What is PhysPort?

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

www.physport.org
**PhysPort Team**

American Association of Physics Teachers

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Good teaching and assessment are important.

How do you know if students are learning?

Assessment is a gateway drug

How to teach better?

How to help students learn more?
PER can help.

Faculty professional development

New Faculty Workshop

Periscope

Research-Based Assessments

Embedded in curricula

Assessment instruments

Research-based teaching methods

Published curricula

Curricular elements
PER resources are scattered.

- Developer websites
- Ask a colleague
- Attend a workshop

How to compare teaching methods?
Which assessment should I use?
What works best for my context?
How do I support diverse learners?

course
program
PhysPort can help.
PhysPort can help.

- Finding information and advice
- Supporting physics teaching with research-based resources
- Changing teaching practices
- Synthesis research
- Faculty-centered online resources
Interpret the results of diverse PER studies

Weighted combination of data from published studies

More robust than single study

Vulnerable to publishing bias

Synthesis research

100,000 students


What are Research-based Assessments?

Force Concept Inventory (FCI)
Force & Motion Conceptual Evaluation (FMCE)
and 80+ more

These are:

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

active learning students do stuff many different ways

Interactive engagement is better than traditional lecture

chalk-and-talk sage on the stage cookbook labs

50,000 Students

Mechanics teaching

Interactive engagement is better than traditional lecture

chalk-and-talk sage on the stage cookbook labs

active learning students do stuff many different ways

Does class size matter?

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

Does institution type matter?

- Reduced Carnegie classification
- No Canadian schools
- Highly dependent on publishing effect
- Data are mostly Doc institutions.

Student beliefs about physics

- How much do students’ beliefs align with physicists?
- Measure **shifts** in physicist-like belief
- CLASS, MPEX

Survey

1. A significant problem in learning physics is being able to memorize all the information I need to know.
   - Strongly Disagree 1 2 3 4 5 Strongly Agree

2. When I am solving a physics problem, I try to decide what would be a reasonable value for the answer.
   - Strongly Disagree 1 2 3 4 5 Strongly Agree

3. I think about the physics I experience in everyday life.
   - Strongly Disagree 1 2 3 4 5 Strongly Agree

4. It is useful for me to do lots and lots of problems when learning physics.
   - Strongly Disagree 1 2 3 4 5 Strongly Agree

5. After I study a topic in physics and feel that I understand it, I have difficulty solving problems on the same topic.
   - Strongly Disagree 1 2 3 4 5 Strongly Agree

Student Beliefs

- 24 studies
- Teaching method, class size, student population

"Ordinary" IE is not enough.

![Bar graph showing student beliefs comparison.](chart)

Student Beliefs

- 24 studies
- Teaching method, class size, student population

"Ordinary" IE is not enough.

Focus on connecting ideas and observations. ("model building")

Men outperform women on RBAs

Mechanics: Men = .43; Women = .37
E&M: Men = .42; Women = .36

This is smaller than the Trad / IE gap.

There is no single factor which causes or maintains the gap.

Questions so far?
PhysPort.org

Supporting physics teaching with research-based resources

Synthesis research

Faculty-centered online resources

go here now!
Faculty-centered online resources

- Teaching Method Resources
  - TM search
- Faculty Development
  - Periscope
    - Online New Faculty Workshop
- Assessment Resources
  - Data Explorer
- Expert Recommendations
  - RBA search

PhySPort.org
Eleanor Sayre, esayre@ksu.edu
Research and development process

1. Interview & survey faculty and chairs
2. Synthesize faculty needs
3. Build resources to meet real users' needs

- 27 faculty & chairs
- 50 LA video project users

Faculty have practical needs.
Faculty want guidance.
Faculty consider broader contexts.

PhysPort.org
Supporting physics teaching with research-based resources

Eleanor Sayre, esayre@ksu.edu
Start with the biggest needs of users.
Expert Recommendations

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

physport.org/recommendations
Expert Recommendations

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

physport.org/recommendations

• Big Ideas
  • Ten results of physics education research that every physics instructor should know
  • Arguments for skeptical colleagues
  • What makes research-based teaching methods in physics work?
  • Recursos en Español / Research-based teaching resources in Spanish
Expert Recommendations

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

physport.org/recommendations

• Big Ideas

• Assessment issues
  • How do I get my students to take concept inventories seriously?
  • Guidelines for administering concept inventories online
  • How can I get my students’ answers to concept inventories into electronic spreadsheets?
  • Effect size: What is it and when and how should I use it?
  • Normalized gain: What is it and when and how should I use it?
Expert Recommendations

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

physport.org/recommendations

- Big Ideas
- Assessment issues
- Teaching method help
  - Where can I learn more about research-based teaching in physics?
  - How can I get students to have productive discussions of clicker questions?
  - Which polling method should I use for Peer Instruction?
  - How do I facilitate Tutorials in Introductory Physics?
Expert Recommendations

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

physport.org/recommendations

- Big Ideas
- Assessment issues
- Teaching method help
- Teaching instructors
  - How can I train teaching assistants and/or learning assistants?
  - How do I facilitate a Periscope lesson for TA/LA training or faculty PD?
  - How can I teach a graduate class on the basics of physics education research?
Expert Recommendations

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

physport.org/recommendations

- Big Ideas
- Assessment issues
- Teaching method help
- Teaching instructors
- Broader issues
  - What racial, gender, and sexual orientation bias still exists in physics and what can I do about it?
  - How can I set up an effective mentoring program to support students in my department?

