AAPT/ComPADRE

Supporting Physics Educators

Or

How can we help?

Thank you…

Lyle Barbato

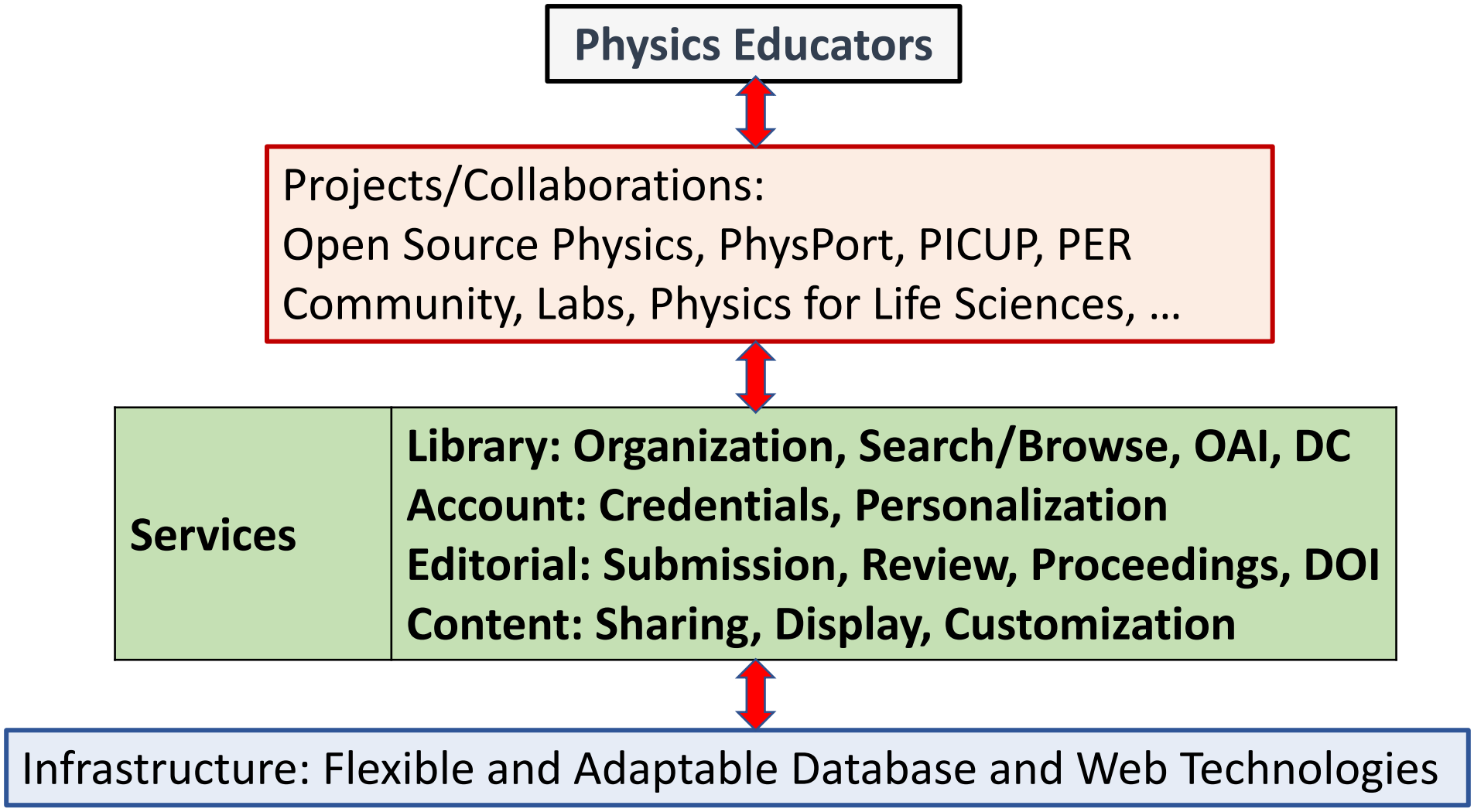
Lyle Barbato: Technical Guru and all-around Genius

Sam McKagan, Adrian Madsen, Michael Thenhaus, Caroline Hall, Thad Lurie, Matt Riggsbee

US National Science Foundation (NSF) & American Association of Physics Teachers (AAPT)

MANY Dozens of collaborators, project managers, authors, content developers, and our users.

What we do:


Physics Educators
Projects/Collaborations:
Open Source Physics, PhysPort, PICUP, PER
Community, Labs, Physics for Life Sciences, …
Services
Library: Organization, Search/Browse, OAI, DC
Account: Credentials, Personalization
Editorial: Submission, Review, Proceedings, DOI
Content: Sharing, Display, Customization
Infrastructure: Flexible and Adaptable Database and Web Technologies

Brief History

1997: AAPT Physical Sciences Resources Center

2003: ComPADRE – NSF Digital Library. Collection. AAPT, APS, AAS, AIP/SPS (MPTL 8, Prague CZ)

2005: ComPADRE – NSF/NSDL "Pathway" for Physics and Astronomy

2008: **OSP** – Web Services Provider for Open Source Simulation Resources

2009: The Physics Classroom – maintain access to highly-accessed High School Physics resources (millions of users)

2010: **PhysPORT** (PER User's Guide) – Physics Education Research information for Everyone

2016: **PICUP** – Computation in Undergraduate Physics

2018: **Portals** – "Living Physics", "Energy & Equity"

2018/2022: Interactive Video – Video for tutorials and problem solving

Answering Questions

What is better …?

How do I …?

Where can I find …?

What background do I need …?

How can I share …?

What are others doing for …?

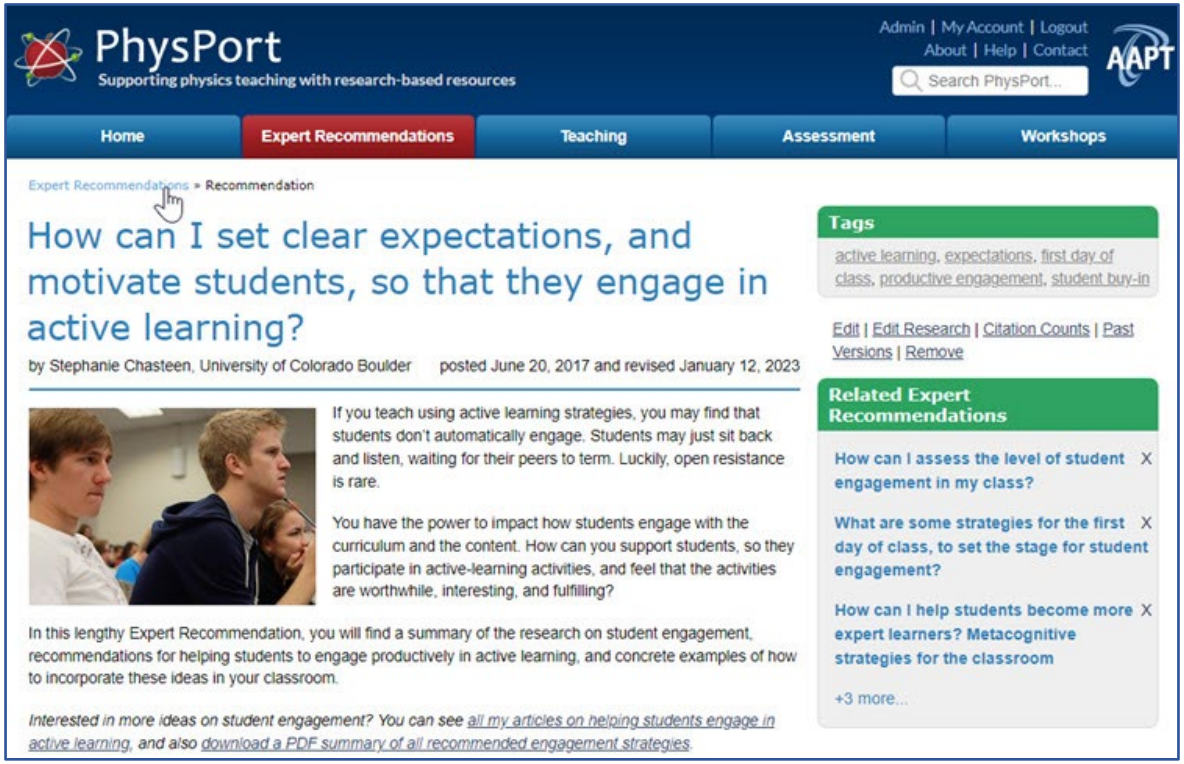
Where are Research-Informed Practices?

Research:

What do Faculty want?
What do Faculty need?
How are Faculty effective?

https://www.Physport.org:
Supporting physics teaching with research-based resources

What do Experts Recommend?



