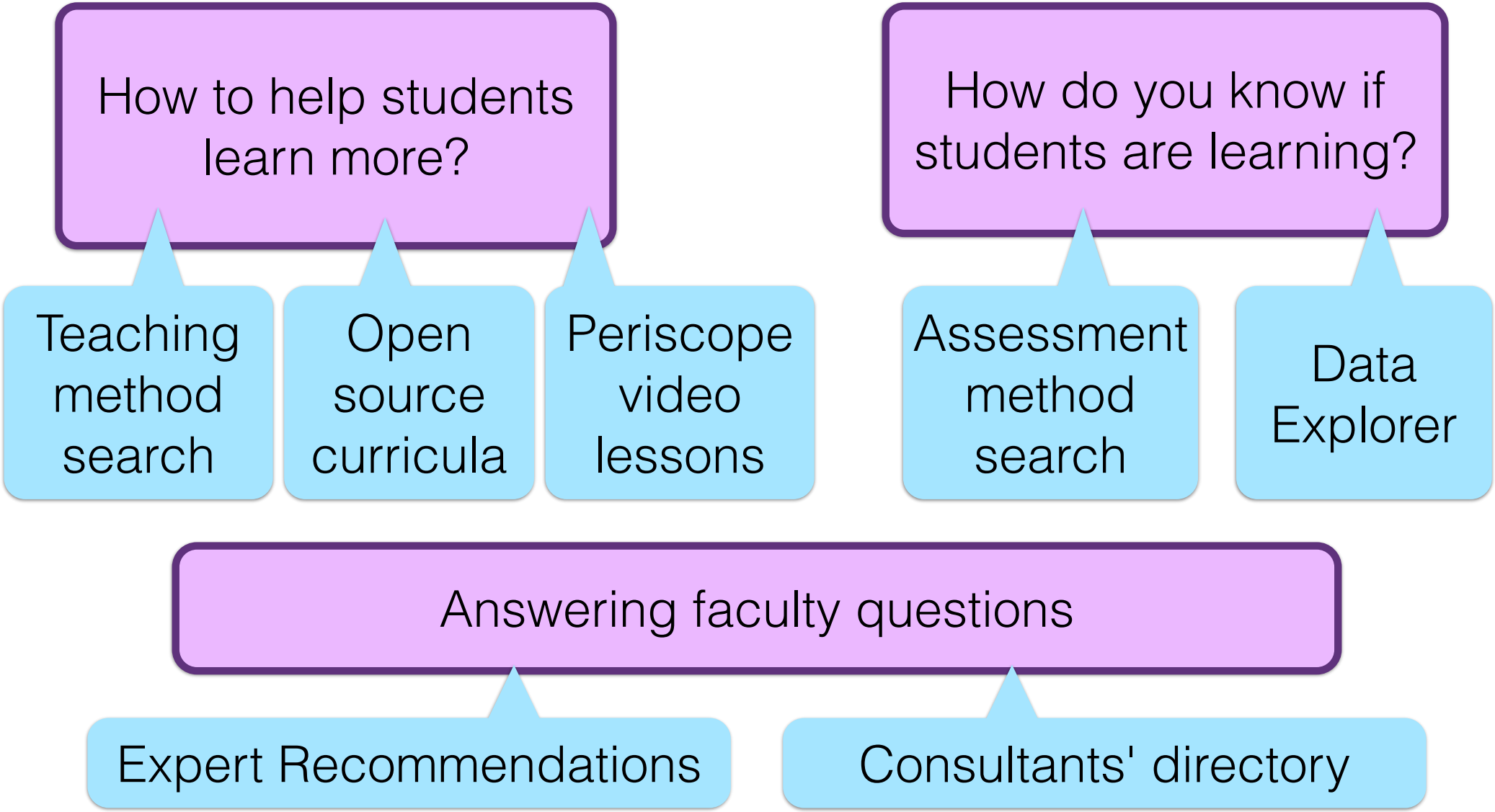
free

friendly

powerful

research-based

PhysPort can help.



Teaching

physport.org/Teaching.cfm

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Get Advice on Teaching and More

Where can I find good questions to use with clickers or Peer Instruction?

How do I use PhET simulations in my physics class?

How do I design a SCALE-UP classroom?

More

Get Teaching Materials

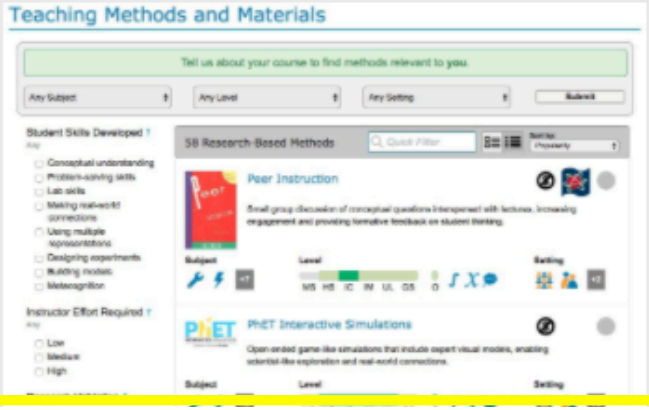
PhysPort hosts several collections of free open-source curricular materials for teaching Physics

Explore

Find Research-Based Teaching Methods for Your Class

Our collection includes example materials and implementation resources for:

- Full curricula
- Curriculum supplements
- Strategies and techniques
- Tutorials and labs
- Computer simulations



Browse

Feedback

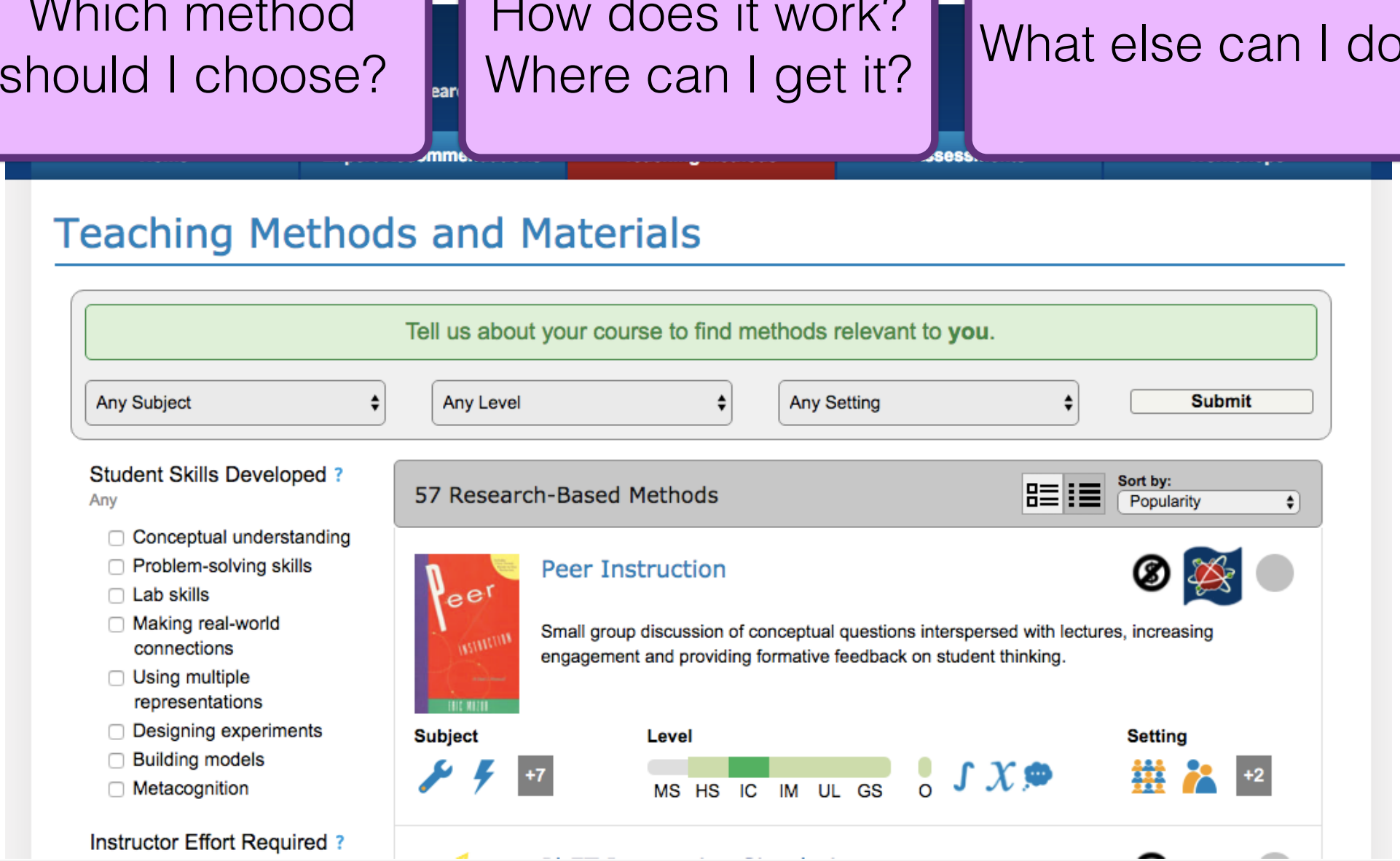
Teaching methods

physport.org/methods

Which method should I choose?

