Finding helpful information about teaching: PhysPort and ComPADRE

Eleanor C Sayre
NFW is overwhelming.
Whoa, that was a lot of info.

When I get home, how do I...?

I need ideas about...

I want to try...
Good teaching is important.

How to help students learn more?

How do you know if students are learning?
Good teaching is important.

How to help students learn more?

How do you know if students are learning?

PhysPort can help.

Find information and advice

Change your teaching
Good teaching is important.

How to help students learn more?

How do you know if students are learning?

PhysPort can help.

Find information and advice

Change your teaching

free

friendly

powerful

research-based
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

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

Eleanor Sayre: esayre@gmail.com @sayrelab www.zaposal.com
Welcome to PhysPort (formerly known as the PER User’s Guide), the go-to place for physics faculty to find resources based on physics education research (PER) to support your teaching. Learn more...

**Teaching**
- I want to...
  - find a new teaching method
  - get implementation help
  - learn more about research-based teaching

**Assessment**
- I want to...
  - interpret assessment results
  - assess the impact of reforms
  - assess advanced physics content or skills

**Troubleshooting**
- I need help with...
  - covering enough material
  - supporting group work
  - arguments for skeptical colleagues

**WHERE CAN I FIND GOOD QUESTIONS TO USE WITH CLICKERS OR PEER INSTRUCTION?**

by Sam McKagan, PhysPort director  
September 26, 2016

Many research-based teaching methods in physics, including Peer Instruction, CAE Think-Pair-Share, Technology Enhanced Formative Assessment, and teaching with clickers, involve having your students discuss and answer multiple-choice conceptual questions. A challenge of using these methods is finding and writing good questions. This recommendation helps you find and write questions for your class.

Explore assessment data
Teaching methods

PhysPort
Supporting physics teaching with research-based resources

Teaching Methods and Materials

Tell us about your course to find methods relevant to you.

Student Skills Developed?
- Conceptual understanding
- Problem-solving skills
- Lab skills
- Making real-world connections
- Using multiple representations
- Designing experiments
- Building models
- Metacognition

Instructor Effort Required?

57 Research-Based Methods

Peer Instruction
Small group discussion of conceptual questions interspersed with lectures, increasing engagement and providing formative feedback on student thinking.

Eleanor Sayre: esayre@gmail.com @sayrelab www.zaposalab.com
Teaching methods

Which method should I choose?

physport.org/methods

57 methods available
Teaching methods

Which method should I choose?

Student Skills Developed?

- Any
- Conceptual understanding
- Problem-solving skills
- Lab skills
- Making real-world connections
- Using multiple representations
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physport.org/methods

57 methods available
# Teaching Methods

Which method should I choose?

<table>
<thead>
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<tbody>
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57 methods available
Teaching methods

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<td>Clickers/polling method?</td>
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Research Validation:
- Gold star validation
- Silver validation
- Bronze validation
- Research-based
Teaching methods

Which method should I choose?

Student Skills Developed?
- Any
  - Conceptual understanding
  - Problem-solving skills

Instructor Effort Required?
- Any
  - Low
  - Medium

Resources Needed?
- Exclude methods requiring the following:

 Tell us about your course to find methods relevant to you.

Any Subject
- Any Level
- Any Setting

representations
- Gold star validation
- Silver validation
- Bronze validation
- Research-based

Lab equipment for complex experiments
- Simple lab equipment
- Advanced lab equipment
- Cost for students
- Tables for group work
- Studio classroom
- Highly skilled instructors
Teaching methods

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Teaching methods

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physport.org/methods

57 methods available
Teaching methods

Which method should I choose?

PhET Interactive Simulations
developed by: PhET Interactive Simulations, University of Colorado - Boulder
Teaching methods

Which method should I choose?

How does it work? Where can I get it?

PhET Interactive Simulations
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physport.org/methods
Teaching methods

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How does it work? Where can I get it?

PhET Interactive Simulations
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Level
- middle school
- high school
- intro college
- intermediate
- upper level
- grad school
- other
- calc based
- alg based
- conceptual

Topics

Setting

Eleanor Sayre: esayre@gmail.com @sayrelab www.zaposc.com
Teaching methods

Which method should I choose?  How does it work?  Where can I get it?