[Expert Recommendations]

Descriptions of What Works for all of us non-PER (Physics Education Research) people

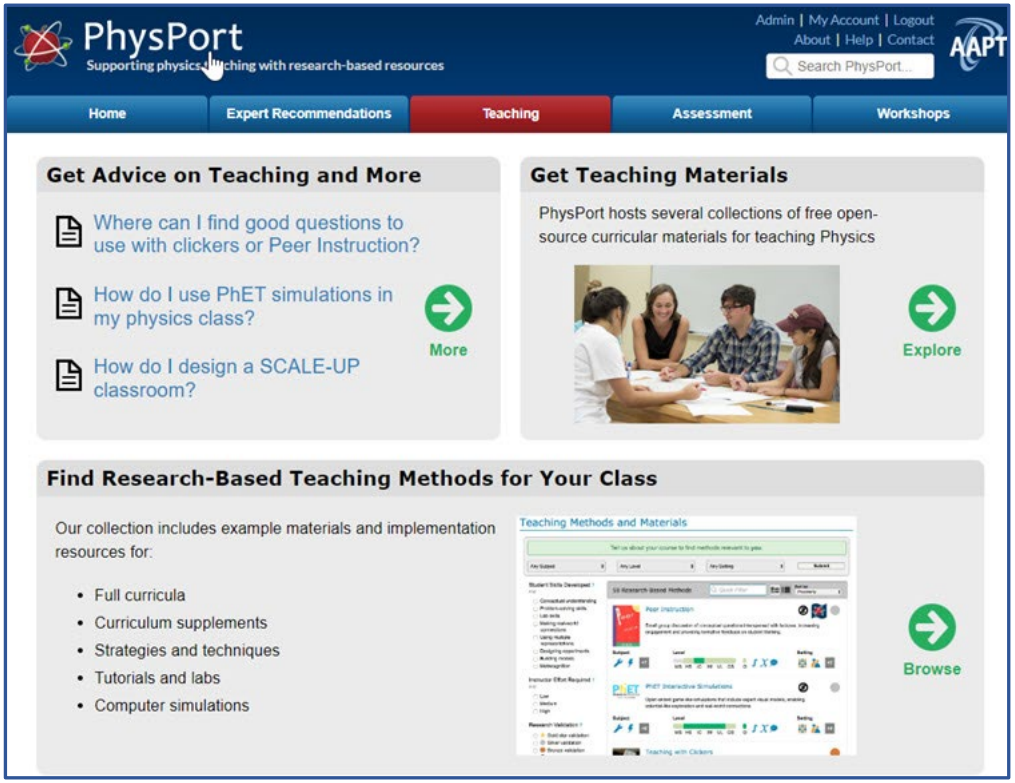
Teaching Recommendations

- How can I set clear expectations, and motivate students, so that they engage in active learning?
- How can I help students work well in small groups, so they are more likely to engage?
- Where can I find good activities for small group discussions?
- Best practices for whiteboarding in the physics classroom
- I suddenly have to move my face-to-face physics/astronomy course online! What should I do?

PER Background

- Arguments for skeptical colleagues
- Ten results of physics education research that every physics instructor should know
- Best Practices for Administering Concept Inventories
- Addressing common concerns about concept inventories
- Normalized gain: What is it and when and how should I use it?
- Effect size: What is it and when and how should I use it?

What can I use in class?



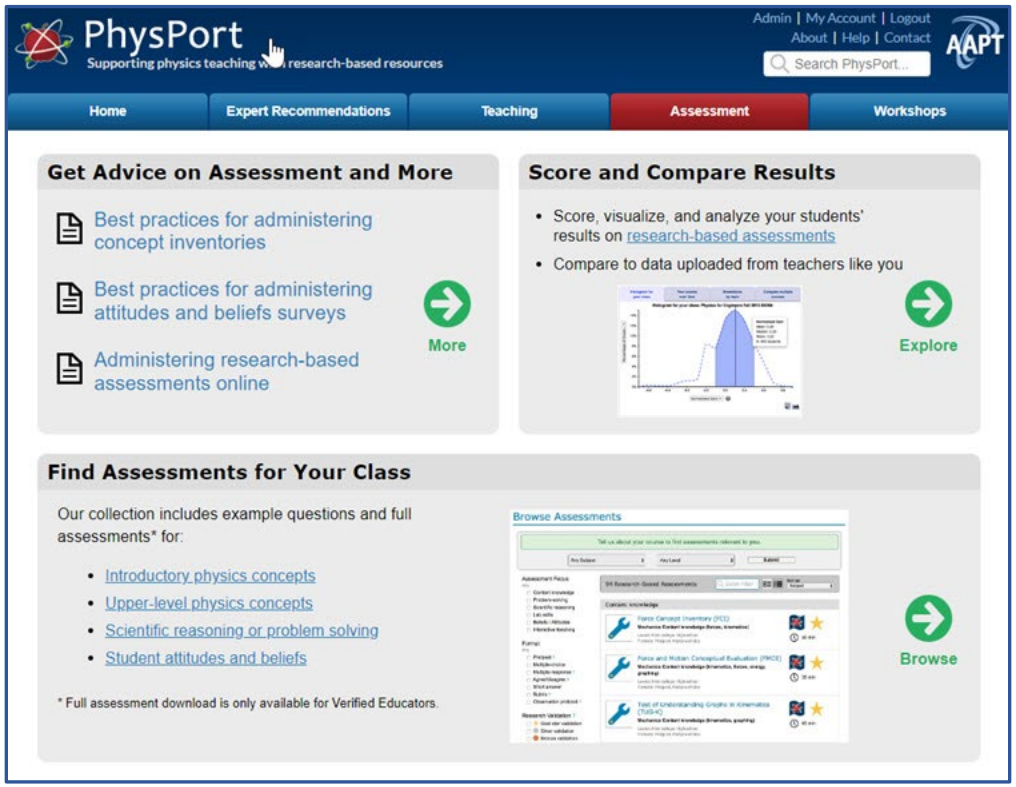
https://www.physport.org/Teaching.cfm

Recommendations, Content, Methods

Shared Teaching Resources?

- ACORN "Student Resources" based Physics Tutorials– Supporting student sense-making
- Maryland Open Source Tutorials – Interactive group exercises from Kinematics to Electric Potentials
- Curricular Exercises for Quantum Mechanics – Tutorials for standard Quantum topics, experiments to Computation
- Graduate Physics Group Exercises – Interactive Group resources for the Graduate Core Courses

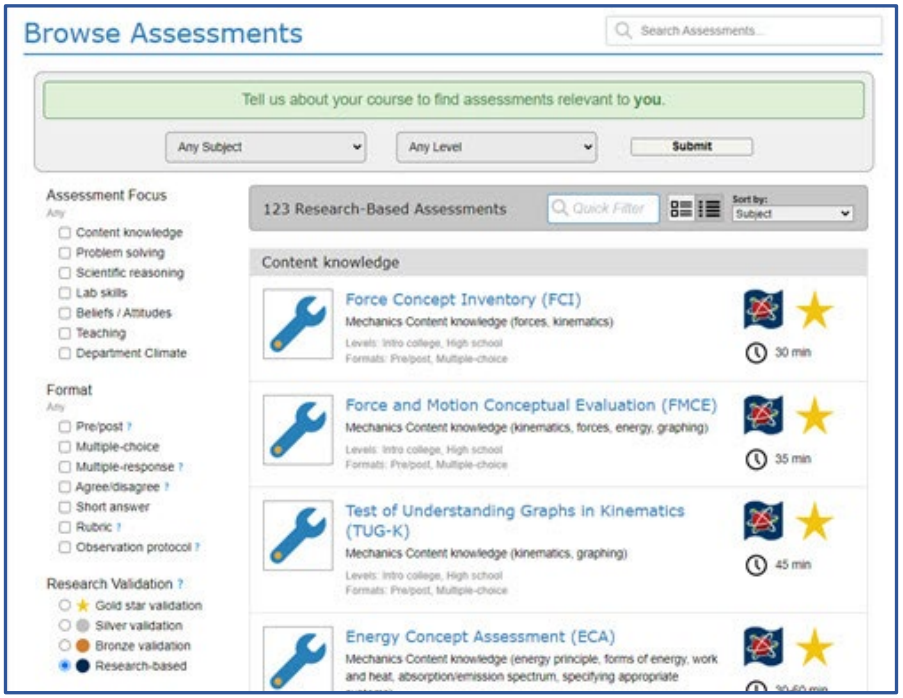
What are my students Learning?



https://www.physport.org/Assessment.cfm

Recommendations, Search, Analysis

Find Assessments? (~100)



Organized by:

- Subject
- Level
- Format
- Research
- Language
- Focus
  - Problem Solving
  - Lab Skills
  - Content Knowledge
  - …

