

GLENCOE

PHYSICS

PRINCIPLES & PROBLEMS



Ease the Transition to Next Generation Science

Whether your district has already adopted Next Generation Science Standards (NGSS) or is considering adopting them or any other new standards, *Physics: Principles and Problems* ensures a seamless transition.

The increased pace of change in education in the last few years has created seismic shifts in the delivery and consumption of educational materials. Students want to connect what they learn in the classroom to what they see happening in the real world – today!

We deliver to you the most effective, innovative, and inspiring high school physics curriculum that meets both NGSS and local science standards. Whether you're looking for a hybrid digital-print or a digital-first program, McGraw-Hill Education is your trusted advisor.

With *Physics: Principles and Problems* you are equipped to:

- Meet science standards **Performance Expectations** (PEs).
- Integrate **Science and Engineering Practices** into your science classroom.
- Apply the **Disciplinary Core Ideas** (DCIs).
- Correlate your lessons to **NGSS**.

***Physics: Principles and Problems*:** Leveraging technology to drive personalized student success while engaging and motivating students with hands-on, project-based activities and real-world applications.

McGraw-Hill Education: Our tools, platforms, and services are focused on serving the needs of educators and learners through our purposeful technology, proven differentiated pedagogy, and unmatched professional development.

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When you combine
the **science of learning**
with the **art of teaching**,
there's no limit to what
students can achieve.





RAMP UP THE ENGAGEMENT...

To create memorable learning experiences.

To meet you wherever you are on the digital spectrum, *Physics: Principles and Problems* interactive learning and teaching resources are easy-to-use, whether you're a technology novice, digital native, or somewhere in the middle.



connectED

ConnectED is your digital teaching platform making it easy and convenient to customize lessons, review assignments, and communicate with students.

Plan, Teach, and Assess with *ConnectED*.

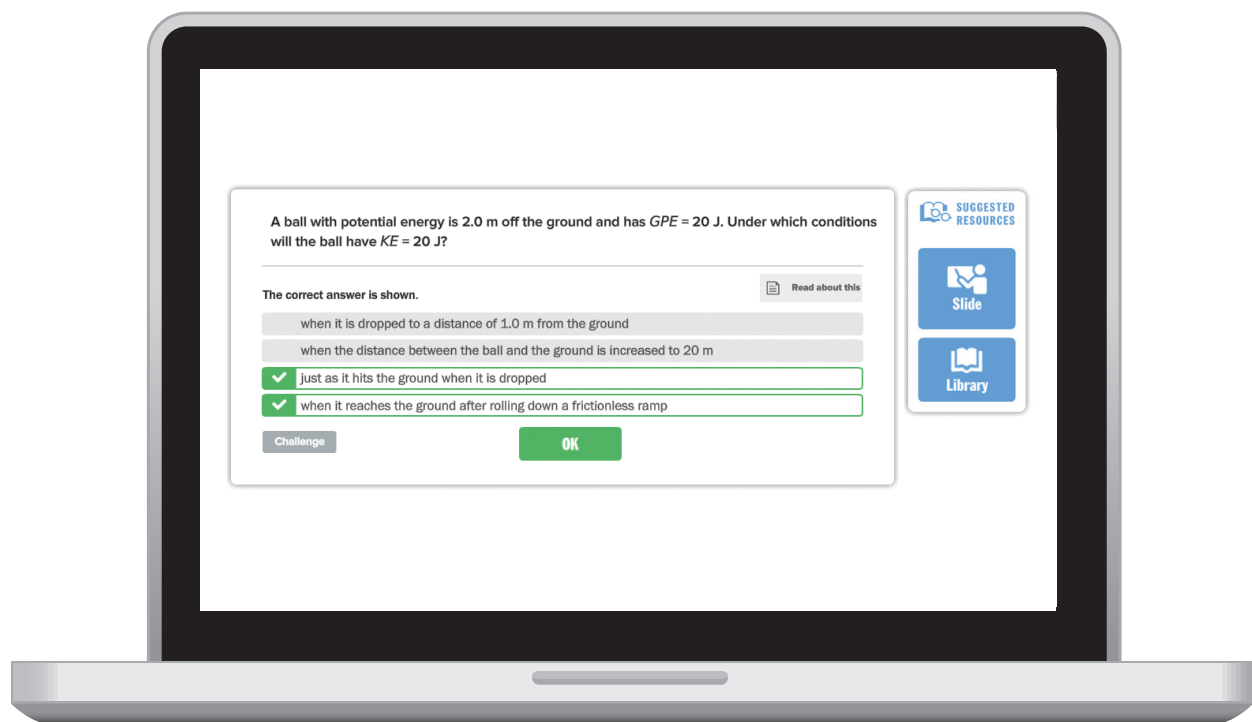
Increase Knowledge Retention with LEARNSMART®.