How does it work? Where can I get it?

What else can I do?



Teaching methods

physport.org/methods

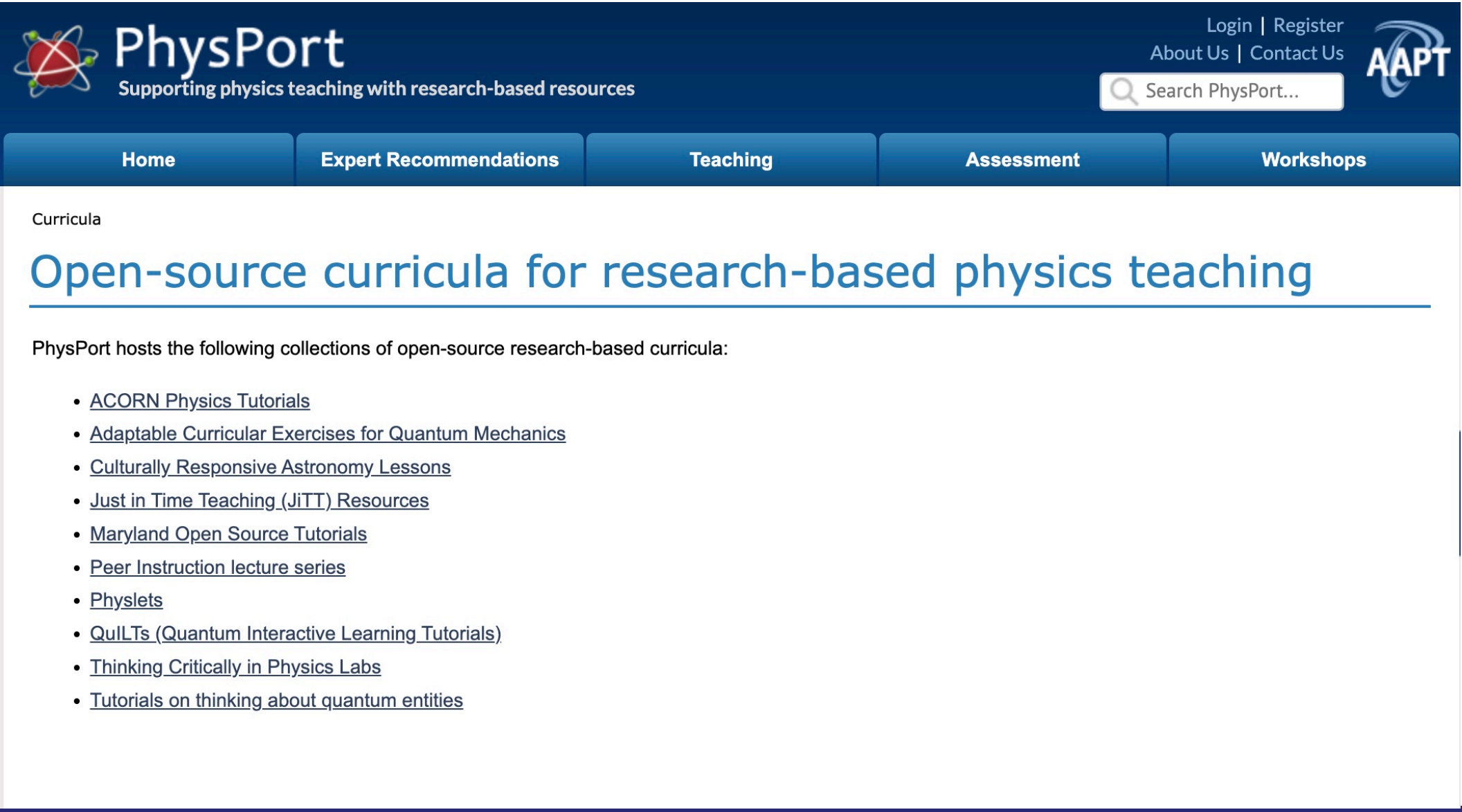
Your questions:

- How can I find tutorials that I can use in a particular class setting and that are open source?
- Any tips or comments for implementing active learning activities like TPS for upper level Undergraduate courses or graduate level courses.
- Where can I learn more about how to implement this stuff?

Curricula

physport.org/curricula

Free research-based open-source curricula



Online workshops

physport.org/workshops

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Periscope: Looking into Learning

What is Periscope?

A collection of lessons for faculty and LAs/TAs to:

- watch and discuss videos of best-practices physics classrooms
- apply lessons learned to actual teaching situations
- practice interpreting student behavior
- become more effective teachers

View Collection

Virtual New Faculty Workshop

What is the Virtual New Faculty Workshop?

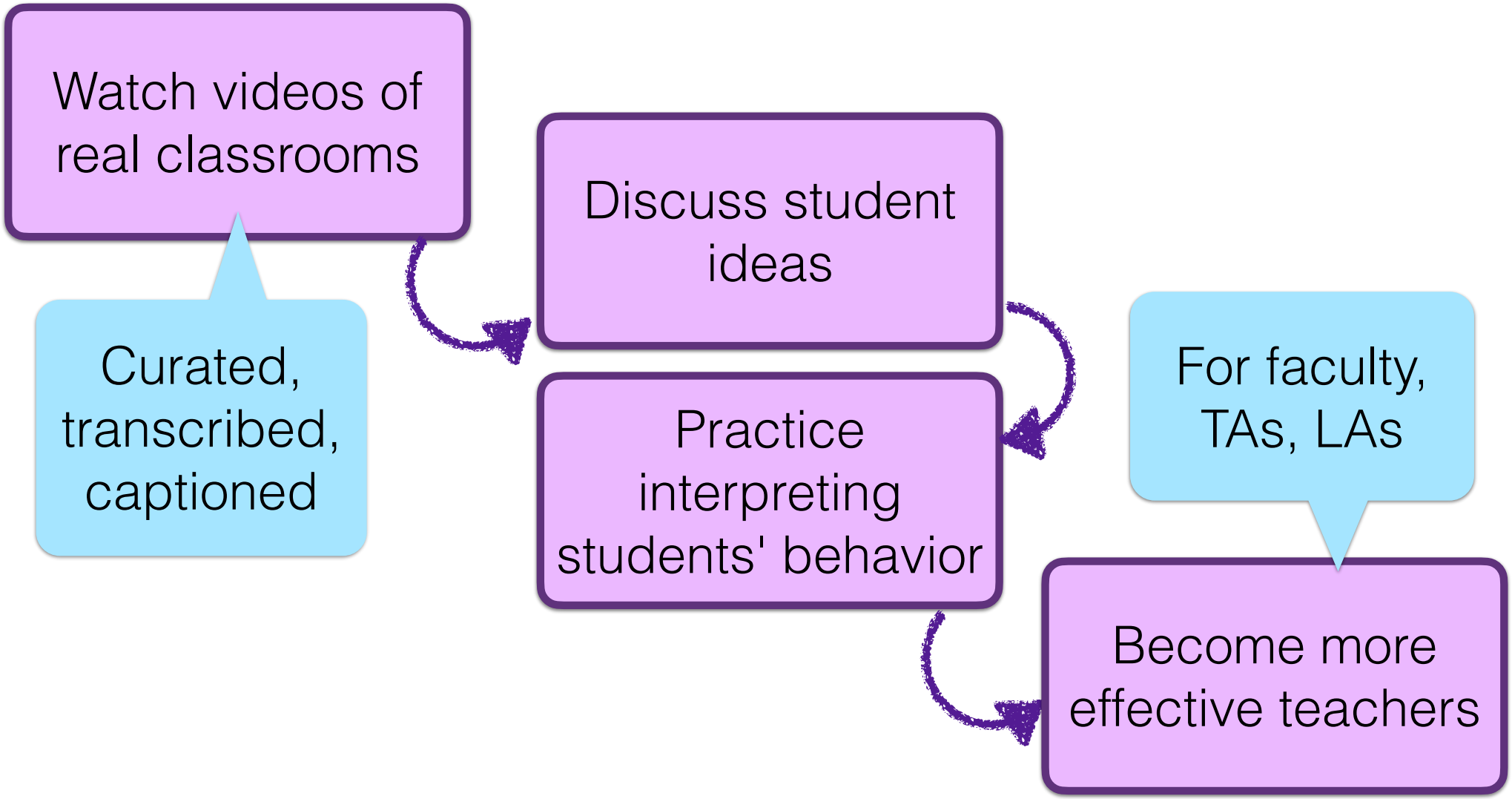
Videos of presentations from the live Workshop for New Faculty in Physics and Astronomy feature:

