

Finding helpful information about teaching: PhysPort and ComPADRE

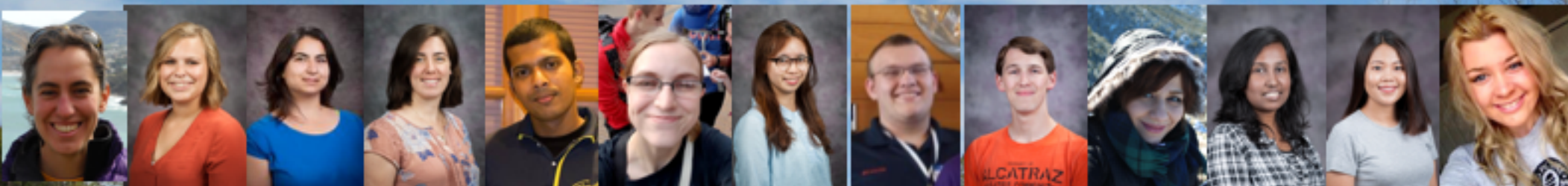
Eleanor C Sayre

esayre@gmail.com



NFW
October 2018

K SUPER



How do students learn physics?



How to help faculty teach better?



How do people learn to research?



NFW is overwhelming.

Whoa, that was a lot of info.

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

NFW is overwhelming.

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





Home

Expert Recommendations

Teaching Methods

Assessments

Workshops

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](#)



NEW - PhysPort Data Explorer



Explore assessment data

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

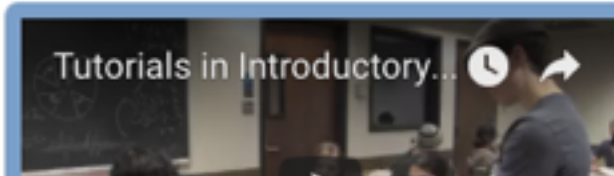
by Sam McKagan, PhysPort director

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.



Teaching methods

physport.org/
methods

PhysPort
Supporting physics teaching with research-based resources

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AAPT

Home Expert Recommendations **Teaching Methods** Assessments Workshops

Teaching Methods and Materials

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

Any Subject Any Level Any Setting Submit

Student Skills Developed ?

Any

- 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

Sort by: Popularity

Peer Instruction

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

Subject
+7

Level
MS HS IC IM UL GS O

Setting
+2

Teaching methods

[physport.org/
methods](https://physport.org/methods)

Which method
should I choose?

57
methods
available

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- Metacognition

Instructor Effort Required ?

Any

- Low
- Medium
- High

Research Validation ?

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

Teaching methods

[physport.org/
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- Research-based

Resources Needed ?

Exclude methods requiring the following:

- TAs / LAs ?
- Clickers / polling method ?
- Projector
- Computers for students
- Lab equipment for demos ?
- Simple lab equipment ?
- Advanced lab equipment ?
- Cost for students
- Tables for group work
- Studio classroom ?
- Highly skilled instructors ?

Teaching methods

physport.org/
methods

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physport.org/
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Teaching methods

[physport.org/
methods](https://physport.org/methods)

Which method
should I choose?



PhET Interactive Simulations

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

Teaching methods

[physport.org/
methods](https://physport.org/methods)

Which method
should I choose?

How does it work?
Where can I get it?



PhET Interactive Simulations

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

Teaching methods

[physport.org/
methods](https://physport.org/methods)

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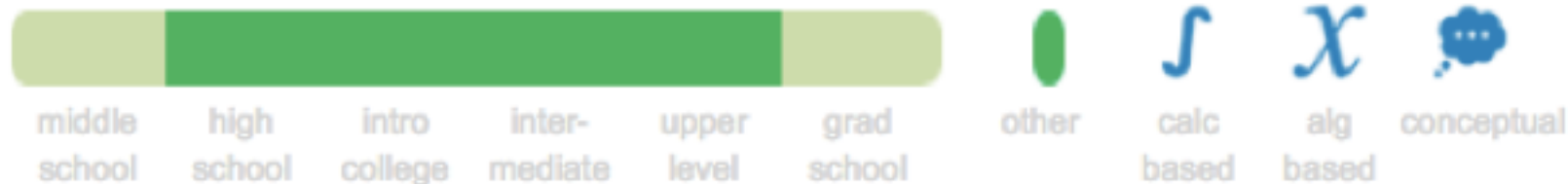
How does it work?
Where can I get it?