The *LearnSmart*® adaptive learning engine with *SmartBook*® gives every student a unique learning path and every teacher the power to reach all students in class.

SmartBook is an eBook whose text is fully integrated with *LearnSmart* technology. As a student reads, this technology determines precisely which learning objectives he/she understands and which ones he/she struggles with, highlighting the most critical content for the student to read next.

Learning Resources close knowledge gaps by immediately clarifying the concepts the student finds most challenging.

The personalized study resources your students need today to master state assessment tomorrow



Pinpoint knowledge gaps for individual students and across classes.

Empower students to personalize their learning experiences with optimal learning paths so they spend more time on what they don't know with *LearnSmart*.

- Practice of basic physics concepts to improve recall and application before moving on
- Additional exposure and increased practice to master new concepts
- Presentation of concepts individual students struggle to master



TIME SAVING TECHNOLOGY...

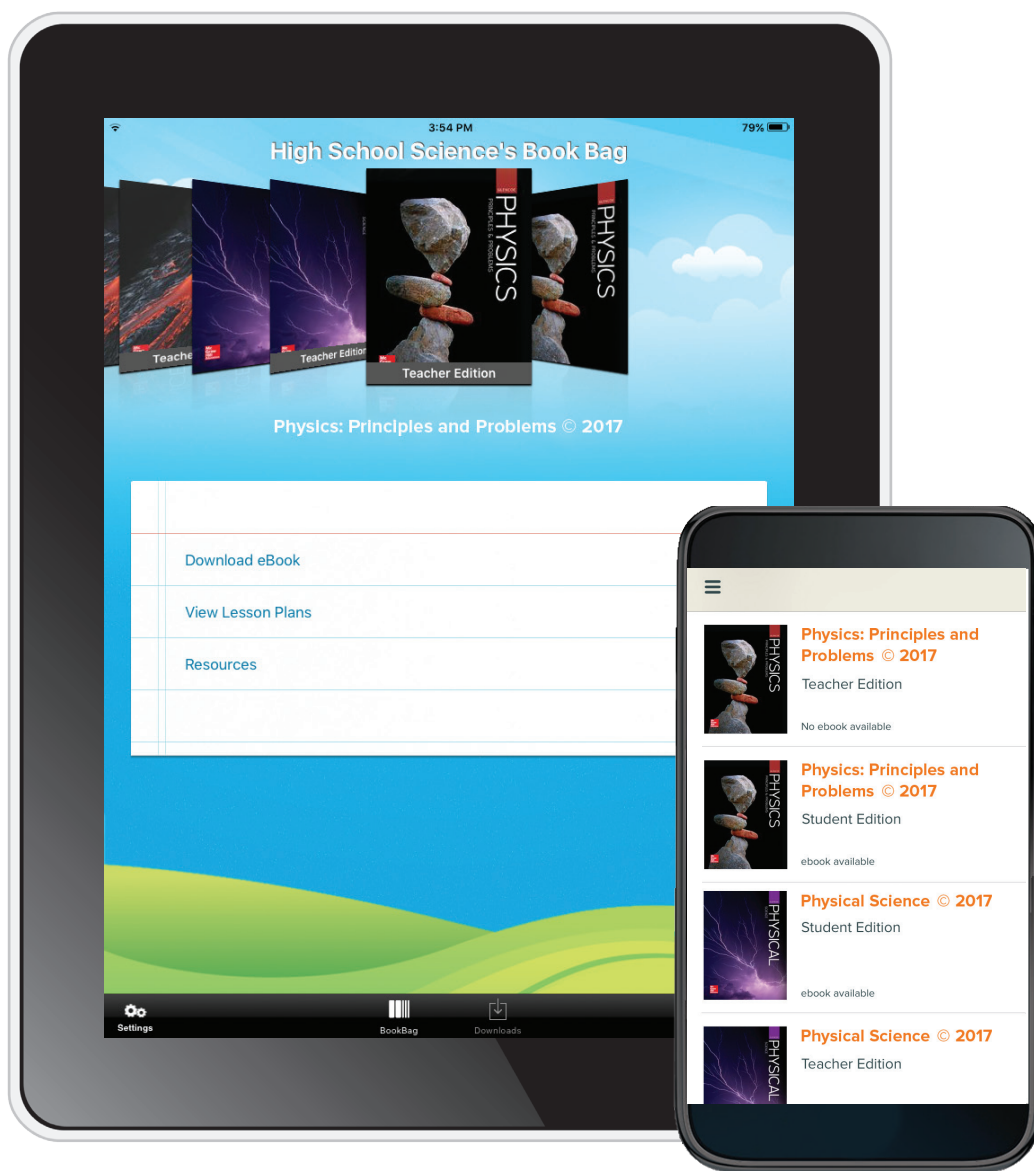
To optimize your productivity

Give your students the resources they need on the go! The *student eBook* helps students turn physics in the real world into learning moments by giving students access to their program materials and resources anytime and anywhere.

Empower students to learn from physics as-it-happens with the *student eBook* which learners can access anytime and anywhere using the Open eBook icon.

Plan and Prepare On-The-Go

The *ConnectED Mobile App* gives access to your Physics program including *student eBook*, planning tools, reference materials, and other program resources. *ConnectED Mobile* is available on select Chromebook, iOS, and Android™ devices.



Use the ConnectED Mobile App to:

- Access all the courses available to you in ConnectED.
- Download *student eBook* for use offline, whenever you need it.
- Review lesson plans from the Plan & Present tab from the *ConnectED Teacher Center* dashboard.