Have a suggestion?

Want to contribute?

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Teaching Methods
Searchable, faculty-friendly guides to research-based teaching practices

physport.org/methods/

- Type of method
- Level & Setting
- Coverage & Topics
- Instructor Effort
- Research validation
- Compatible methods
- Similar methods
- More information
Assessment Resources

physport.org/assessments

- Search for RBAs
- Get administration details
- See sample questions
- See typical results
- Download RBAs
- Download usage guides
Data Explorer

Visualize and compare your students’ performance from 50+ research-based assessment instruments.

physport.org/DataExplorer

Upload your data
Explore your data
Download a report
Data Explorer

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

- 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

- Explore responses on by questions or clusters
- Track your classes over time
- Split data by demographics
- Rigorous statistics done for you in the background
Your students' average normalized gain of $0.10 \pm 0.01$ is near the bottom of the range for traditional lecture classes. See typical results.

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

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

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

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
Breakdown by Cluster: Physics for Engineers Fall 2015 FMCEv98

- Acceleration
- Force
- Newton's 3rd Law
- Velocity
physport.org/DataExplorer
physport.org/DataExplorer
A toy car can move to the right or left along a horizontal line (the positive part of the distance axis). Assume that friction is so small that it can be ignored. A force is applied to the car. Choose the one force graph (A through H) for each statement below which could allow the described motion of the car to continue. You may use a choice more than once or not at all. If you think that none is correct, answer choice I.

The car was pushed toward the right and then released. Which graph describes the force after the car is released?

- A. A 8.5%
- B. B 3.4%
- C. C 2.1%
- D. D 1.6%
- E. E 21.4%
- F. F 24.5%
- G. G 7.2%
- H. H 24.0%
- I. None of these graphs is correct. 0.0%

Error: +1.79% -1.69%
(Error bars are Chi Squared with 68.3% confidence interval)
Data Explorer

Visualize and compare your students’ performance from 60+ research-based assessment instruments.

physport.org/DataExplorer

• Compare multiple courses
• Track your courses over time
• Group and split by gender, major, section, instructor, etc
• Easy to upload
• Download reports for your tenure file
• Coming soon:
  • Compare to national averages
  • Add custom assessments

Available now!
FCI, FMCE
CSEM, BEMA
CLASS, MPEX

Available soon!
60+ research-based assessments
Online workshops

Video workshops for training teaching assistants and faculty professional development in best practices

physport.org/workshops

What is Periscope?

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

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
Periscope

Videos of students working with handouts for training TAs and faculty in best-practices.

How can I best facilitate a student discussion?

What is Periscope?

1 Watch classroom video
2 Discuss in small groups
3 Discuss with whole group

Some physics classes intersperse collaborative work in small groups with whole-class discussions. The purpose of these whole-class discussions is for students to share their small group’s work, appreciate other groups’ work, and collaborate to increase everyone’s understanding. How should instructors facilitate student discussions?

Modeling Instruction, mechanics, forces, friction, Florida International University

Self Study
You can also use Periscope lessons for self-study by watching the video episode and reflecting on the sample discussion prompts. In this case, we recommend printing out the handout so that you can easily refer to it while watching the episode, or opening both the episode and the handout on a large screen.

This episode shows a group of about twenty students in a Modeling Instruction “board meeting,” in which students who just presented their work share a question that came up for them in their analysis. Sample discussion prompts are about how the instructor facilitates the student discussion.
Periscope

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Handout

How can I best facilitate a student discussion?

Introduction

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Task for students

(from University Modeling Instruction)

A block is placed against the vertical front of a cart as shown in the figure. What acceleration must the cart have so that block A does not fall? The coefficient of static friction between the block and the cart is μs.

Sample discussion prompts

1. What did you observe in this episode? Talk to your partners about what you saw. What does he do while he is not talking? What message do you think his behavior sends?

Periscope Looking into learning

Episode 902: "Moving box"

FIU
Periscope

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Periscope

physport.org/periscope

Available now!

54 lessons
Facilitators' Guide
Resources

• Synthesis research
• Expert recommendations
• Teaching method search
• Assessment search
• Data explorer
• Online workshops
Join us!

Learn about better teaching!
Search for teaching methods
Read recommendations from experts

Be a PhysPort verified educator!
Download assessments
Take online workshops

Do Physics Education Research!
Discover how students learn
Build better pedagogy

Email us to learn more:
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