PhET Interactive Simulations

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Level



Topics



Setting



Teaching methods

physport.org/
methods

Which method
should I choose?

How does it work?
Where can I get it?

Overview

Resources

Teaching Materials

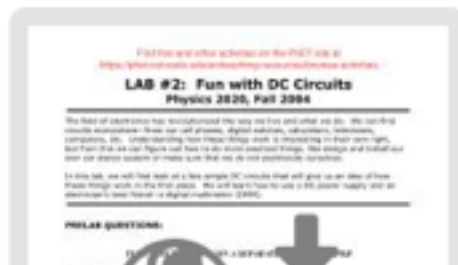
Research

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.

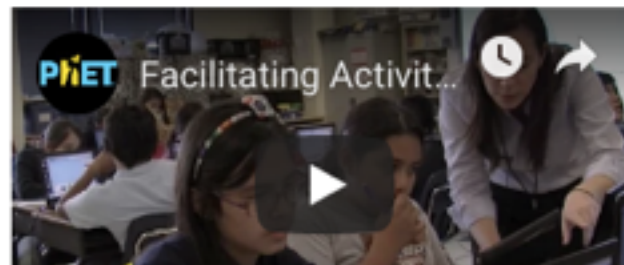
Why? They are free and easy to incorporate into nearly any teaching environment or style. They are based on research into how students learn in general, student understanding of specific science concepts, and user interface design. Effective use of PhET simulations can lead to improved conceptual learning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



Teaching methods

physport.org/
methods

Which method
should I choose?

How does it work?
Where can I get it?

Overview

Resources

Teaching Materials

Research

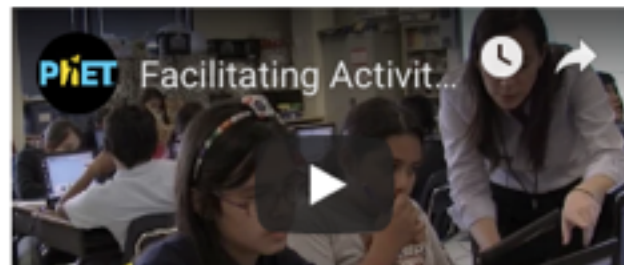
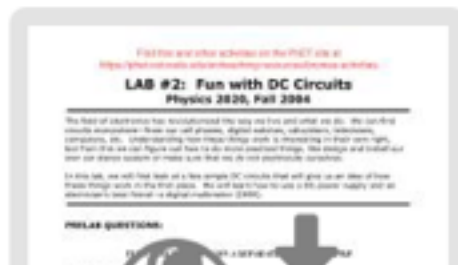
What? Open-ended game-like simulations are designed with minimal text appropriate for a variety of class settings. They are visually rich and accessible, providing multiple representations and real-world connections.

Why? They are free and easy to use, and they are designed to be used in a variety of styles. They are based on research and best practices, and they are designed to be used in a variety of settings. They are designed to be used in a variety of settings, and they are designed to be used in a variety of settings.

Why not? PhET simulations are designed to be used in a variety of settings, and they are designed to be used in a variety of settings. They are designed to be used in a variety of settings, and they are designed to be used in a variety of settings.

Example materials

Classroom video



Teaching methods

physport.org/
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 minimal text appropriate for a variety of class settings. They are designed to be visible and provide multiple representations of concepts and world connections.

Why? They are free and easy to use. They are based on research that shows that interactive learning improves conceptual learning. They are designed to be visible and provide multiple representations of concepts and world connections.