- leaders in physics education research and curriculum development
- teaching techniques proven to work in many environments
- cutting-edge developments in physics/astronomy curriculum and pedagogy

View Collection

Periscope

physport.org/periscope



How can I bring out students' ideas?

physport.org/periscope

Episode 101: Depth

Pedagogy Content — Attending to student ideas

Physics Content — Pressure

Instructor Interaction ✓

STEM-wide audiences ✓

Sample discussion prompts

1. What did you notice in this episode? Talk to your neighbor about what you noticed.

2. What does Levi (the instructor) say that gets his students to articulate their ideas?

3. What does Levi do (nonverbally) to support the students in expressing themselves?

4. It can be tricky for an instructor to draw out both sides of a contradictory argument without embarrassing anyone. What specific strategies or behaviors does Levi use to keep everyone in the game?

Download

Classroom video

Student handout

Specific lesson guide

General facilitator's guide

physport.org/periscope

Periscope Video Lessons

part of PhysPort

Looking into learning in best-practices physics classrooms

Home | All Lessons | FAQ | About

Search

Featured Lessons

see all lessons ➔

BEST PRACTICES

How can I bring out students' ideas?

STUDENT IDEAS

What ideas do students have abo… ba…

GROUP WORK

How can I encourage …ent

SUPPORTING EQUITY

How can I assess group work in a way that is equitable?

Available now!

40+ lessons

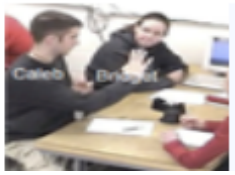
Facilitators' Guide

CU Colorado LA Pedago…

see this collection ➔

What ideas do students have about charge transfer?

What ideas do students have about mechanical energy?



What ideas do students have about forces and fields?

Expert Recommendations

physport.org/recommendations

Friendly articles that interpret and synthesize PER results for physics faculty.

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FEATURED

Strategies and resources for teaching your physics course online on short notice

by Chandralekha Singh, University of Pittsburgh — March 24, 2020

Due to the COVID-19 pandemic, many of us teaching physics as well as those teaching other subjects in face-to-face brick-and-mortar classrooms have suddenly found themselves in an unprecedented situation: the rest of the term should immediately transition to a completely online format! Here I outline some strategies and resources that can help you and your colleagues.

Read more »

COVID-19, online tools

I suddenly have to move my lab course online! What should I do?
by Linda Strubbe and Sam McKagan, PhysPort

I suddenly have to move my face-to-face physics/astronomy course online! What should I do?
by Linda Strubbe and Sam McKagan, PhysPort

How can I maintain sensemaking when moving my class from in-person to online?
by Andrew Elby (he/him) and

Search Expert Recommendations...

Most Popular

Effect size: What is it and when and how should I use it?

I suddenly have to move my face-to-face physics/astronomy course online! What should I do?

Normalized gain: What is it and when and how should I use it?

View all »

Tags

active learning

Feedback

Expert Recommendations

physport.org/
recommendations

Your questions:

- Here, we, as teachers, are motivated enough to engage in class. For a diverse population of students, e.g., large gen. ed. classes, it's hard to be the case. How to motivate them (the least motivated ones)?
- How do we create a classroom climate that enables students to bring their "whole selves" to the classroom (in terms of the socio-cultural identities that Tali spoke about)?
- How do we help our students become science communicators?

Expert Recommendations

physport.org/recommendations

Friendly articles that interpret and synthesize PER results for physics faculty.

Assessment

www.physport.org/Assessment.cfm

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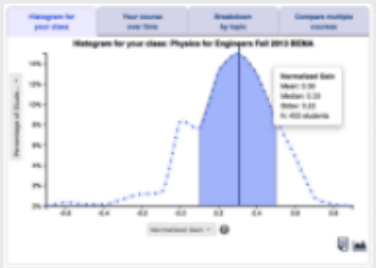
Get Advice on Assessment and More

- Best practices for administering concept inventories
- Best practices for administering attitudes and beliefs surveys
- Administering research-based assessments online

More

Score and Compare Results

- Score, visualize, and analyze your students' results on research-based assessments
- Compare to data uploaded from teachers like you



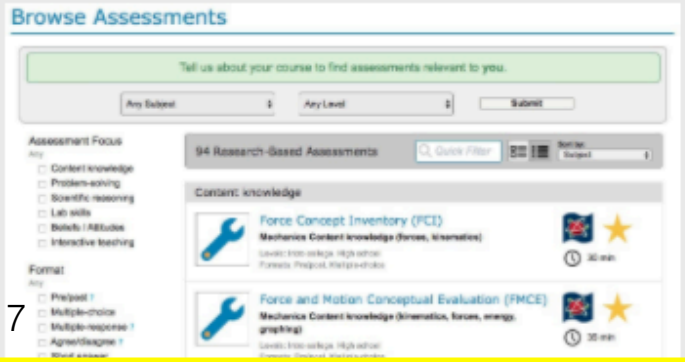
Explore

Feedback

Find Assessments for Your Class

Our collection includes example questions and full assessments* for:

- Introductory physics concepts
- Upper-level physics concepts
- Scientific reasoning or problem solving
- Student attitudes and beliefs



Browse

Assessment

www.physport.org/Assessment.cfm

Your questions:

- Should we use questions from concept inventories (like from PhysPort) on our tests/quizzes/exams in order to grade students?
- I did FCI last year and I would like to know if there is a way to analyze and/or use that data effectively?

What are Research-based Assessments?

Force Concept Inventory (FCI)

Force & Motion Conceptual Evaluation (FMCE)

and 100+ more

These are:

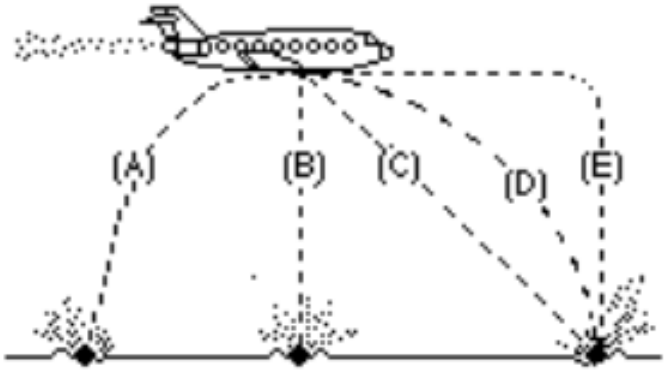
- Generally multiple-choice surveys
- Carefully crafted questions
- Conceptual topics across the physics curriculum
- Additionally: beliefs, problem-solving skills, affect

Force Concept Inventory

- 30 multiple choice problems on introductory mechanics
- Many variants
  - Gendered, free-response, random-order, representational…
  - Many translations
- 2000+ citations

14. A bowling ball accidentally falls out of the cargo bay of an airliner as it flies along in a horizontal direction.

As observed by a person standing on the ground and viewing the plane as in the figure at right, which path would the bowling ball most closely follow after leaving the airplane?