- Manage the content you download to the app.
- Retrieve a comprehensive list of resources from the Resource tab from the *ConnectED Teacher Center* dashboard.

Real-World Connections

Be confident helping students achieve more! Use the *Science and Engineering Practices Handbook* to introduce the skills to students and support their scientific investigations and engineering projects.

As a reference book, the *Science and Engineering Practices Handbook* provides students with background information, definitions, examples, and Quick Practice activities to stimulate and reinforce learning.

The *Science and Engineering Practices Handbook* is an easy-to-use reference for all eight practices.

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Defining Problems

Defining problems is an engineering practice that underlies any technological solution. The different components of this practice are briefly summarized below.

1. Engineers design solutions to problems.
2. Problem statements outline the problem and the solution.
3. Asking questions is part of engineering as well as science.

Defining problems doesn't involve a dictionary or a math worksheet. Engineers study how people do things and try to make the experience better. If people don't have a way to do something yet, engineers invent it. Engineers have to consider many factors when defining a problem.

Seeking a Solution

Engineers identify problems for people and society and then design solutions to those problems. The solution could be a process, a system, or an object, such as a tool. Space suits worn by astronauts are technological solutions designed by engineers. When coming up with any solution, engineers must consider many criteria.

Criteria are requirements or specifications for a product to be successful.

Criteria for a space suit may include the size of the person wearing it, how easy it is to move around in, and the temperatures it can withstand. Engineers also have certain constraints on every solution.

Constraints are limitations on a product's design.