Why not? PhET simulations are not suitable for your students to learn to use real lab equipment or to learn about real-world science. They are designed to be visible and provide multiple representations of concepts and world connections.

Comparative
overview

Teaching materials

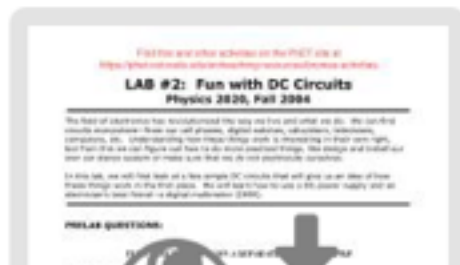
Classroom video

Resources

Research basis

Example materials

Classroom video



Teaching methods

[physport.org/
methods](http://physport.org/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

Open Source Physics

www.compadre.org/osp/



Welcome Eleanor Sayre (le@zaposa.com) - [my profile](#) - [AAPT link](#) - [logout](#)
[filing cabinet](#) - [suggest a resource](#) - [administrators](#)

Search the OSP Collection.

SIMULATIONS

[EJS MODELING](#)

[CURRICULUM](#)

[PROGRAMMING](#)

[TOOLS](#)

[JS/HTML MATERIALS](#)

[BROWSE MATERIALS](#)

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[DISCUSSION](#)

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Science SPORE Prize
November 2011



The Open Source Physics Project is supported by NSF DUE-0442581.

Computational Resources for Teaching

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.

[Learn more about Tracker](#)

Featured Tracker Package



[Projectile Motion with Angry Birds](#)

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.

[Learn more about EJS](#)

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 Advanced Labs

PHYSICS EDUCATION


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Information Exchange

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- [Software](#)
- [Supplements](#)




News and Events




[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. .



Featured Folders


- [AAPT 2013 Advanced Labs Workshop](#)
 - [Low-Cost Capacitance Profiling of a Semiconductor](#)
 - [Multimode fiber optics](#)
 - [Temperature Dependent Lifetime Measurements of Fluorescence from a Phosphor](#)
 - [Cosmic Ray Statistics using LabVIEW](#)
 - [532 nm Laser Lab](#)
- [AAPT 2012 Advanced Labs Workshop](#)
- [AAPT 2011 Advanced Labs Workshop](#)
- [AAPT 2010 Advanced Labs Workshop](#)



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](#)



Other Services

- [BFY Proceedings](#)
- [advlabs-l](#)

Teaching methods

[physport.org/
methods](https://physport.org/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

[physport.org/
methods](https://physport.org/methods)

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How does it work?
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I need
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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

physport.org/
recommendations

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

The screenshot shows the PhysPort website interface. At the top, there is a dark blue header with the PhysPort logo (a red atom) and the text "PhysPort Supporting physics teaching with research-based resources". To the right of the logo are links for "Admin | My Account | Logout" and "About Us | Contact Us", along with the AAPT logo. Below the header is a navigation bar with five buttons: "Home", "Expert Recommendations" (highlighted in red), "Teaching Methods", "Assessments", and "Workshops".

The main content area is titled "Expert Recommendations" and is divided into three columns. The left column features a "FEATURED" section with the article "Addressing common concerns about concept inventories" by Adrian Madsen, Sam McKagan, and Eleanor Sayre, dated July 8, 2016. Below the title is a small image of a hand pointing at a document. The text describes how concept inventories are used to assess teaching effectiveness and discusses common concerns. A "Read more »" link is provided, along with tags for "assessment" and "concept inventories".

The middle column contains two article teasers. The first is "Where can I find good activities for small group discussions?" by Sam McKagan, PhysPort director. The second is "Where can I find good questions to use with clickers or Peer Instruction?" by Sam McKagan, PhysPort director.