Hestenes, D., Wells, M., & Swackhamer, G. (1992). Force Concept Inventory. *The Physics Teacher*

Interpret the results of diverse PER

Weighted combination of data from published studies

More robust

Vulnerable to publishing bias

Synthesis research

100,000 students

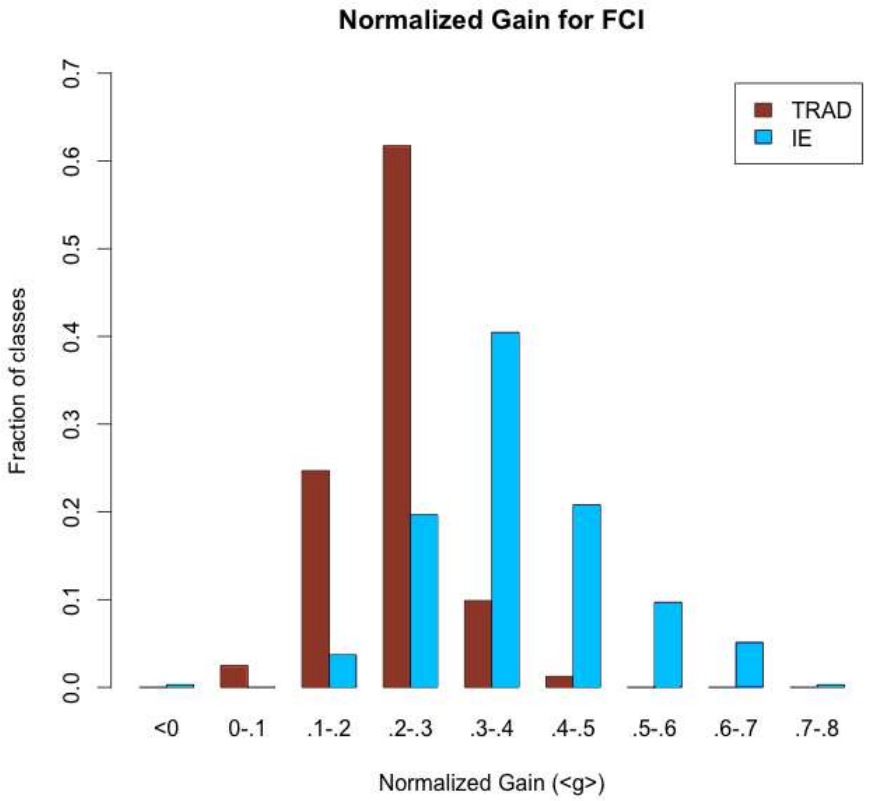
Madsen, McKagan, & Sayre (2013). Gender gap on concept inventories in physics: What is consistent, what is inconsistent, and what factors influence the gap? *PhysRevST-PER*

Madsen, McKagan, & Sayre (2015). How Physics Instruction impacts students' beliefs about learning physics. *PhysRevST-PER*

Von Korff, *et al* (2016). Secondary Analysis of Teaching Methods in Introductory Physics : a 50k - Student Study. *AmJPhys*

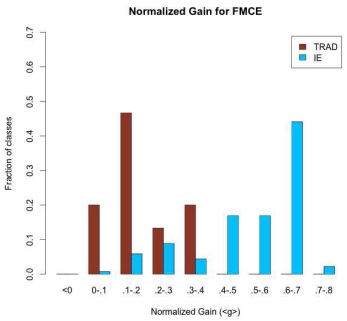
Mechanics teaching

Interactive engagement



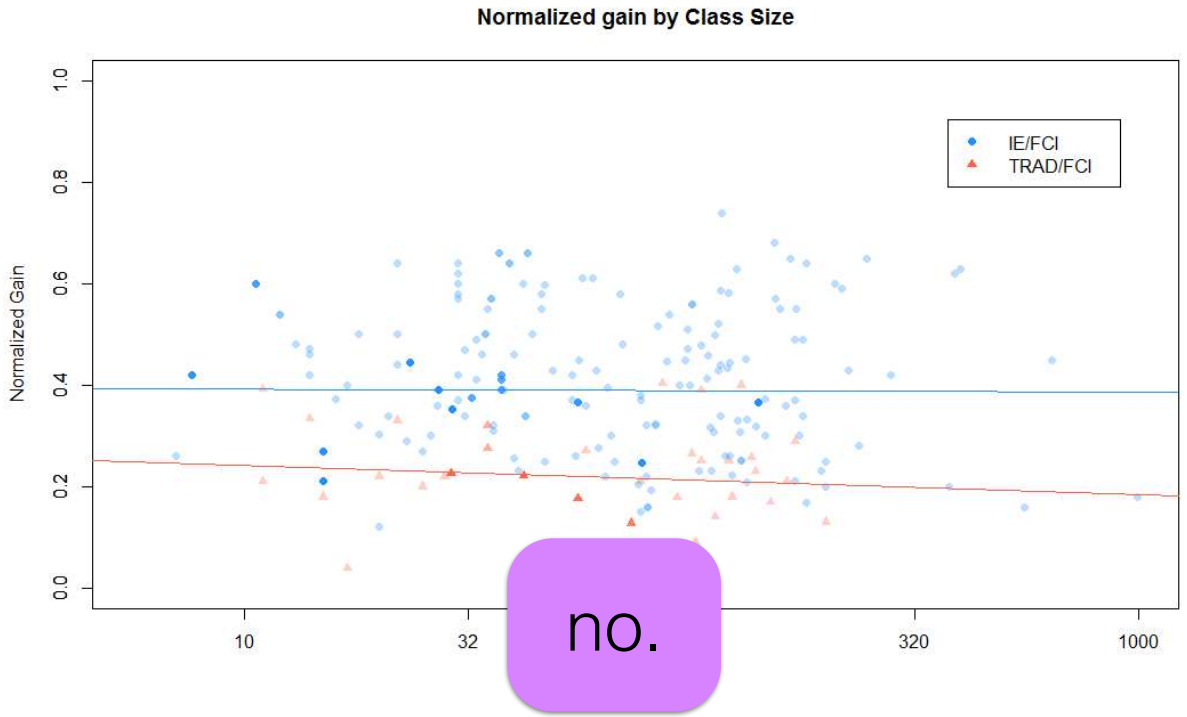
50,000 Students

Von Korff, J., *et al* (2016). Secondary Analysis of Teaching Methods in Introductory Physics : a 50k - Student Study. American Journal of Physics



Does class size matter?

- Different sizes use different IE methods.
- Same trend for lecture and lab



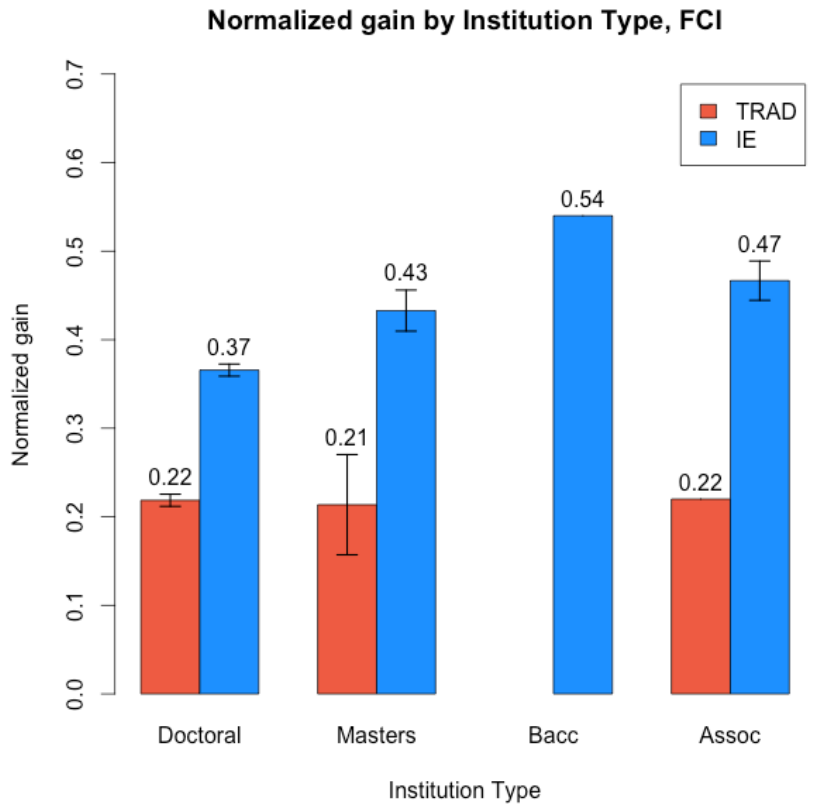
Von Korff, J., *et al* (2016). Secondary Analysis of Teaching Methods in Introductory Physics : a 50k - Student Study. American Journal of Physics

Does institution type matter?

- Reduced Carnegie classification

no.

- Highly dependent on publishing effect
- Data are mostly Doc institutions.