Overview  Resources  Teaching Materials  Research

What? Open-ended game-like simulations with an intuitive interface and minimal text appropriate for a variety of class settings. Includes expert visual models that make the invisible visible and provide multiple representations, enabling scientist-like exploration and real-world connections.

Why? They are free and easy to incorporate into nearly any teaching environment or style. They are based on research into how students learn in general, student understanding of specific science concepts, and user interface design. Effective use of PhET simulations can lead to improved conceptual learning over traditional lectures, demonstrations, and labs.

Why not? PhET simulations might not be the best approach if your goal is for your students to learn to use real lab equipment or to learn to program, or if you don't have access to computers.

Example materials  Classroom video

physport.org/methods
Teaching methods

- Which method should I choose?
- How does it work? Where can I get it?

Comparative overview

**What?** Open-ended game-like simulations and minimal text appropriate for a variety of class settings and for visible and provide multiple representations and world connections.

**Why?** They are free of charge and are based on research on how students learn specific science concepts, and can improve conceptual learning.

**Why not?** PhET simulations may not be suitable for your students to learn to use real lab equipment or to teach them concepts if they do not have access to computers.

Example materials

Classroom video
Teaching methods

Which method should I choose? How does it work? Where can I get it?

Comparative overview

PhySport.org/methods

Teaching materials
Classroom video
Resources
Research basis
Teaching methods

Which method should I choose?  How does it work?  Where can I get it?

Get it at compadre.org

- Collections of teaching materials
- Free.
- Intro, upper division, astro, IPLS.... etc
- Simulations, tutorials, clicker questions, ebooks.... etc
Welcome Eleanor Sayre (le@zapos.com) - my profile - AAPT link - logout filing cabinet - suggest a resource - administrate

Search the OSP Collection... [Search] [Advanced]

Open Source Physics

The OSP Collection provides curriculum resources that engage students in physics, computation, and computer modeling. Computational physics and computer modeling provide students with new ways to understand, describe, explain, and predict physical phenomena. Browse the OSP simulations or learn more about our tools and curriculum pieces below.

Tracker

The Tracker tool extends traditional video analysis by enabling users to create particle models based on Newton’s laws. Because models synchronize with and draw themselves right on videos of real-world objects, students can test models experimentally by direct visual inspection.

EJS Modeling

Student modeling, the guided exploration of physical systems and concepts, is a powerful approach to engaged learning. Easy Java Simulations provides the computational tools for students and faculty to explore physics without the need for learning details of Java programming.

Programming

Open Source Physics provides extensive resources for computational physics and physics simulations. Included are:

- An Eclipse environment for OSP
- OSP Source Code Libraries
- OSP best practices
- Documentation

Newest OSP Materials

May 26 Physlet® Waves and Oscillations Problems Package
May 24 Physlet® Physics Periodic Motion Problems JS Package
May 13 Solar and Lunar Eclipse JS Model
Apr 24 Celestial Sphere with Analemma JS Model

Recently Updated Materials

Jun 10 STP Textbook Chapter 9: Critical Phenomena
Jun 10 STP Textbook Errata supplement
May 8 Two-Body Orbits JS Model
Mar 20 Open Source Physics Users Guide supplement

Recent Library Comments

Jun 08 - 2:22 PM EST Jason Diemer posted Physlets won’t... to the
Advanced Labs

www.compadre.org/advlabs/

AAPT Summer Meeting 2017
Preparations are underway for the AAPT Summer meeting in Cincinnati, Ohio (July 22-26, 2017). The meeting will be held at the RiverCenter Convention Center. The main conference hotel is the Marriott Cincinnati RiverCenter.

Recently Added Materials
May 10  Interferometric Faraday effect magnetic field measurements
May 10  Interferometric Faraday effect magnetic field measurements
May 10  Spin Noise Spectroscopy in Rb Vapor
May 10  2016 AAPT-ALPhA Award Lab Manual
Apr 26  2016 AAPT-ALPhA Award - The Hong Ou Mandel Effect
Apr 25  2015 AAPT-ALPhA Award - Mechanical Chaotic Oscillator
Apr 25  Investigating student ownership of projects in an upper-division physics lab course

RSS Feed
Teaching methods

Which method should I choose?

How does it work? Where can I get it?

What else can I do?

Compatible Methods
- Peer Instruction
- Tutorials in Introductory Physics
- Just-in-Time Teaching
- +49 more...