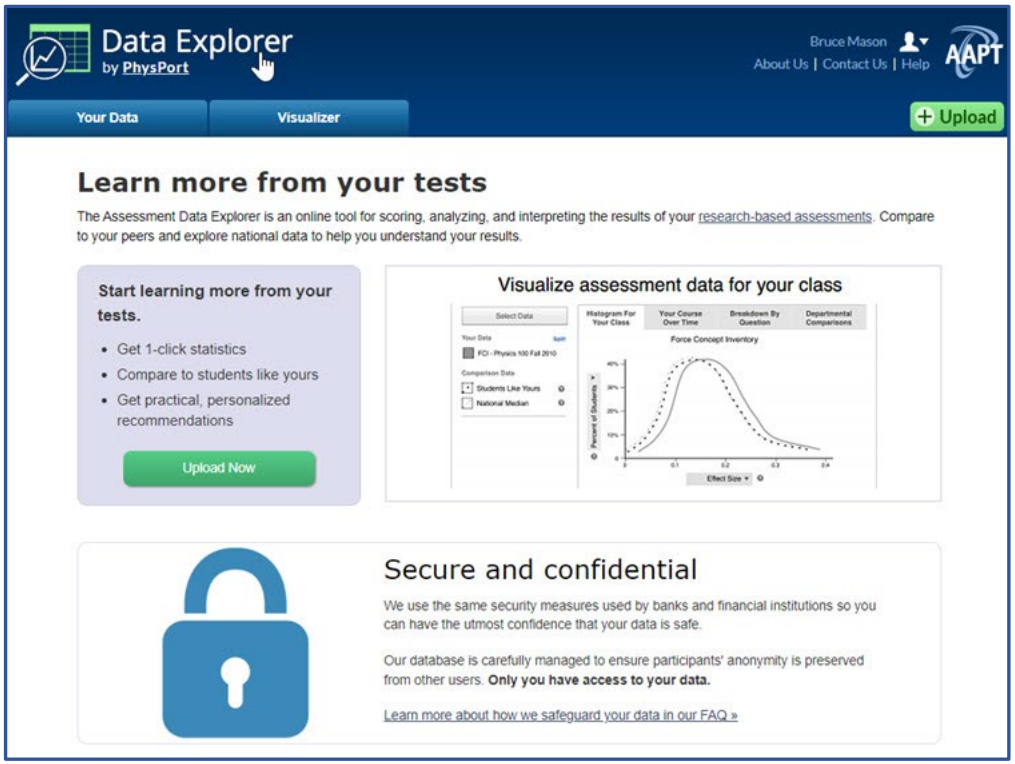
HOW to use

Czech Translations:

Force Concept Inventory, Calculus Concept Inventory

Others are welcome!

Understand Assessments?



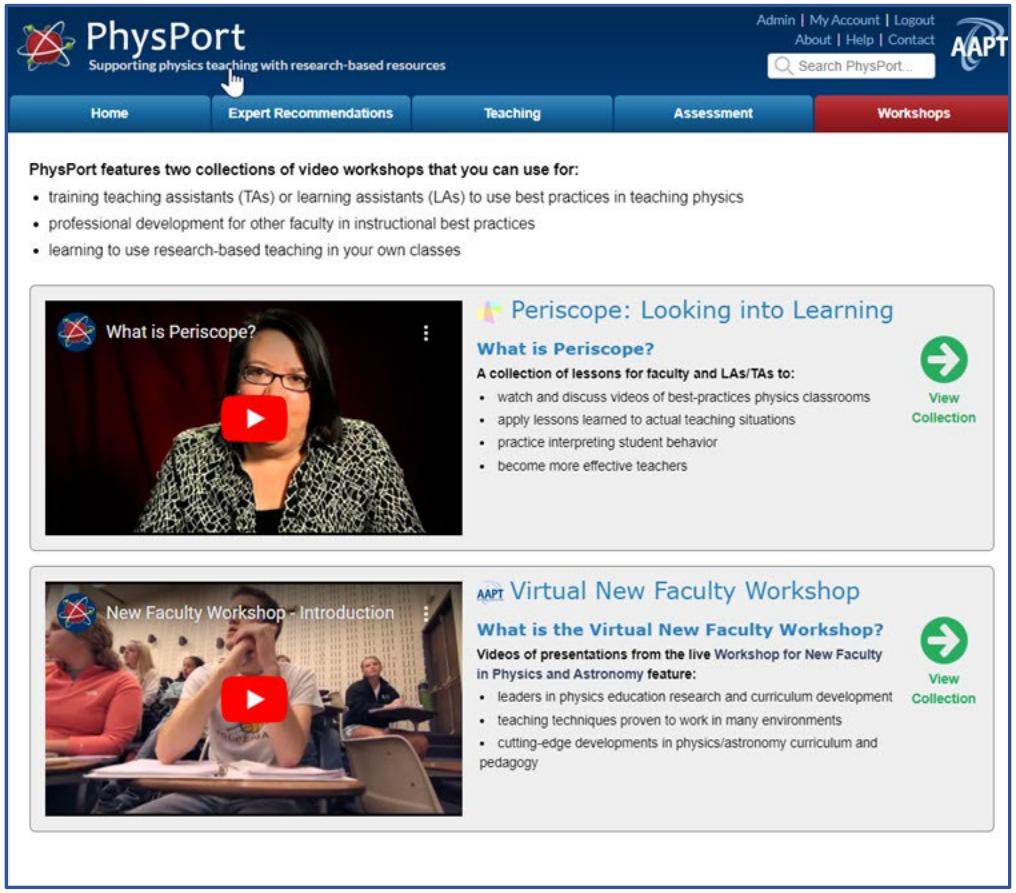
Data Explorer:

- Upload Results and Download Analysis
- Statistics
- Comparisons
- Recommendations

Data Explorer:

https://www.physport.org/dataexplorer/

How can I teach teachers?



Periscope Video Lessons: Class Videos and Discussion Worksheets

New Faculty Workshop: Information from Experts

Periscope lessons

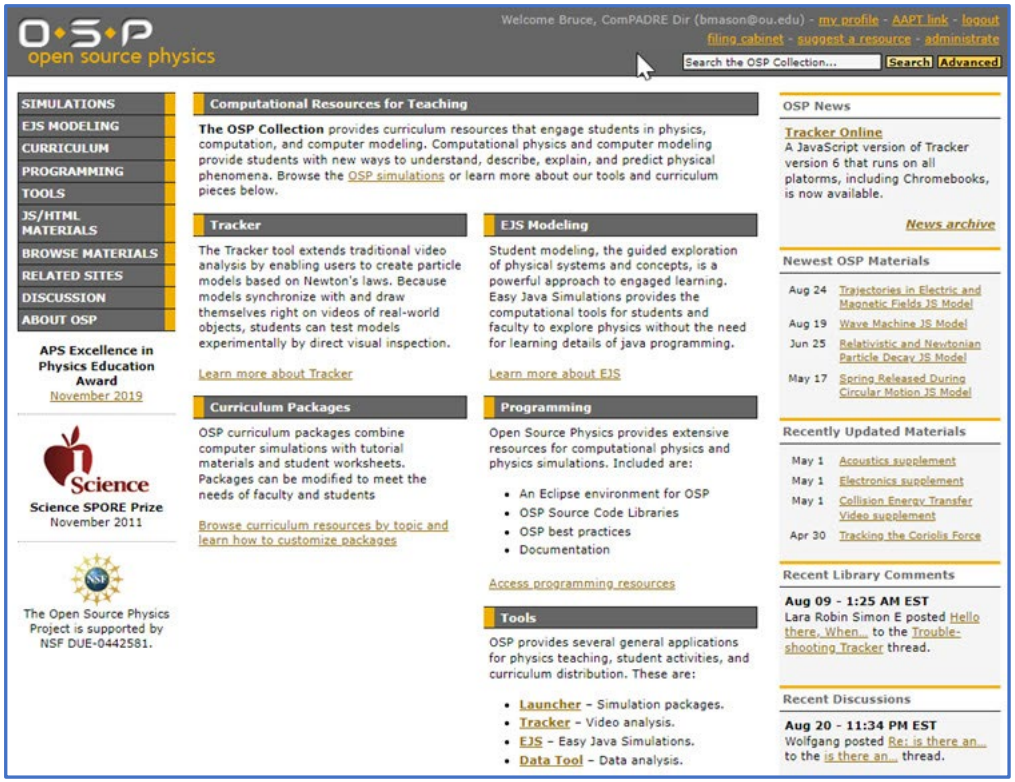
Lessons for Instructors (New or Experienced)

Video of Student/Student & Student/Instructor interactions

Lesson guide for participants and leaders

Explores some difficult questions/situations

Where can I get physics simulations?