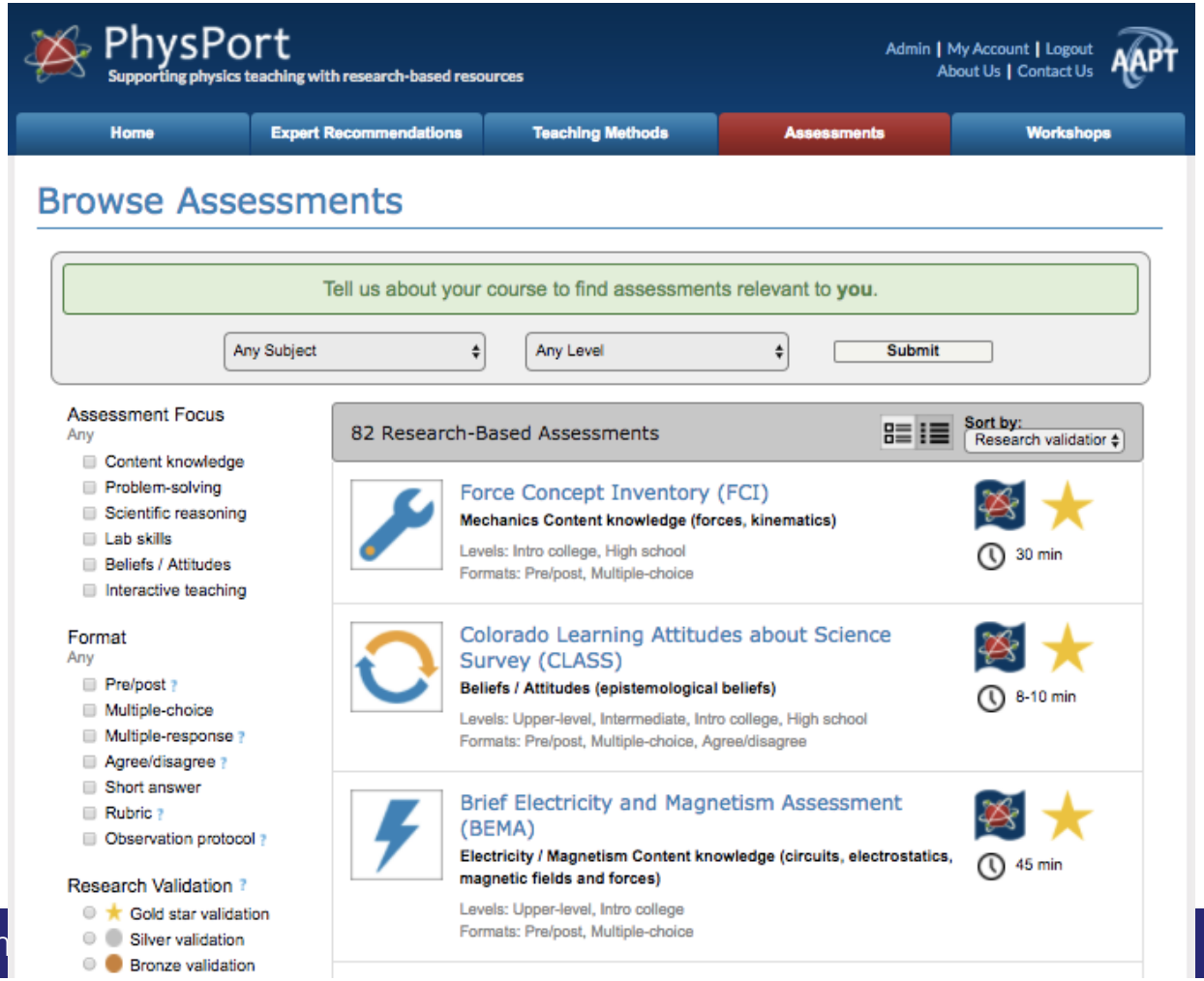


Von Korff, J., *et al* (2016). Secondary Analysis of Teaching Methods in Introductory Physics : a 50k - Student Study. American Journal of Physics

Assessment

physport.org/assessments

Which assessment should I choose?



- Conceptual topics across physics curriculum
- Additionally: beliefs, problem-solving skills, affect
- Searchable by
  - kind & level of course
  - format & topic
  - research validation

100+ available

Assessment

physport.org/assessments

Which assessment should I choose?

How should I administer it?

Force Concept Inventory (FCI)

Developed by David Hestenes, Malcolm Wells, Gregg Swackhamer, Ibrahim Halloun, Richard Hake, and Eugene Mosca

Purpose	To assess students' understanding of the most basic concepts in Newtonian physics using everyday language and common-sense distractors.
Format	Pre/post, Multiple-choice
Duration	30 min
Focus	Mechanics Content knowledge (forces, kinematics)
Level	Intro college, High school

Typical results

Sample questions

Research overview

Translations

Assessment

physport.org/assessments

Which assessment should I choose?

How should I administer it?

Where do I get it?

Verified educators!

For faculty and teaching staff

free, easy

Download test

Administration guide

Security instructions

Assessment

physport.org/assessments

Which assessment should I choose?

How should I administer it?

Where do I get it?

How should I interpret my results?

Assessment

www.physport.org/Assessment.cfm

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- Best practices for administering attitudes and beliefs surveys
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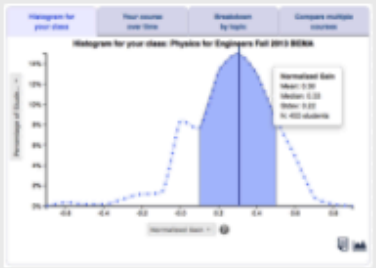

Explore

Feedback

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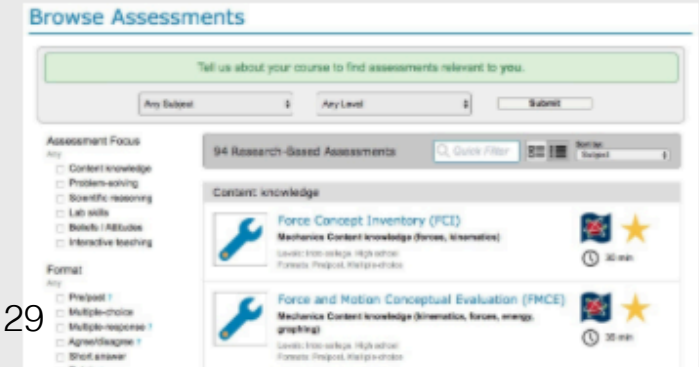
- Student attitudes and beliefs



Browse

Data Explorer

physport.org/DataExplorer

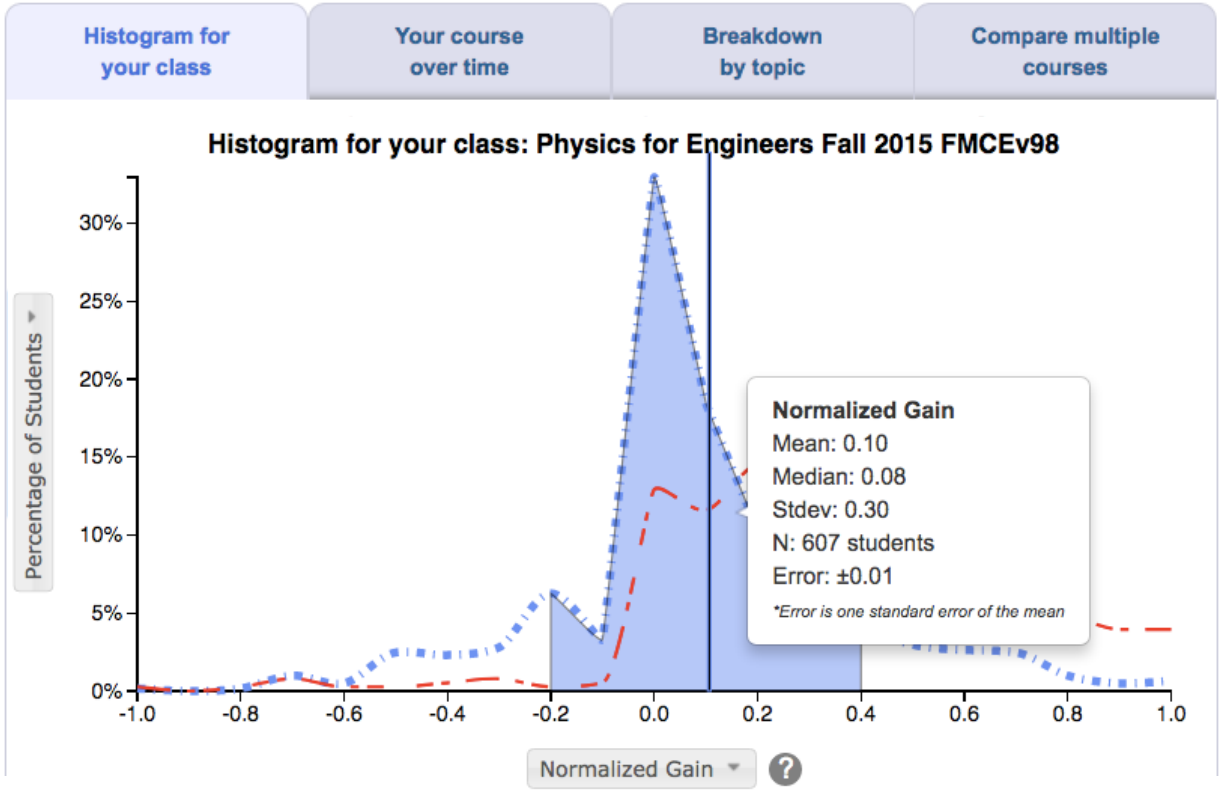
Visualize and compare your students' performance from 36 research-based assessment instruments.