The right column has a "Most Popular" section with two article teasers: "Normalized gain: What is it and when and how should I use it?" and "Arguments for skeptical colleagues". Below these is a "View all »" link. At the bottom of the right column is a "Tags" section with a list of tags: "active learning", "assessment", "best practices", "clickers", "concept inventories", "cooperative groups", "Peer Instruction", "PhET Interactive Simulations", "physics education", "research", and "teaching".

Expert Recommendations

[physport.org/
recommendations](https://physport.org/recommendations)

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

42
available
now!

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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?

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

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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...

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

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

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

+6 more...

How can I set up an effective

Have a suggestion?

Want to contribute?

esayre@ksu.edu

smckagan@aapt.org

active learning classrooms:

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

physport.org/
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)

→   <https://www.physport.org/recommendations/>        



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Expert Recommendations

FEATURED

[What racial, gender, and sexual](#)

[How do I help students](#)

Most Popular

Expert Recommendations

[physport.org/
recommendations](https://physport.org/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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Assessment Resources

physport.org/assessments

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Home Expert Recommendations Teaching Methods **Assessments** Workshops

Browse Assessments

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

Any Subject Any Level Submit

Assessment Focus
Any
 Content knowledge
 Problem-solving
 Scientific reasoning
 Lab skills
 Beliefs / Attitudes
 Interactive teaching

Format
Any
 Pre/post
 Multiple-choice
 Multiple-response
 Agree/disagree
 Short answer
 Rubric
 Observation protocol

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

Translations

82 Research-Based Assessments

Sort by: Research validation

- Force Concept Inventory (FCI)**
Mechanics Content knowledge (forces, kinematics)
Levels: Intro college, High school
Formats: Pre/post, Multiple-choice
30 min
- Colorado Learning Attitudes about Science Survey (CLASS)**
Beliefs / Attitudes (epistemological beliefs)
Levels: Upper-level, Intermediate, Intro college, High school
Formats: Pre/post, Multiple-choice, Agree/disagree
5-10 min
- Brief Electricity and Magnetism Assessment (BEMA)**
Electricity / Magnetism Content knowledge (circuits, electrostatics, magnetic fields and forces)
Levels: Upper-level, Intro college
Formats: Pre/post, Multiple-choice
45 min
- Force and Motion Conceptual Evaluation (FMCE)**
Mechanics Content knowledge (kinematics, forces, energy, graphing)
35 min

These are:

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

project info



Assessment

[physport.org/
assessments](https://physport.org/assessments)

Which assessment
should I choose?

Assessment

physport.org/
assessments

Which assessment
should I choose?

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Browse Assessments

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

Any Subject | Any Level | Submit

Assessment Focus
Any

- Content knowledge
- Problem-solving
- Scientific reasoning
- Lab skills
- Beliefs / Attitudes
- Interactive teaching

Format
Any

- Pre/post
- Multiple-choice
- Multiple-response
- Agree/disagree
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Research Validation

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82 Research-Based Assessments

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Formats: Pre/post, Multiple-choice, Agree/disagree
8-10 min
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Levels: Upper-level, Intro college
Formats: Pre/post, Multiple-choice
45 min

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

80+ available

Assessment

[physport.org/
assessments](https://physport.org/assessments)

Which assessment
should I choose?



Force Concept Inventory (FCI)

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

Assessment

[physport.org/
assessments](https://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

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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