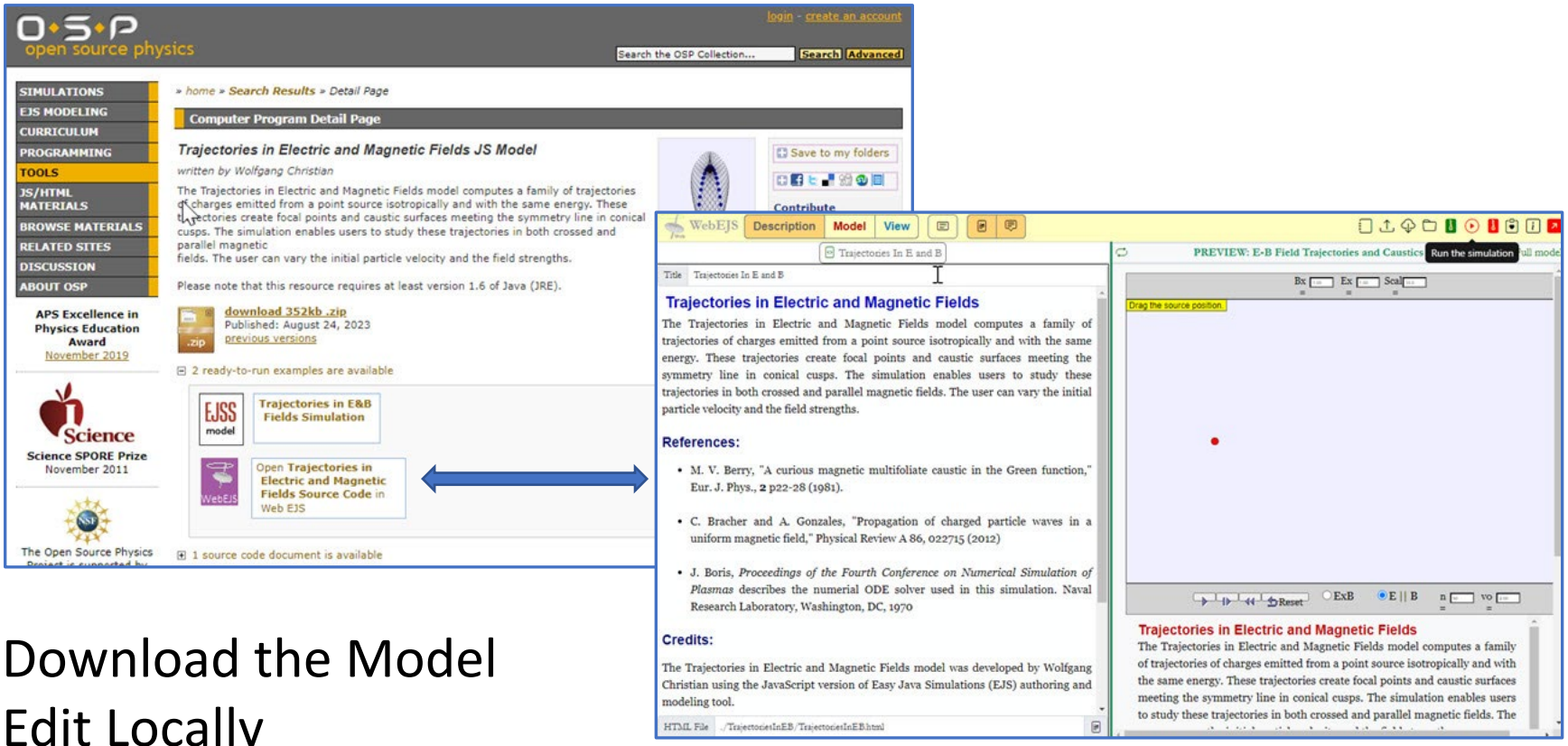


Others, of course:
PhET, BU Simulations

OSP: Open, Editable, Sharable, Runnable

Open Source Physics:
https://www.compadre.org/osp

Open Simulations EJSS, WebEJS?



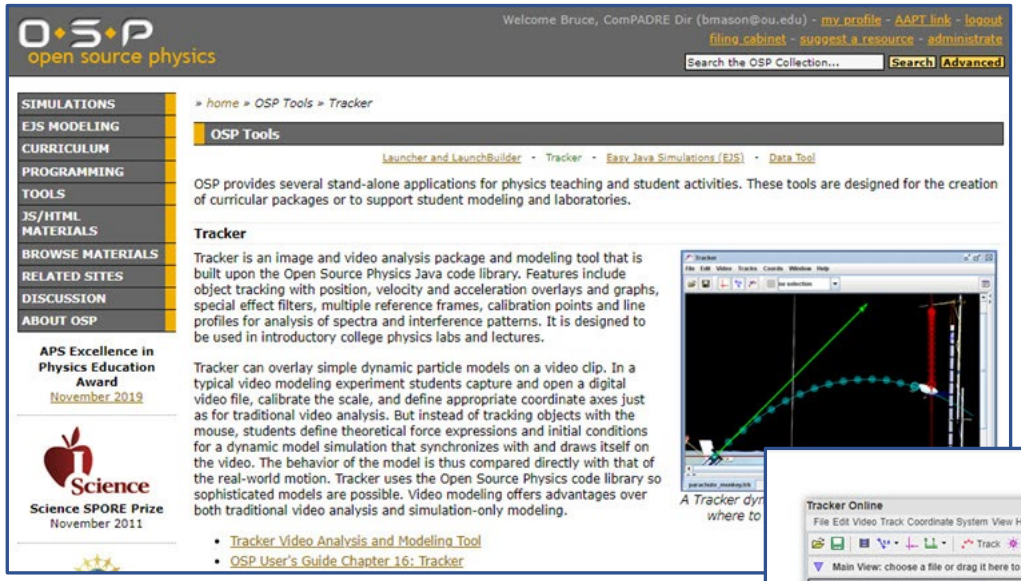
Download the Model

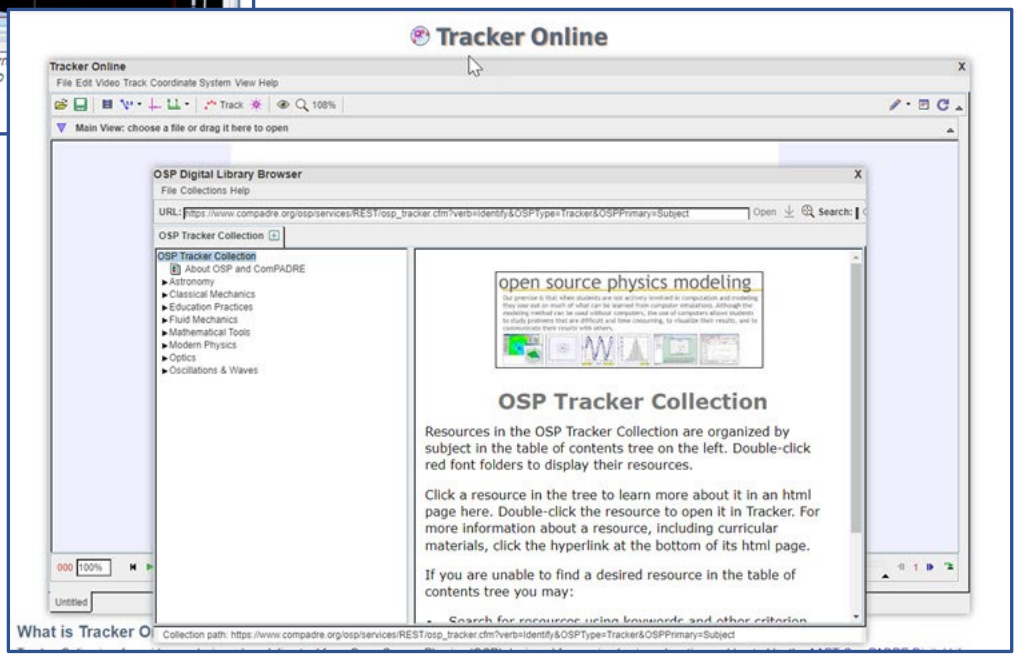
Edit Locally

EJSS Editor connects to the OSP Library

NEW DEVELOPMENT: Web EJS!

Video Analysis… for Free?

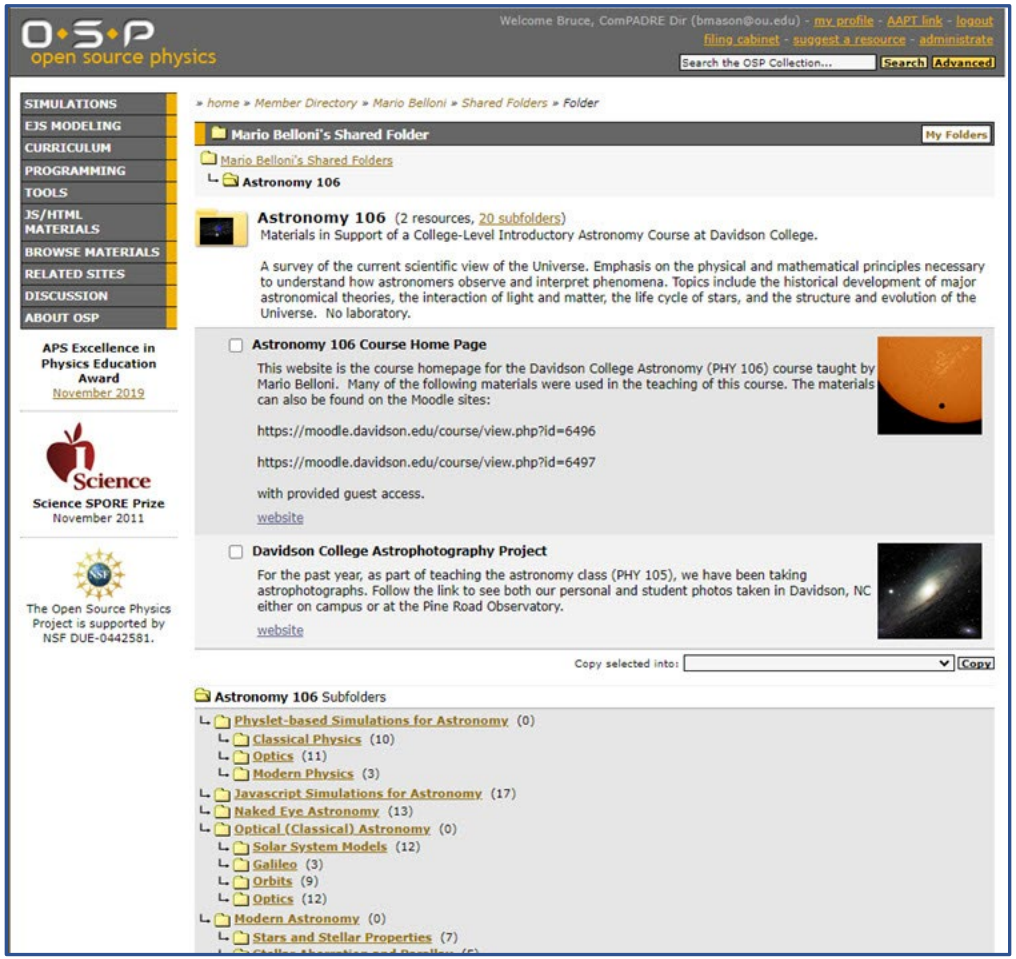




[Tracker](#) and
[Tracker Online](#)

Sophisticated modeling Tracker examples in the OSP Library

Can I share?