- View & download beautiful graphs
- Compare multiple courses
- Track your courses over time
- Group and split by gender, major, section, instructor, etc
- Easy upload, automatic pre/post matching and scoring
- Compare to national averages
- Download pdf reports for your tenure file

Data Explorer

physport.org/
DataExplorer

Visualize and compare your students' performance on research-based assessment instruments.



Upload your data

Explore your data

Download your results

Sam McKagan: smckagan@aapt.org

Data Explorer

physport.org/
DataExplorer

Secure

We use the same security measures used by banks and financial institutions so you can have the utmost confidence that your data is safe.

- Your identity is protected
- Your students' identities are protected
- We use one-way, cryptographically-secure transformations
- We report on aggregate data

Data Explorer

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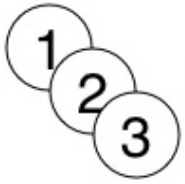
Secure

We use the same security measures used by banks and financial institutions so you can have the utmost confidence that your data is safe.



Easy

Our guided process makes it easy to upload your data, and our visualization engine is tailored to assessments, making charting a snap.

- We match pre- and post-data for you
- You can upload the files you already have*: no need to use a template

* .csv, xls, or .xlsx; one assessment per file; one row per student

Data Explorer

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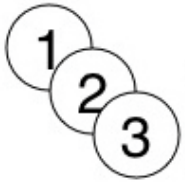
Secure

We use the same security measures used by banks and financial institutions so you can have the utmost confidence that your data is safe.



Easy

Our guided process makes it easy to upload your data, and our visualization engine is tailored to assessments, making charting a snap.

Powerful

With one click, you get a comprehensive analysis of your results, allowing you to compare your data with classes and teachers in similar institutions nationwide.

- Explore responses on by questions or clusters
- Track your classes over time
- Split data by demographics
- Rigorous statistics done for you in the background

physport.org/DataExplorer

Histogram for your class | Your course over time | Breakdown by topic | Compare multiple courses

Summary

Average Gain
0.10
± 0.01

Your students' average normalized gain of **0.10 ± 0.01** is near the bottom of the range for traditional lecture classes . See typical results.

Effect Size
0.61

The effect size of the change between pre and post for your class is **0.61**. This is a moderate effect size

Average Score
Pre 18%
± 1%
Post 30%
± 1%

Your students' average score increased from **18% ± 1%** on the pre-test to **30% ± 1%** on the post-test. See typical results.

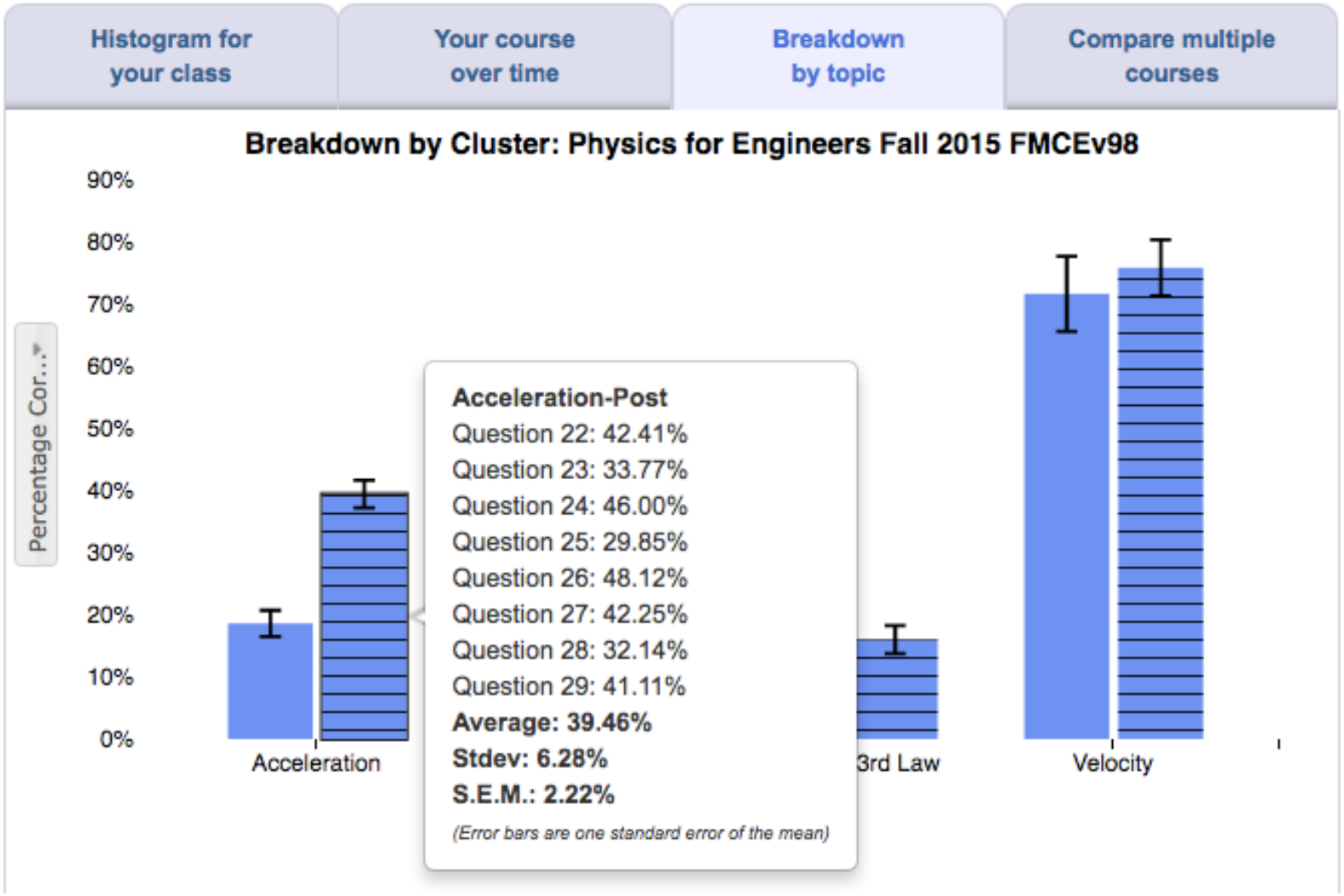
N (matched)
607

You have 607 "matched" students (who took both the pre- and post-test) in your class. All calculations are based on matched students.