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Typical results

Sample questions

Research overview

Translations

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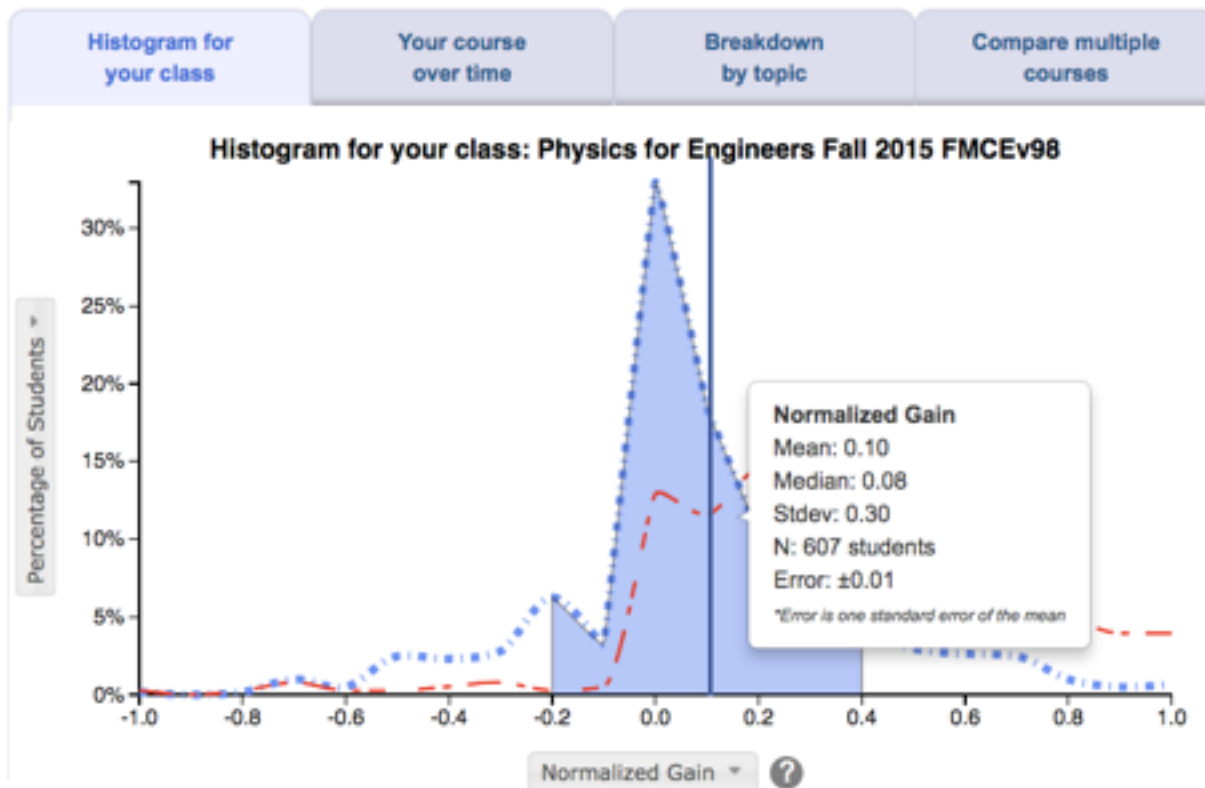
Where do I get it?

How should I interpret
my results?