"Shared" File Cabinets

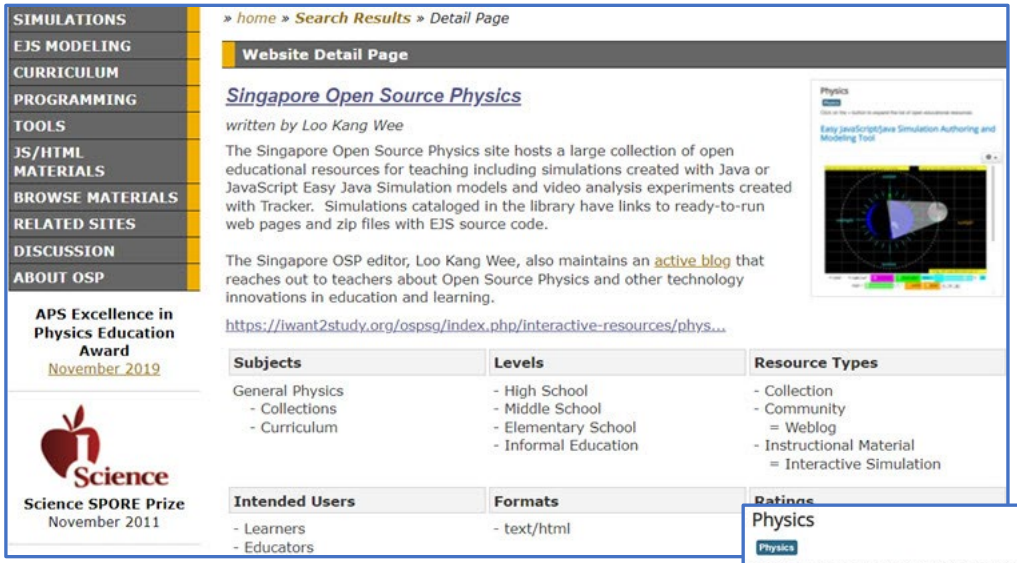
Your Materials

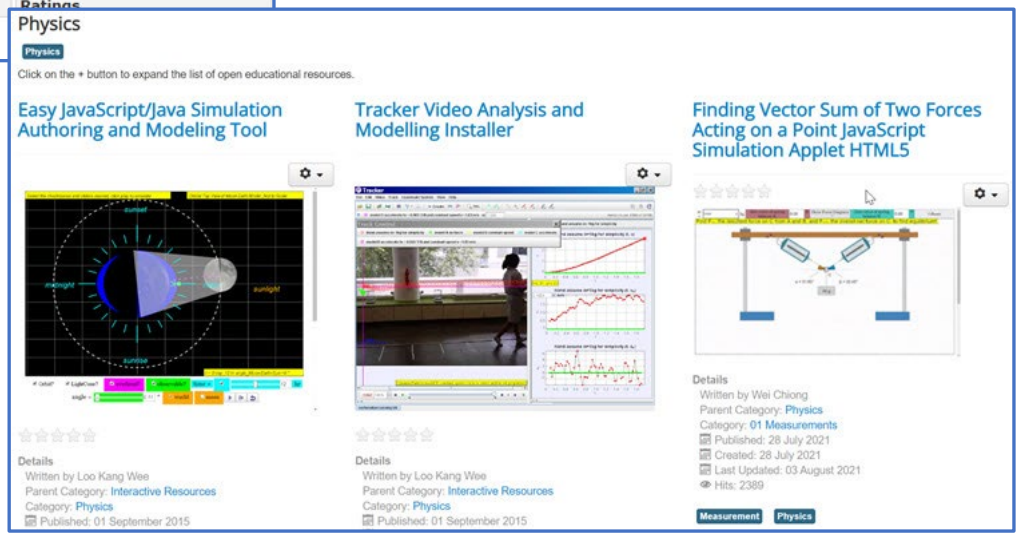
Other's Materials

A few resources or an entire course

Restricted to Registered Users

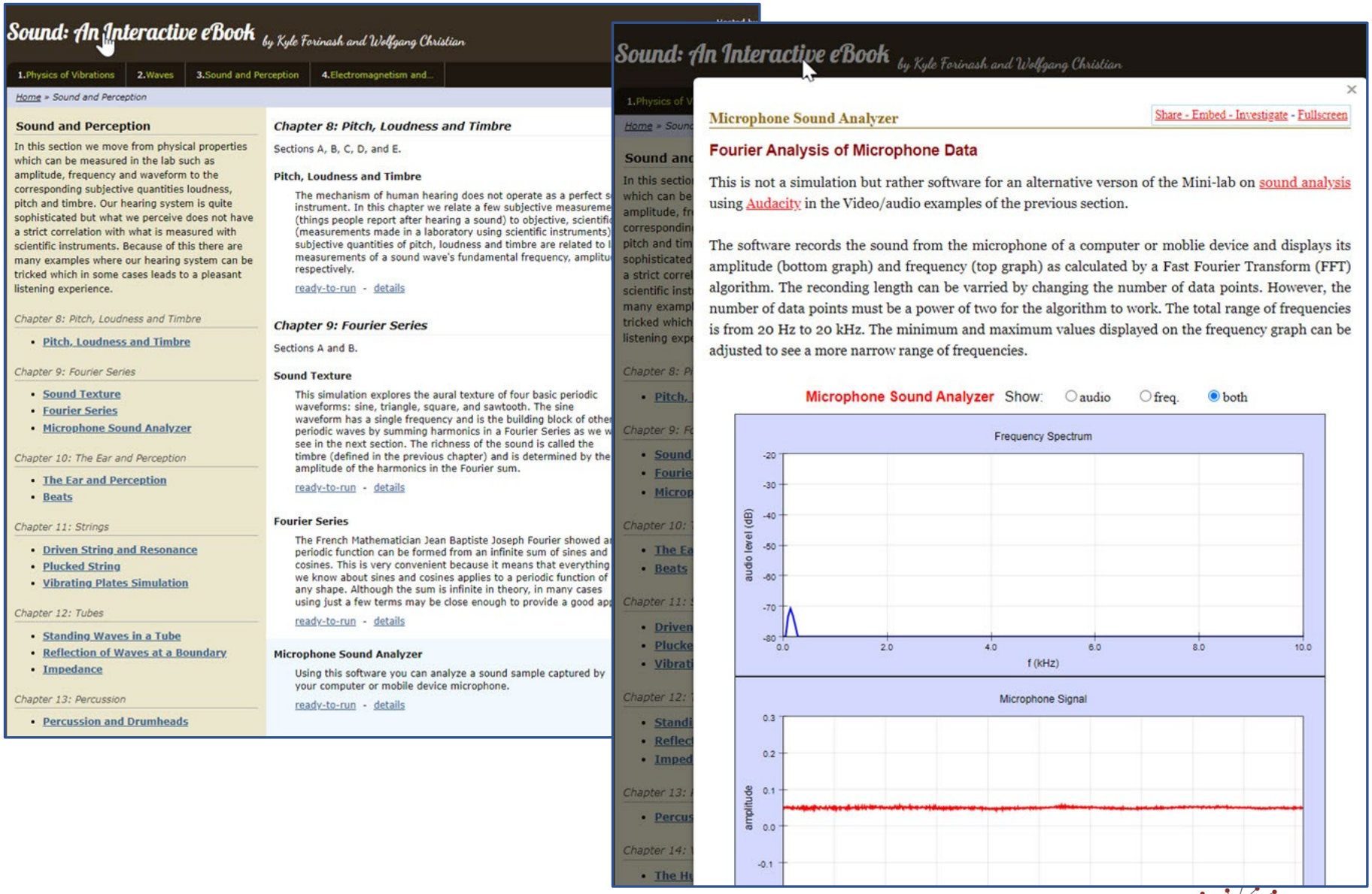
Can I share?