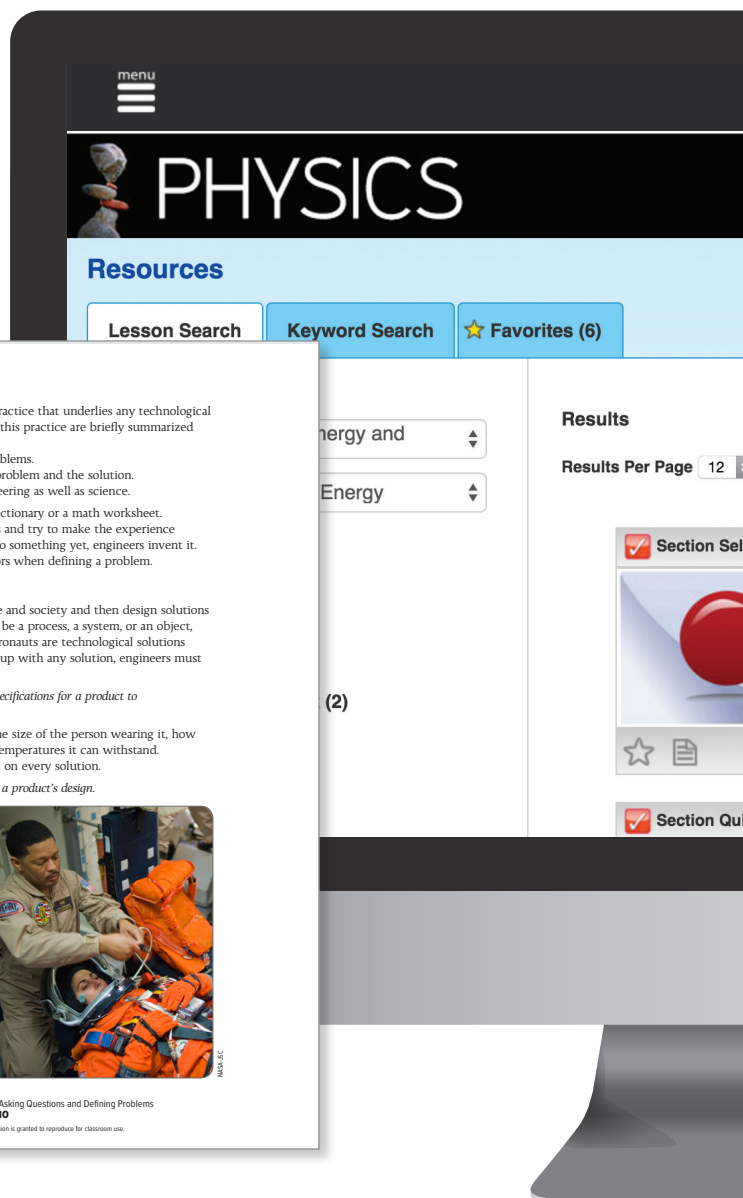
For example, some materials may not be durable enough or may be too expensive to use. Major constraints include time, energy, space, and the availability of tools and materials. Other important constraints are the number of people working on the project, how much money is available for the project, and what information about the project exists.

Space suits have many criteria for safety and functionality.



Science and Engineering Practices • Asking Questions and Defining Problems
10
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Find the Practices Handbook in your teacher resources.



Integrated Student Resources

Written to meet each Next Generation Science Standard (NGSS) performance expectation, **Applying Practices Worksheets** and **Project-Based Learning Activities** (PBLs) challenge your students to solve real problems in the real world. These sheets are editable, downloadable, accessible online, and designed to meet specific performance expectations.

Student resources, learning activities, and worksheets are embedded for point-of-use access. Students can use these dynamic resources immediately to practice new concepts.

Students practice physics in action with these learning tools.

- **Applying Practices** and **Project-Based Learning Activities** that integrate traditional science content with science and engineering practices
- Design-your-own labs
- Guided Laboratory Investigations
- Modeling activities
- Research and communicate projects

The image shows a computer monitor with a 'TEACHER CENTER' interface. The interface includes a search bar, a user profile icon, and a sidebar with various resources like 'Animation: Work' and 'PhysicsLAB-Stair...'. Overlaid on the monitor is a printed worksheet titled 'Modeling Fission, Fusion, and Radioactive Decay'. The worksheet includes a title, a description of the activity, and four numbered steps for developing a model. The steps are: 1. In your own words, describe what process or question your model will illustrate. 2. What type of model will you use? What materials will you need to develop your model? 3. Use the space below to sketch a prototype of your model. If you need more space, you can use a separate page. 4. Complete your model. Below, explain how it works and describe how it addresses the process or question.

TEACHER CENTER

Modeling Fission, Fusion, and Radioactive Decay

For this activity, you will use a model to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. You will also model the amount of energy released in each process relative to other kinds of energy transformations. This worksheet will help you plan, develop, and execute your models.

Develop Your Model

1. In your own words, describe what process or question your model will illustrate.
2. What type of model will you use? What materials will you need to develop your model?
3. Use the space below to sketch a prototype of your model. If you need more space, you can use a separate page.
4. Complete your model. Below, explain how it works and describe how it addresses the process or question.

Applying Practices • Modeling Fission, Fusion, and Radioactive Decay

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Find Applying Practice Worksheets in your teacher resources and teacher blades. Also accessible at point-of-use in student resources.

All Answers, Always Up To Date

Use the **eSolutions Manual** to design a dynamic learning environment and effectively personalize content to meet each student's specific learning needs.

Replace your traditional solutions manual with this digital **eSolutions Manual** to effectively create customized homework assignments and assign ready-made practice activities.

The **eSolutions Manual** can help you use class time more effectively. Use the “view online” feature in class and project questions and solutions on a screen or interactive whiteboard to make class time more interactive and productive.