Similar Methods
- Physlets
- Open Source Physics Collection
- CPU Computer Simulators

57 methods available
Teaching methods

Which method should I choose?

How does it work? Where can I get it?

What else can I do?

I need more help
Teaching methods

Which method should I choose?
How does it work? Where can I get it?
What else can I do?

I need more help

Related Expert Recommendations

How do I use PhET simulations in my physics class?
How do I increase student interactivity when using PhET simulations in lecture?
How can I design an effective in-class student worksheet for PhET simulations?
+3 more...
Expert Recommendations

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

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

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

physport.org/recommendations

42 available now!
Expert Recommendations

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

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

How can I set up an effective mentoring program to support students in my department?

42 available now!
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Normalized gain: What is it and when and how should I use it?

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How do I help students engage productively in active learning classrooms?

42 available now!
Friendly articles that interpret and synthesize PER results for physics faculty.

**Related Expert Recommendations**

- How can I help students become more expert learners, so they engage in active learning?
- How can I help students feel intrinsically and extrinsically motivated to engage in active learning?
- How can I help students work well in small groups, so they are more likely to engage?

+6 more...

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How can I help students work well in small groups, so they are more likely to engage?

+6 more...

Have a suggestion?

Want to contribute?

esayre@ksu.edu

smckagan@aapt.org

42 available now!
Find expert recommendations

- Thinky-researchy alone time (5 mins)
- Make a triad (2 mins)
- Take turns to talk about the results of your investigation. (9 mins)
Expert Recommendations

- By yourself, on your phone or laptop
- Identify an expert recommendation that speaks to you
  - Helps with an issue in your teaching
  - Helps with a question sparked by NFW
  - Helps with your challenge from the last session
- Use the expert recommendation to better articulate your question (and start to solve it?) (5mins)
Expert Recommendations

• Make a triad. Longest hair goes first.
• Take turns and play "yes, and"
• Person 1 presents their new question
  • Persons 2&3 think about how they share that question
  • Everyone brainstorms around this topic: what do you want to know? which NFW presentations gave you ideas? how does this connect to your institution?
• Cycle to person 2 then person 3.
• 3 mins focus on each person.
PhysPort can help.

How to help students learn more?

How do you know if students are learning?

free
friendly
powerful
research-based

Find information and advice

Change your teaching
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- How to help students learn more?
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- Find information and advice
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Assessment Resources

physport.org/assessments

These are:

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

Which assessment should I choose?
Assessment

Which assessment should I choose?

physport.org/assessments

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

80+ available
Assessment

Which assessment should I choose?

Force Concept Inventory (FCI)
Developed by David Hestenes, Malcolm Wells, Gregg Swackhammer, Ibrahim Halloun, Richard Hake, and Eugene Mosca

physport.org/assessments
Assessment

Which assessment should I choose?  How should I administer it?

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Assessment

Which assessment should I choose?  How should I administer it?

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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
Assessment

Which assessment should I choose?  How should I administer it?

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Typical results
Sample questions
Research overview
Translations
Assessment

Which assessment should I choose?

How should I administer it?

Where do I get it?

physport.org/assessments
Assessment

Which assessment should I choose?

How should I administer it?

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Verified educators!
For faculty and teaching staff
free, easy

physport.org/assessments
Assessment

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

physport.org/assessments

Eleanor Sayre: esayre@gmail.com @sayrelab www.zapos.com
Assessment

Which assessment should I choose?

How should I administer it?

Where do I get it?

How should I interpret my results?
Data Explorer

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

Histogram for your class: Physics for Engineers Fall 2015 FMCEv98

- Normalized Gain
  - Mean: 0.10
  - Median: 0.08
  - Stddev: 0.30
  - N: 607 students
  - Error: ±0.01

*Error is one standard error of the mean

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Upload your data

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Data Explorer

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

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

Upload your data
Explore your data

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Data Explorer

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

Upload your data
Explore your data
Download your results

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Find information and advice
Change your teaching
I want personalized help and advice.

- **FOLCs**
  - www.aapt.org/Conferences/newfaculty/folc.cfm

- **Consultants**
  - physport.org/consultants

- **Questions about research**
  - esayre@ksu.edu
PhysPort can help.

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
PEER field schools

Email us to learn more
smckagan@aapt.org
esayre@ksu.edu