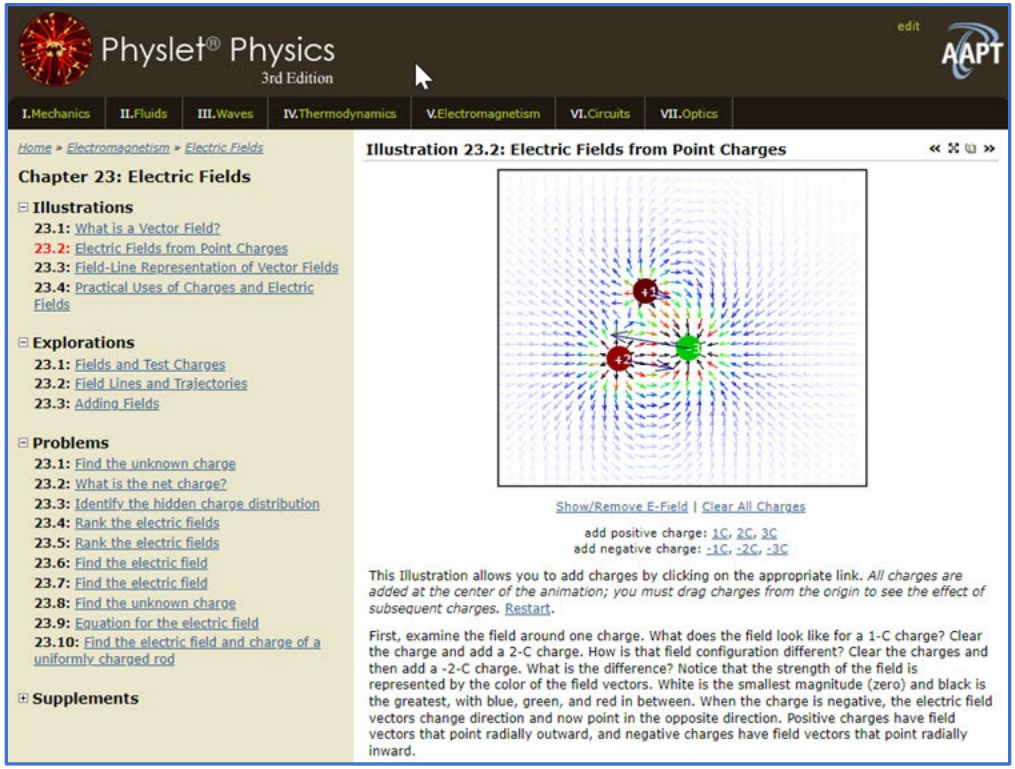


Contributors to the OSP Community from around the world

Can I share “Books”?



What is ready-to use?



[Physlet Physics]

[Physlet Quantum Physics]

[STP Book (Stat Mech)]

In use since 1995. Each very specific.

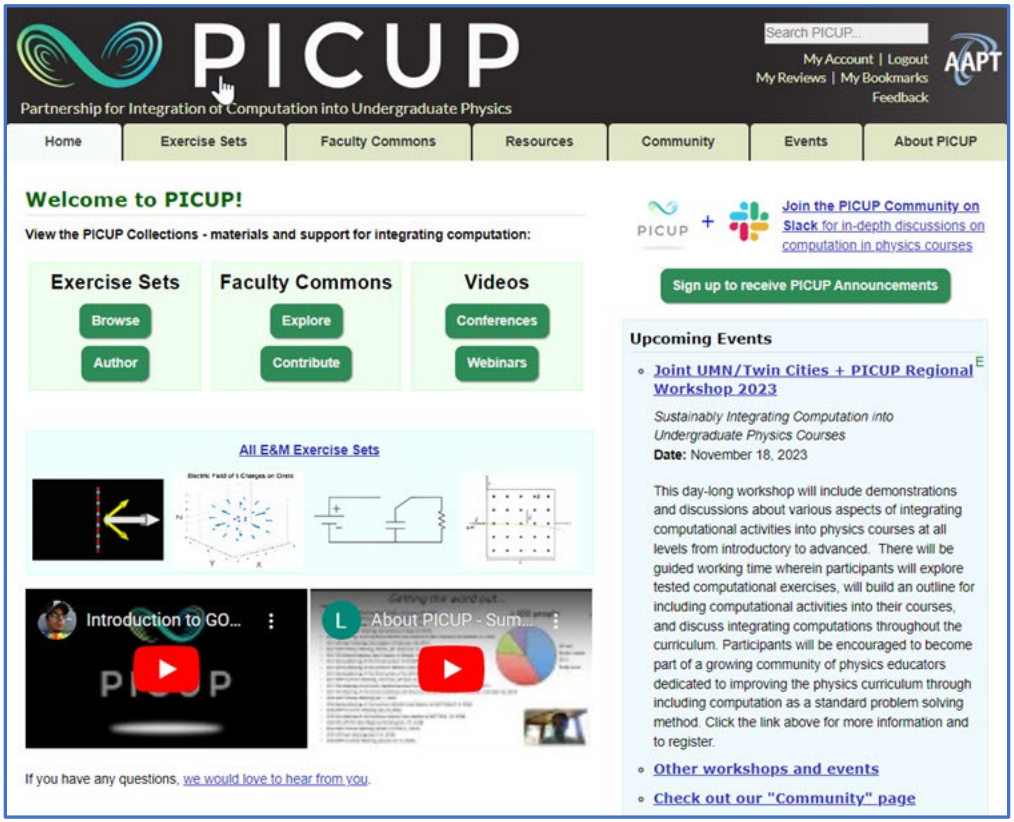
Online & runnable:

Illustrations: Look/move around, create, guided, with answers

Explorations: Tutorial, students seek answers, students decide measurements

Problems: Conceptual to numerical, require information from physlet

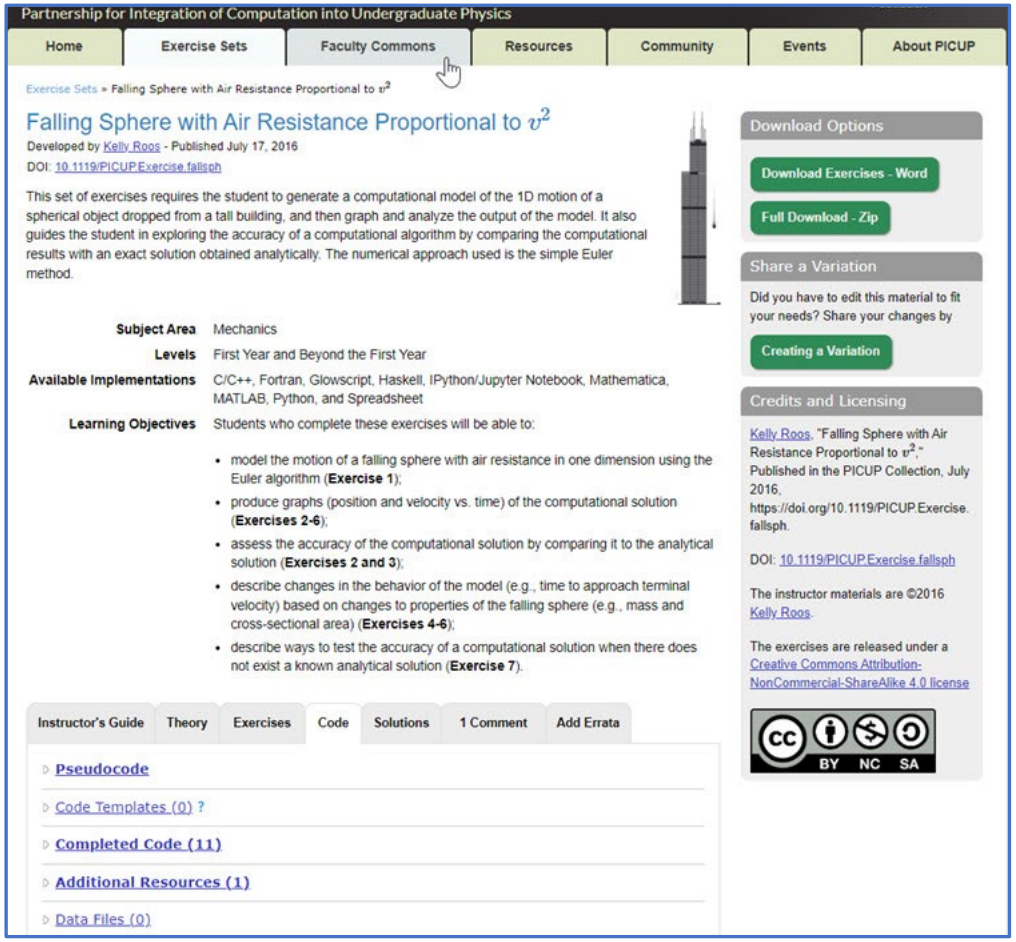
Adding computation to my course?



Partnership for Integrating Computation into Undergraduate Physics:

An active community

What can I use?



PICUP Exercise Sets

Created for, used in and by classes:

Student Activities
Physical Problems
Peer Reviewed

Restricted:

Instructor Guide
Physics/Computational
Theory
Code (Multiple)

What can I use?