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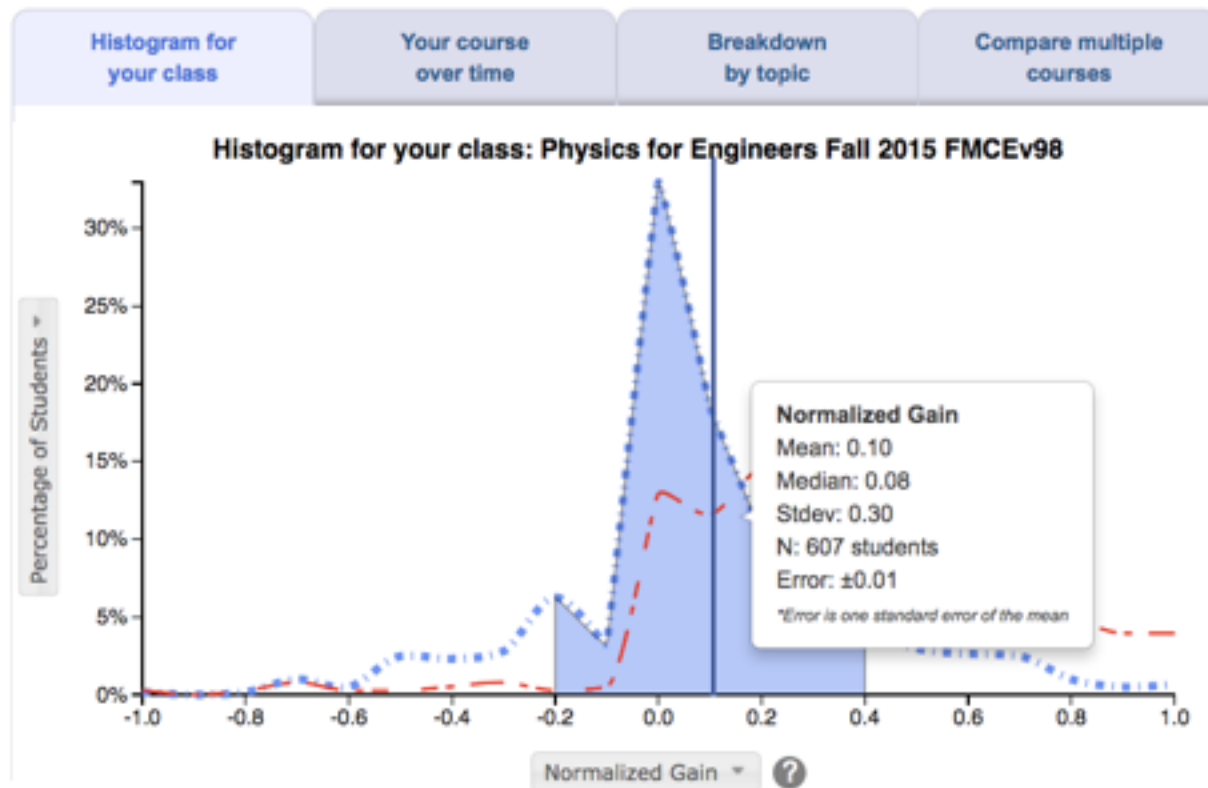
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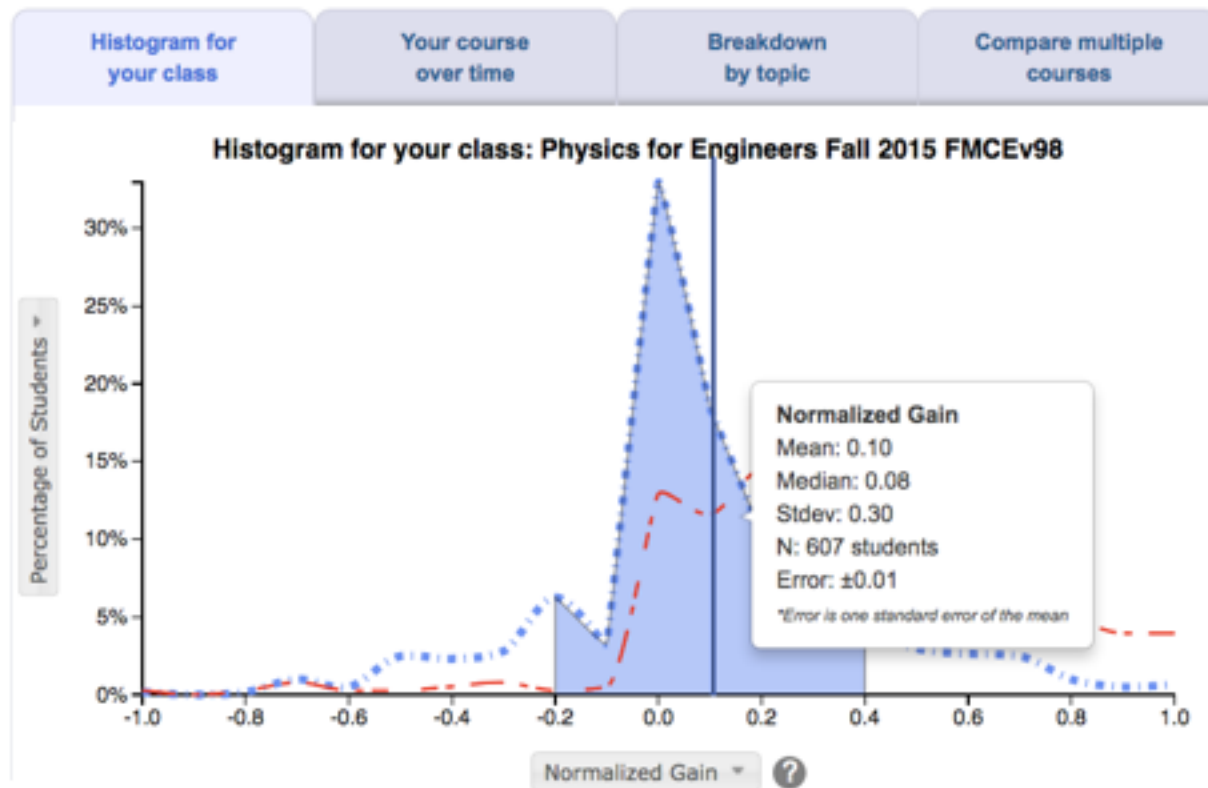