Display questions one at a time and reveal steps to help students work through problem sets individually or collaboratively.

The screenshot displays the eSolutions Manual interface. On the left, a sidebar lists the contents of the 'Physics Principles and Problems' section, including chapters from 1 to 23. The main area shows a 'No Image Available' placeholder. Below this, there are sections for 'Include:' (Answers, Solutions) and 'Select:'. A 'Finish' button is visible in the top right corner. The bottom part of the screenshot shows a sample exercise solution for 'Exercise 1' under 'Section 1 Temperature, Heat, and Thermal Energy: Practice Problems'. The problem asks for the heat absorbed by a copper water pipe. The solution is shown as follows:

Exercise 1
Section 1 Temperature, Heat, and Thermal Energy: Practice Problems

When you turn on the hot water to wash dishes, the water pipes heat up. How much heat is absorbed by a copper water pipe with a mass of 2.3 kg when its temperature is raised from 20.0°C to 80.0°C?

SOLUTION:

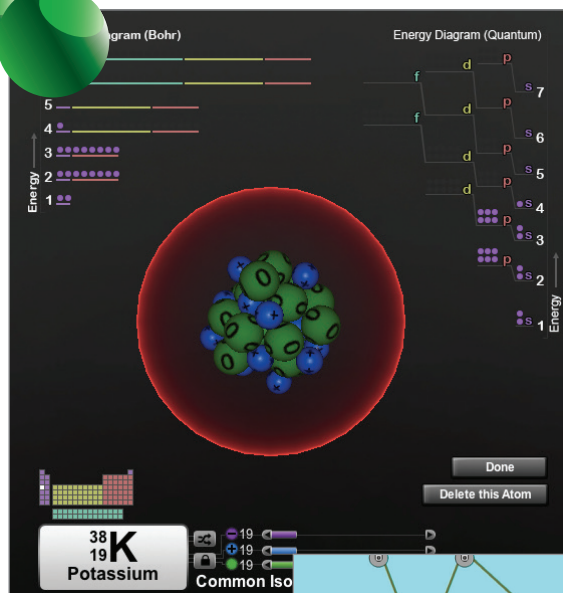
$$Q = mc\Delta T$$
$$= (2.3 \text{ kg})(385 \text{ J/(kg}\cdot\text{K)})$$
$$(80.0^\circ\text{C} - 20.0^\circ\text{C})$$
$$= 5.3 \times 10^4 \text{ J}$$

Access your **eSolutions Manual** anytime and anywhere using **Connected** or **Connected Mobile**.

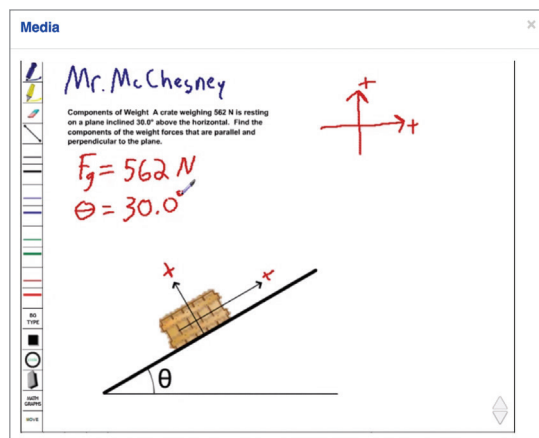
The **eSolutions Manual** features:

- All questions from the Student Edition.
- The flexibility to show answers, solutions, both, or neither.
- The ability to make customized worksheets from questions in the Student Edition, using evens, odds, or all problems.

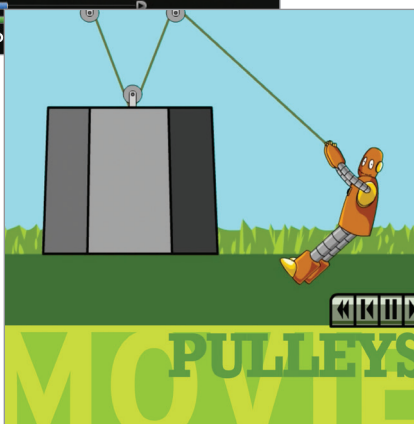
Cyber Science 3D[®]



Personal
Tutor



Expanded features
such as Personal Tutor,
BrainPOP[®], and Cyber
Science 3D[®] go beyond
the limitations of the
printed page.