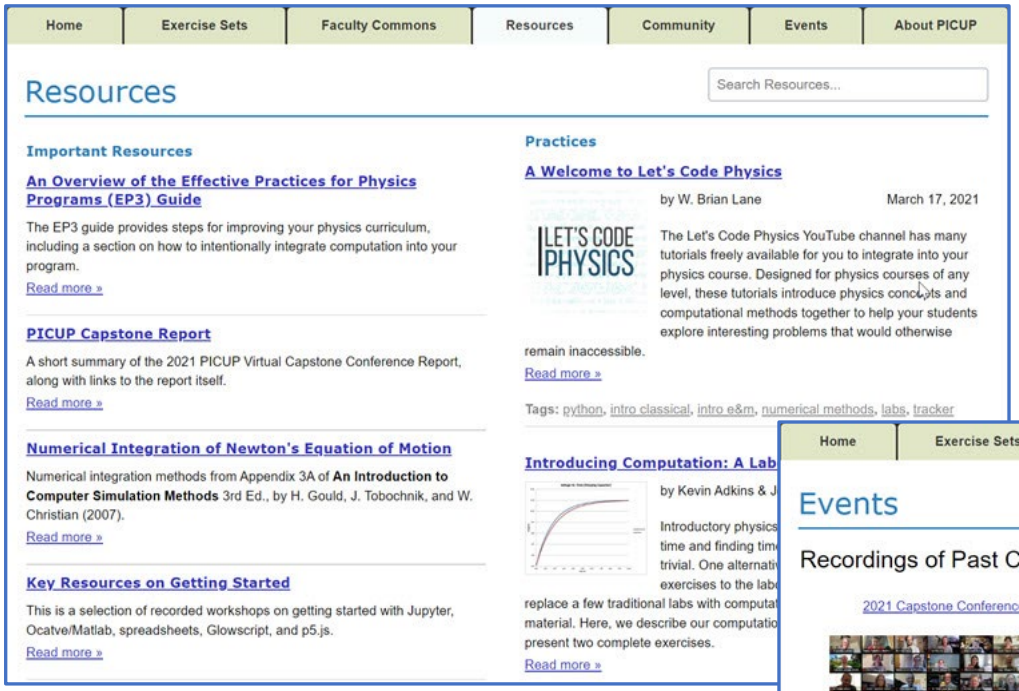
Examples from Faculty:

Simpler submission
Less information
Editor reviewed

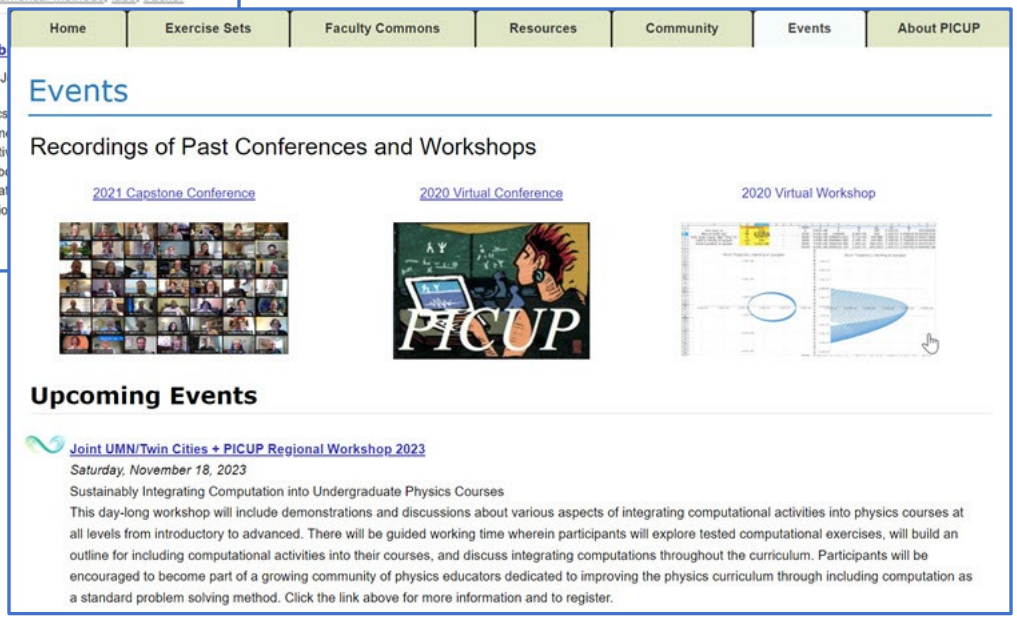
Restricted to Instructors Only

PICUP Faculty Commons

How do I start with computation?

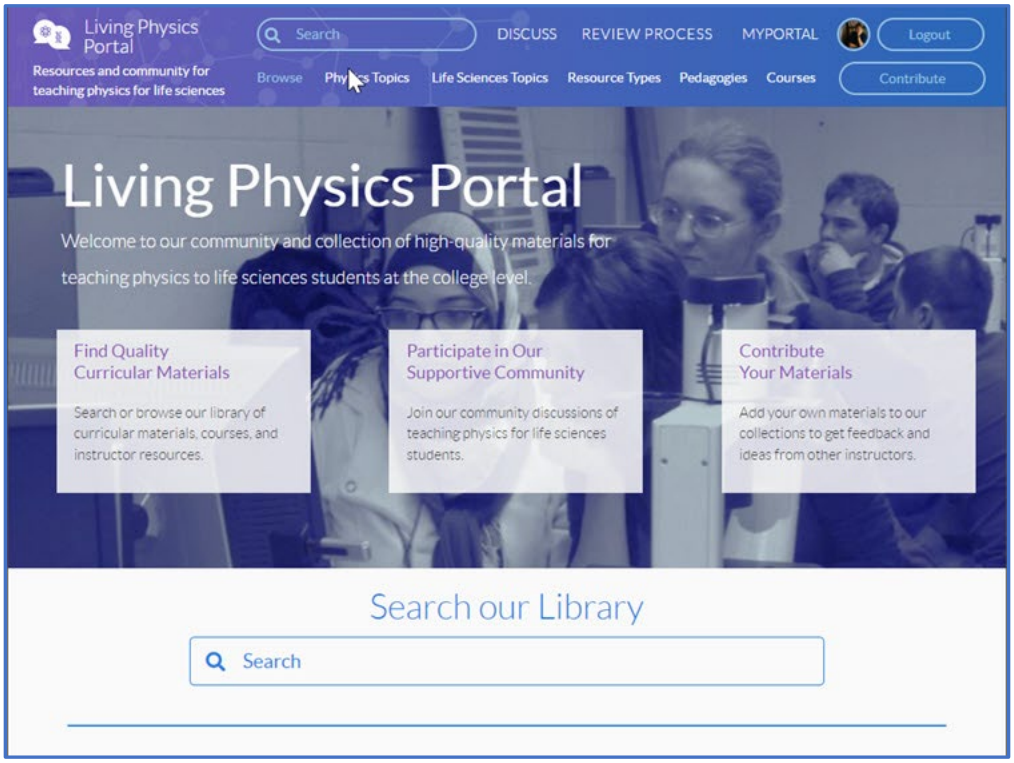


PICUP Resources



PICUP Events

What do I know about Biology?



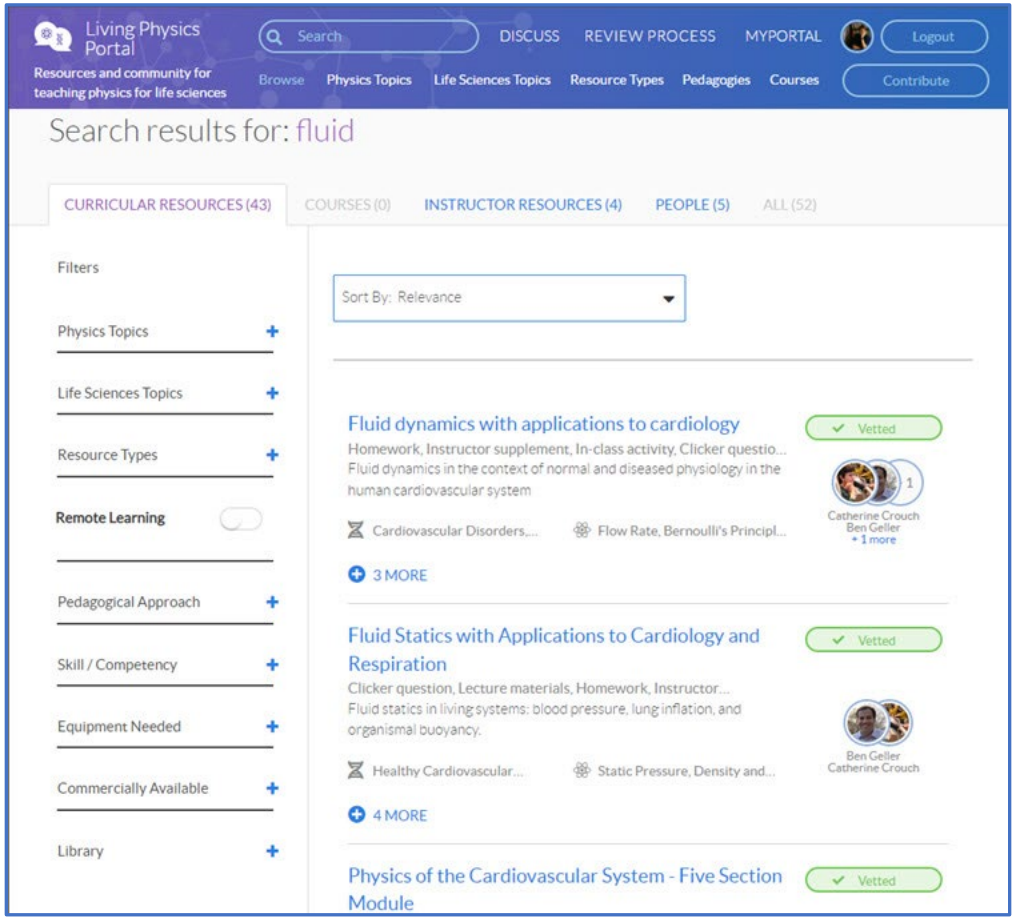
Living Physics Portal

https://www.livingphysicsportal.org/

Changes in Bioscience Education

Experienced Instructors Sharing their work

What interests life science students?