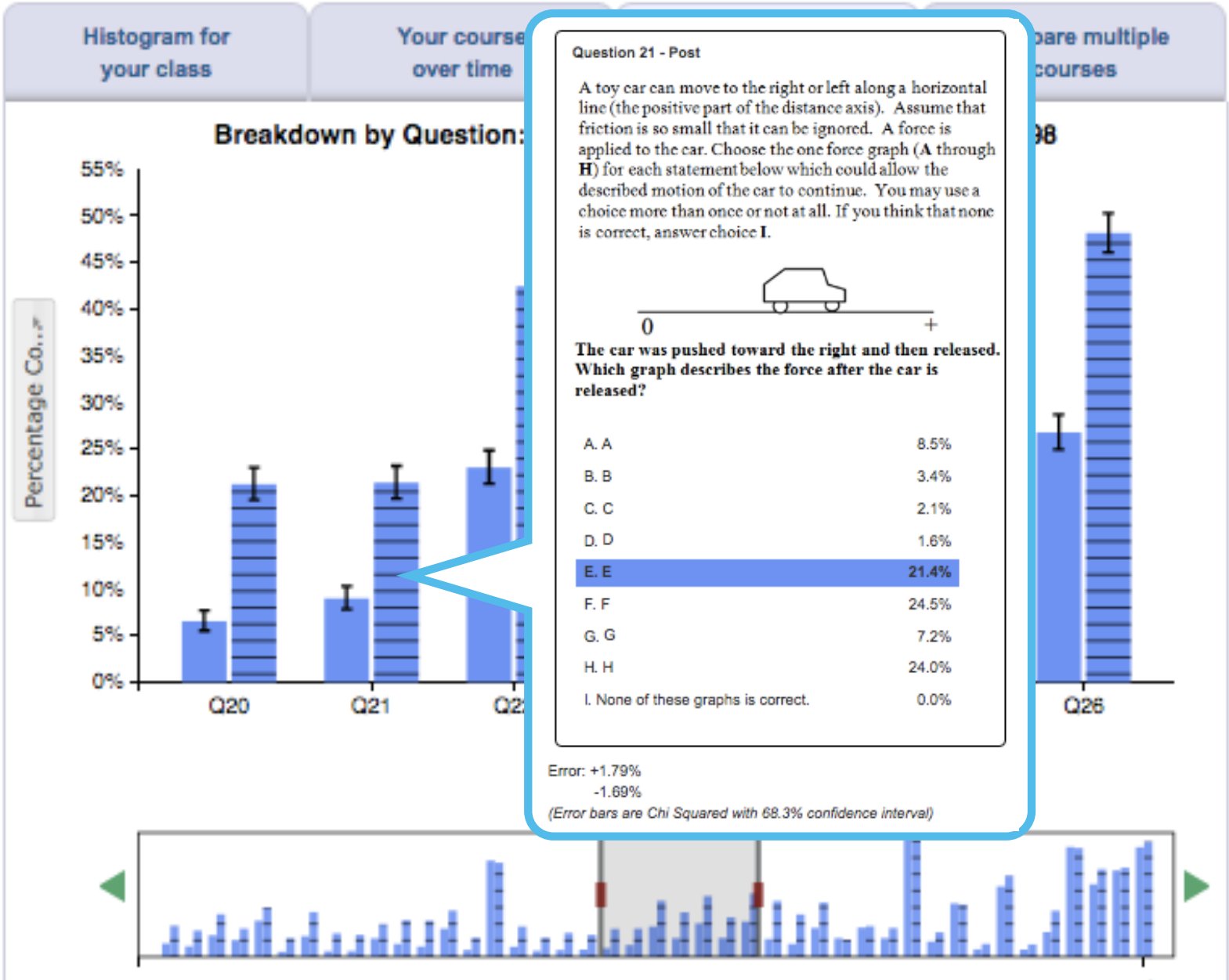
Recommendations

Courses that are taught using interactive engagement techniques tend to have higher normalized gains than those using traditional lecture. The key to these methods is getting students actively engaged in constructing their own understanding and not just passively listening.
This can be accomplished in many ways. Popular methods that you could try include: Peer Instruction, PhET Interactive Simulations, Interactive Lecture Demonstrations, and Just In Time Teaching.
As we collect more data on how teaching practices correlate with learning gains, we will eventually provide more customized recommendations.

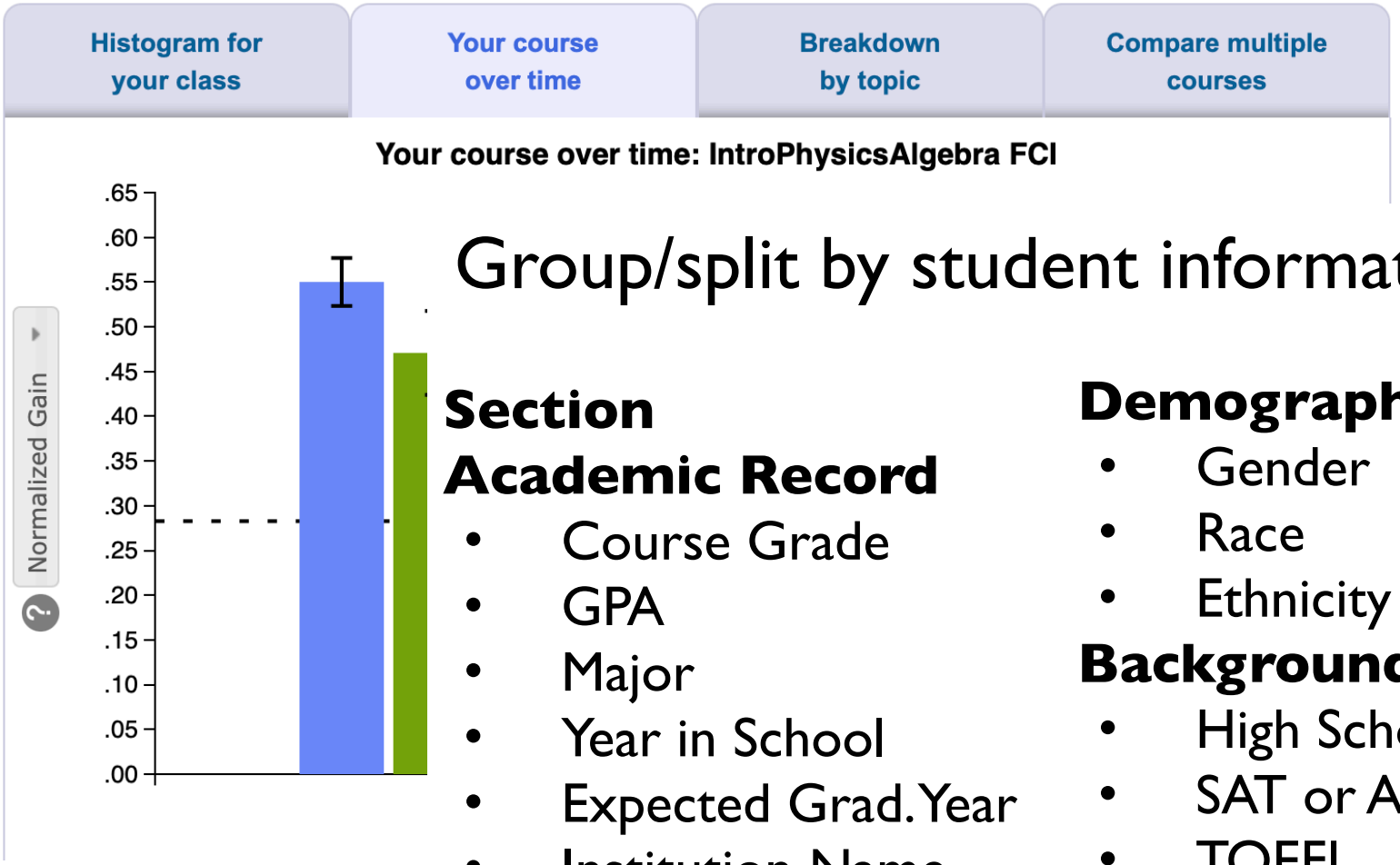
physport.org/DataExplorer



physport.org/DataExplorer



physport.org/DataExplorer



Group/split by student information* including:

Section

Academic Record

- Course Grade
- GPA
- Major
- Year in School
- Expected Grad. Year
- Institution Name

Demographics

- Gender
- Race
- Ethnicity

Background

- High School Physics
- SAT or ACT
- TOEFL
- Highest Level of Math

*Using any labels you provide within each of these categories

physport.org/DataExplorer

Uploading assessment results

Specify what's in your columns:

- Upload any spreadsheet of your assessment results (.xls, .xlsx, .csv) with a header row telling us what's in each column and individual student responses.
- Tool makes intelligent guesses as to the structure of uploaded data which are confirmed by uploader.

Student Full Name	Student ID	Gender	Major
name	ID	gender	major
Mikel Betancourt	4736686	M	PHY
Marla Danks	7109085	F	ENG
Yuko Kingsbury	6238587	F	PHY
Dani Litke	1105743	NonBinary	PHY
Lamar Quimby	4695152	M	BIO

More materials: ComPADRE

www.compadre.org

ComPADRE
Resources and Services for Physics Education

The AAPT ComPADRE Collections | Events | Collaborate | Community Services | About | History | Contact Us

Welcome to comPADRE — resources for physics and astronomy communities

Featured Collection

Physlet Physics
Simulation-based tutorials and learning exercises covering all of the introductory physics course.

Did You Know?
Interactive Video Vignettes use online video to help students explore topics in physics. Browse the collection or build your own.

The AAPT ComPADRE Digital Library is a network of free online resource collections supporting faculty, students, and teachers in Physics and Astronomy Education.

Each of our collections contain materials designed for a specific group or course. Browse below to find a collection right for you.

K-12 Physics

Physics Front
Resources for K-12 physics teachers

OSP
Open Source Physics

IVV
Interactive Video Instruction

PSRC
A broad collection of physical science resources

Faculty Resources

OSP
Open Source Physics

PhysPort
Supporting physics teaching with research-based resources

IVV
Interactive Video Instruction

PER-Central
Physics Education Research

PICUP
Computational materials for physics classes

PhysTEC
Physics Teacher Education

Participate!

ComPADRE is powered by your submissions. We encourage you to login and contribute! Account registration is free.