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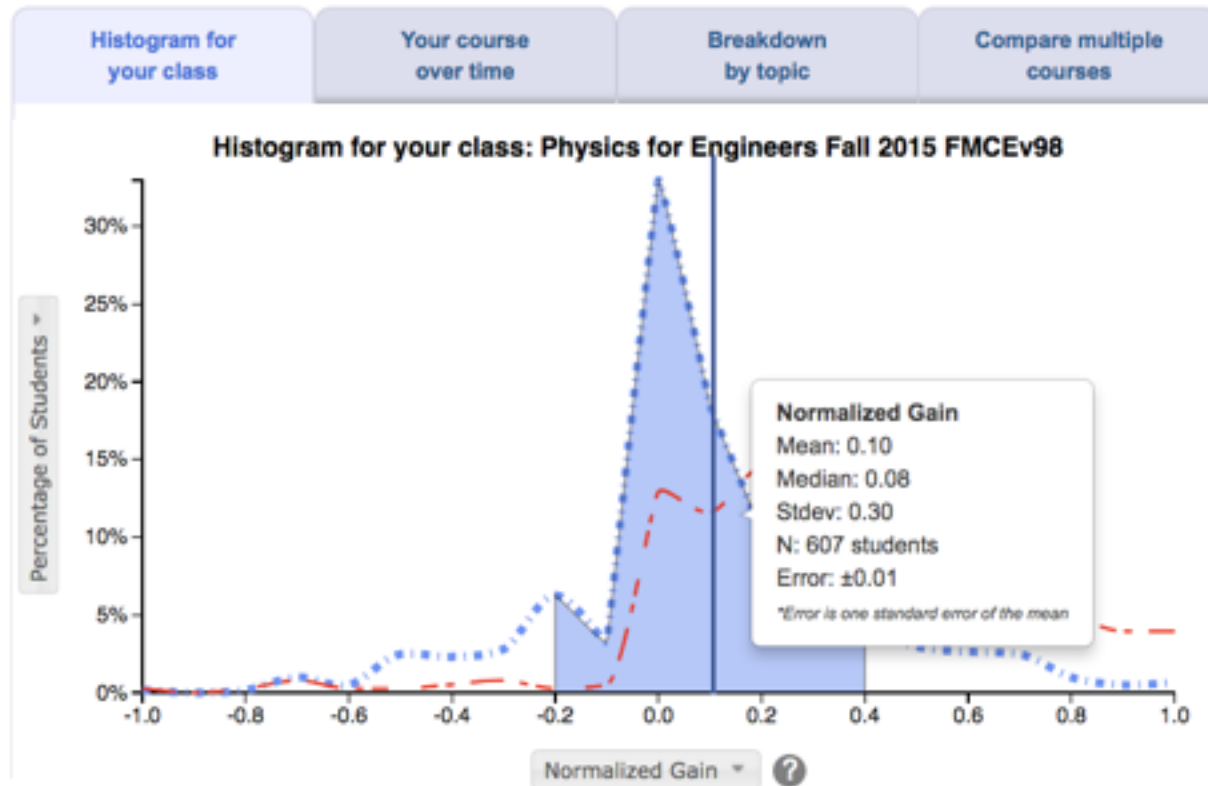