Less!

Frictionless Incline Plane

Ballistic Motion w/o Air

Lightbulbs

More!

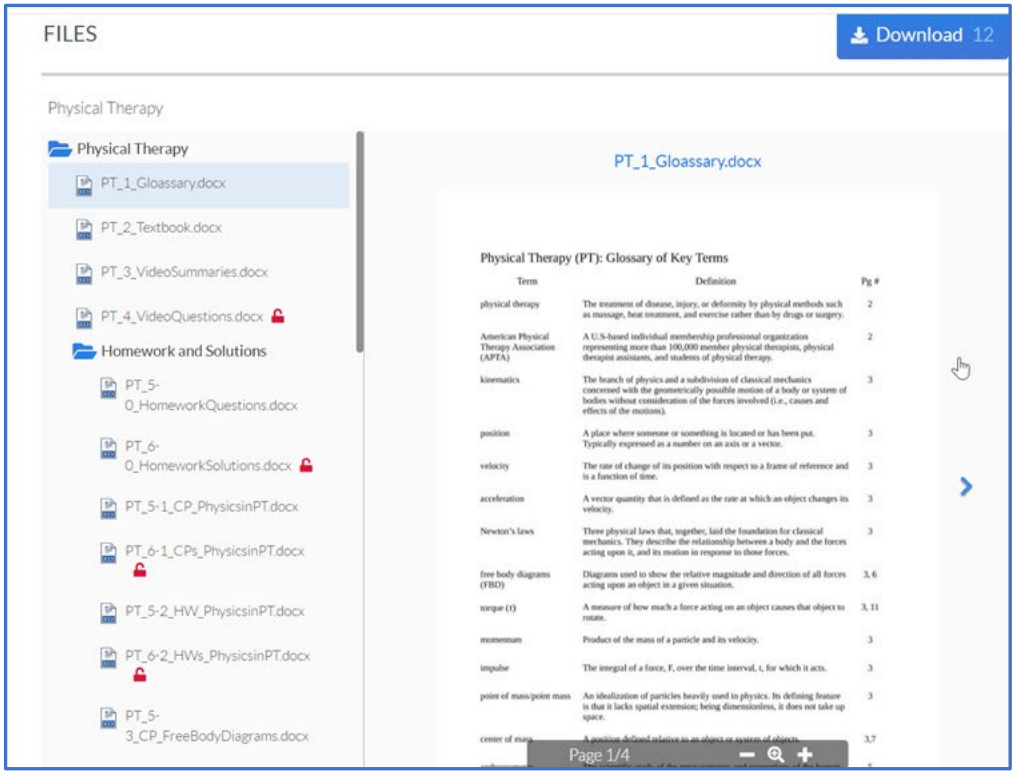
Fluid Dynamics

Animal movement

Nerves

Medical Machines

How do I structure my stuff?

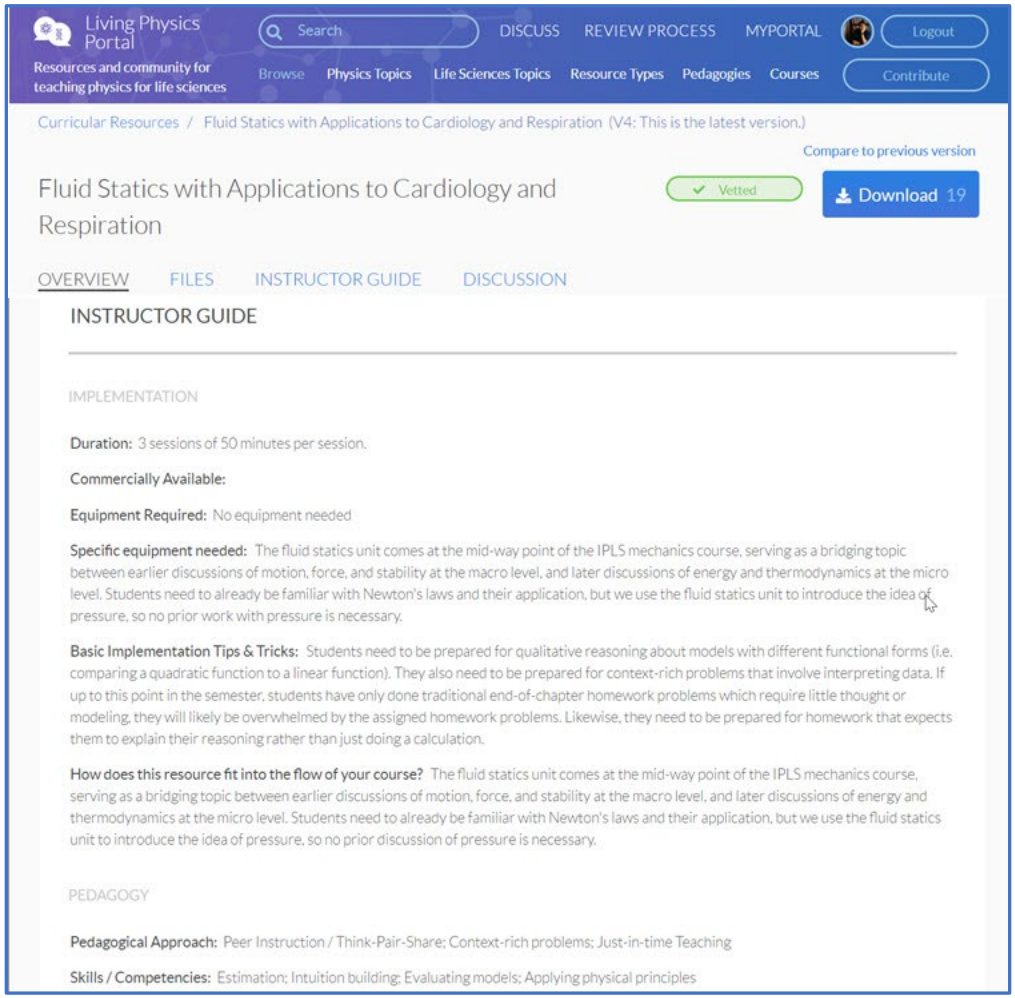


Folders/Subfolders
Editable/Formatted files
URLs if needed
Instructor Resources

Highlights & Abstract
Resource Types
Physics, Bio, Chem, and Math topics

Community Library: Contributions with minimal information
Available only for Logged-in Verified Educators
No or very quick check by editors

What do other instructors need?



Research Results:

Duration, Equipment, Basic Tips & Tricks, Course Fit, Pedagogical Approach, Skills Addressed, Insight from the Resource, Life-Science Connections

Vetted Library: Teaching Info., Editorial Review

What are some numbers?

File Count	Resource Count	Description
1149	164	In-class activity
145	45	Clicker question
365	98	Lecture materials
566	104	Lab
91	31	Demonstration
247	52	Video
689	137	Pre-class assignment
2272	280	Homework
273	78	Exam problem
451	134	Student reading
34	14	Project
1346	332	Instructor supplement
1368	292	Restricted access

Resource Count	Description
208	Human and Animal Physiology
165	Medical Applications
149	Cross-cutting Biological Concepts
128	Biomechanics
84	Molecular and Cellular Biology
84	None
23	Biochemistry
6	Evolution
4	Ecology
3	Botany

Resource Count	Description
243	Classical Mechanics
139	Thermo & Stat Mech
133	Fluid Mechanics
123	Electricity & Magnetism
114	Optics
107	Oscillations & Waves
56	Modern Physics
43	None

What more is there?

- PER Central:

  Getting started in PER, Annual PER Conferences, PER Dissertations, Research literature, etc.

- Advanced Labs:

  Lab "Immersions", Lab Conferences, Manuals, Software, etc.

- Adopt-a-Physicist:

  Connect with High School classes around the word.

Challenges & the Future?

- Moving infrastructure to the cloud
- Encouraging and aiding authors to submit
- Editorial processes
- Supporting new partners/projects
- Handling legacy content/legacy code
- Funding

A Few References

PhysPort as professional development to foster creativity in teaching, Linda E. Strubbe, Adrian M. Madsen, Sarah B. McKagan, and Eleanor C. Sayre. Physics Education Research Conference 2020

Beyond teaching methods: Highlighting physics faculty's strengths and agency, Linda E. Strubbe, Adrian M. Madsen, Sarah B. McKagan, and Eleanor C. Sayre. Phys. Rev. Phys. Educ. Res. **16**, 020105 (2020)

The **Physlet** Approach to Simulation Design, Wolfgang Christian, Mario Belloni, Francisco Esquembre, Bruce A. Mason, Lyle Barbato, Matt Riggsbee. Phys. Teach. 53, 419–422 (2015)

Examining course syllabi: Introductory physics for life sciences, Remy Dou, Raluca Teodorescu, Adrian Madsen, Edward F. Redish, and Mark Reeves. Phys. Rev. Phys. Educ. Res. **15**, 020143 (2019)

Teaching strategies predict instructors' perceptions of their effectiveness in engaging students in introductory physics for life sciences courses, Ellen Altermatt, Raluca Teodorescu, and Ellen R. Iverson. Phys. Rev. Phys. Educ. Res. **17**, 020133 (2021)

What Are Your Questions?

(Thank you)