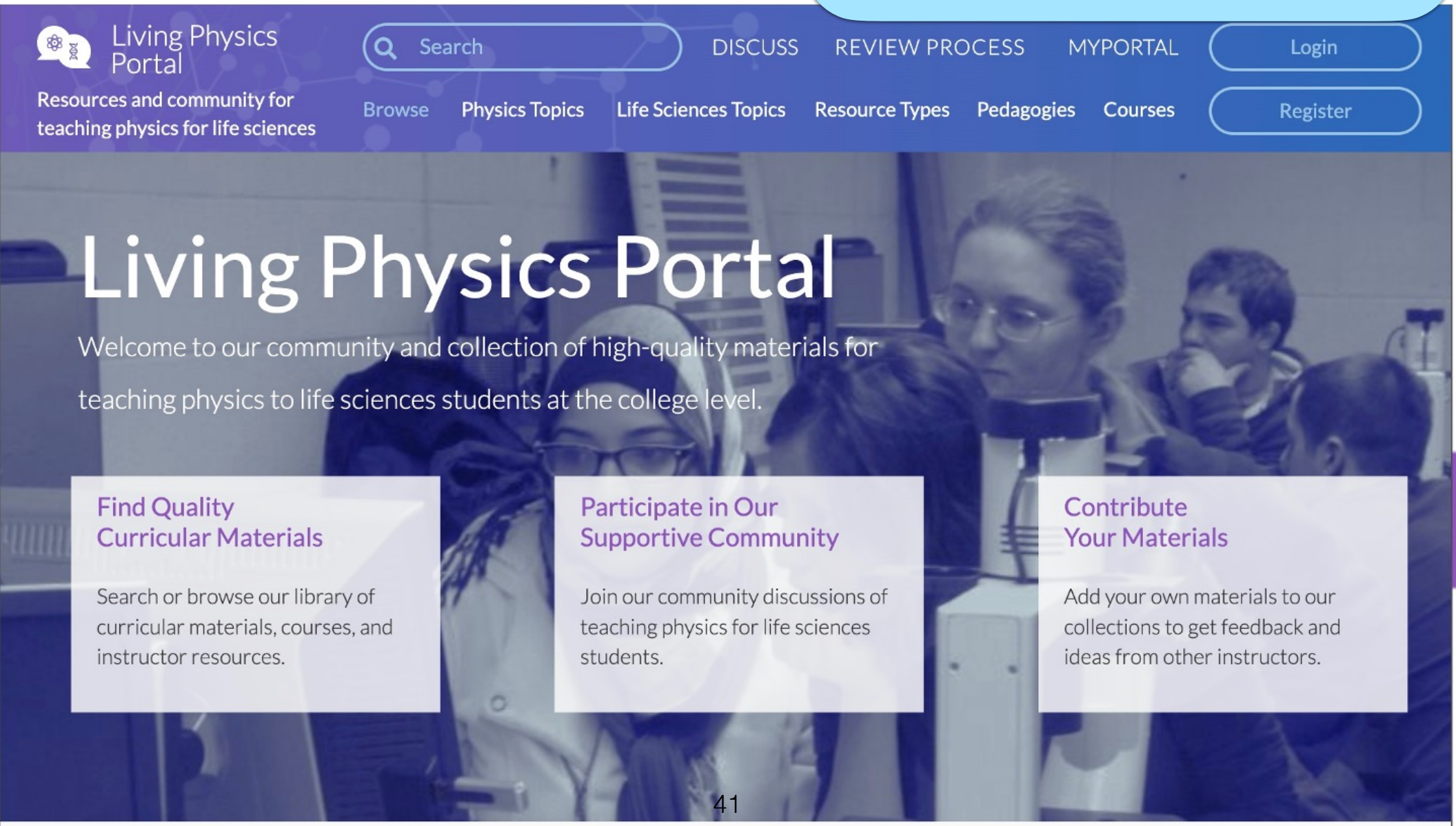
Featured Community Events

OSP Upcoming OSP Events

Adopt-a-Physicist

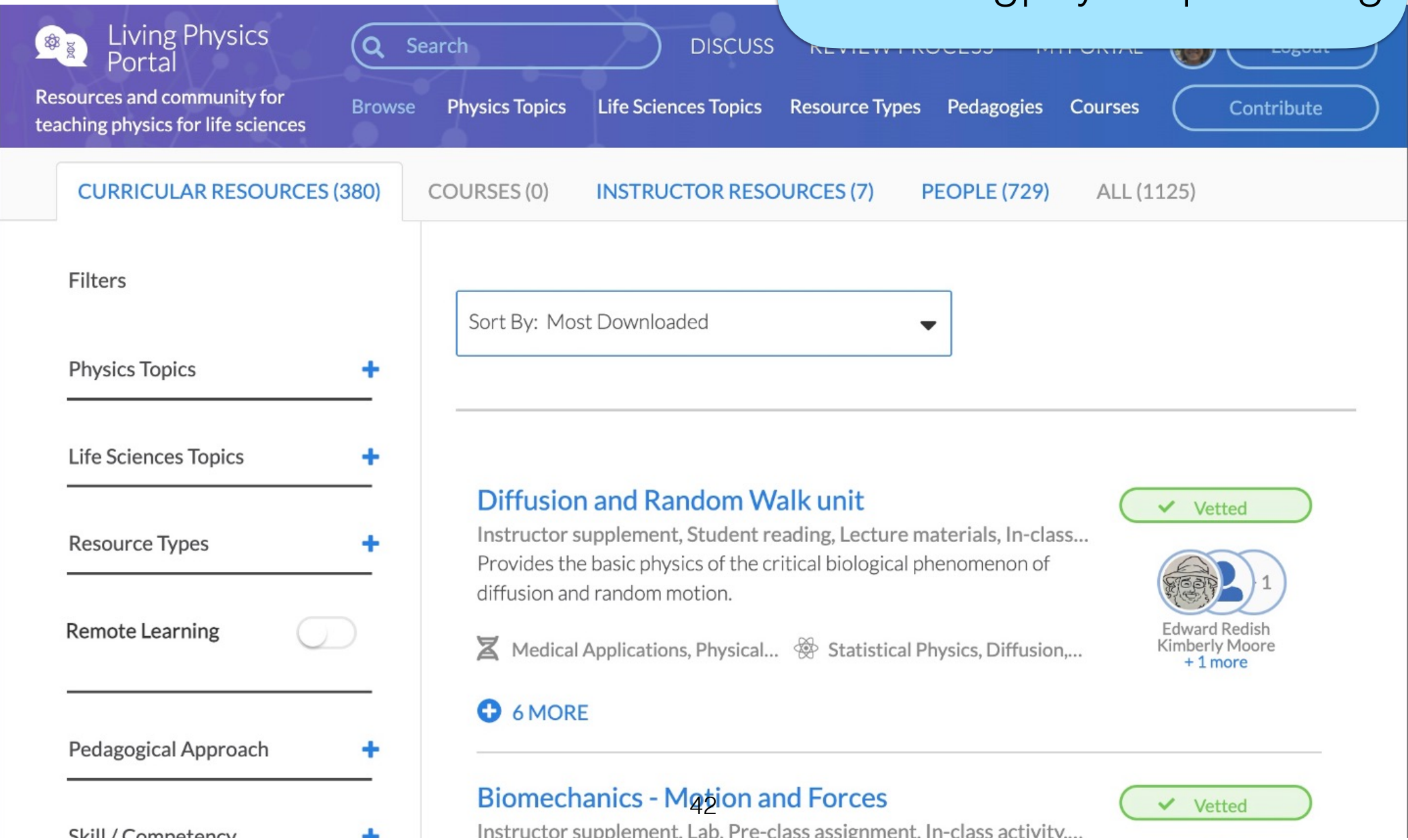
More: Living Physics Portal

www.livingphysicsportal.org



More: Living Physics Portal

www.livingphysicsportal.org



Look it up

- Cruise through the PhysPort teaching pages or ComPADRE or Living Physics Portal
- Find something:
  - You already do
  - You learned about here at NFW
  - You're curious about trying next fall
- Imagine:
  - What do I need to know to do this in my class?
  - What resources do I need to implement it?
  - Who else do I need to talk to?

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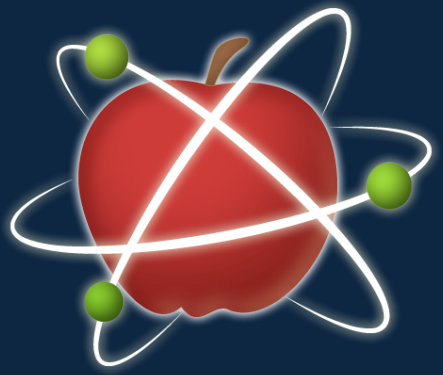

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