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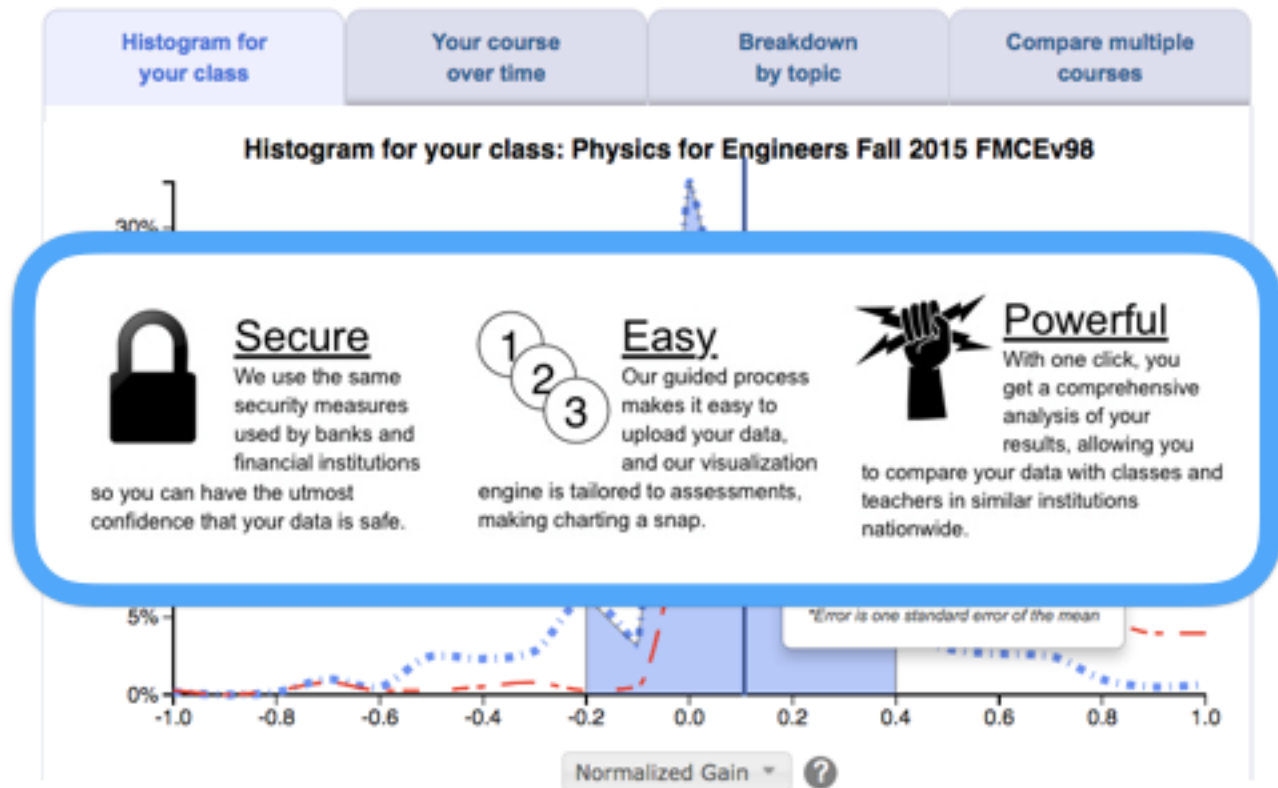
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