Brain
POP[®]

Apply Interactive Practice

Students have their own digital learning platform called the *ConnectED Student Center*, complete with student worksheets and digital resources. Assignments you create appear in their to-do lists. Students can message you directly and submit their work.

Use expanded Student Center features such as *Personal Tutor*, *BrainPOP[®]*, and *Cyber Science 3D[®]* videos to go beyond the limitations of the printed page and bring science into your student's lives like never before.



EFFECTIVE RESULTS...

To support student success

Easy-to-use *eAssessment* with reporting tools equip you with the data you need to make informed instructional decisions and keep students engaged.

- ***eAssessment*** supports diverse types of evaluations and includes online scoring and report generation for digital and/or print distribution.
- **Professional Development** resources including pertinent information on new science standards and implementation best practices are available to you at point-of-use.

Turn Students into Star Performers with **eAssessment**.

Turn your classroom into a physics success center with **eAssessment** suite – a robust resource – giving you powerful tools to assess student progress and make data-driven instructional decisions.

The **eAssessment** reporting feature means you'll always have access to valuable data on individual students and whole classes to help you differentiate and support student mastery of concepts appropriately.

Other features of **eAssessment** to help increase your efficiency include:

- Question Bank with questions organized by strand, subject, and lesson.
- Report generation on proficiency and accuracy.
- Create and customize premade diagnostic and summative evaluations.

Identify students with knowledge gaps to make data-driven instructional decisions with **eAssessment**.

The screenshot displays the McGraw-Hill eAssessment interface. On the left, a navigation pane shows a tree structure of question sets and tests. The main area displays a 'Multiple Choice' question about a car's acceleration. Below the question, an 'Assignment Results' pop-up window is shown, displaying student information and a table of results for 14 questions.

Question Set: Chapter 3 Additional Challenge Problems (Ancillary)

Multiple Choice

The driver of a car traveling at 110 km/h slams on the brakes so that the car undergoes a constant acceleration, skidding to a complete stop in 4.5 s.

1. What is the average acceleration of the car during braking?

a. 20.041 m/s² b. 20.15 m/s²
c. 26.9 m/s² d. 224 m/s²

ANSWER: c

2. If the car skids in marks?

a. 7.0×10¹ m
c. 2.1×10² m

ANSWER: a

3. Which is the mos

Assignment Results

Date: June 11, 2014

Assignment: Practice Homework
Student: Sample Student
Class: 2nd Period
School: SAMPLE SCHOOL
Term:
Score: 13 / 87

Question #	Question Type	Points	Response
X 1	True / False	0 / 1	T
X 2	True / False	0 / 1	F
3	True / False	1 / 1	T
4	True / False	1 / 1	T
X 5	True / False	0 / 1	T
6	True / False	1 / 1	F
7	True / False	1 / 1	T
8	True / False	1 / 1	F
9	True / False	1 / 1	F
X 10	True / False	0 / 1	F
11	True / False	1 / 1	T
12	True / False	1 / 1	F
X 13	True / False	0 / 1	T
14	True / False	1 / 1	T

eAssessment suite collects valuable data for every student and the class.

Practical Professional Development

The right tools make all the difference in getting your work done efficiently. Seamlessly embedded digital resources and the convenient print materials of *Physics: Principles and Problems* gives you everything you need to make science relevant, rigorous and possible for every student. Designed on the principles of effective professional development (PD), *Physics: Principles and Problems* PD includes self-paced courses, Foldables® and NGSS videos, and on-demand webinars.

Get Started

Online, self-paced Quick-Start course designed to get teachers and administrators up and running fast.

Learn More

Online Implementation course designed to help teachers connect professional learning to the classroom.

Watch It

Videos from Dinah Zike and on-demand webinars and videos support great instruction in the classroom.



Where and When You Need It

In just a few clicks, you can quickly access relevant, timely, and ongoing **Professional Development** videos and webinars available to you, on-demand.

Directly embedded in *Physics: Principles and Problems* is your interactive professional learning program. Learn how other science educators have successfully implemented the program and increase your awareness of new science standards.

Relevant Resources for science educators

Rich, web-based resources include modeled classroom instruction videos, implementation support, technology resource optimization, and professional learning community support.

Use the ConnectED Professional Development tab to access on-demand webinars and these free video libraries:

- Dinah Zike/Foldable Videos
- Science and Engineering Practices Videos
- Pedagogical/Instructional Support Videos
- On-Demand Webinars

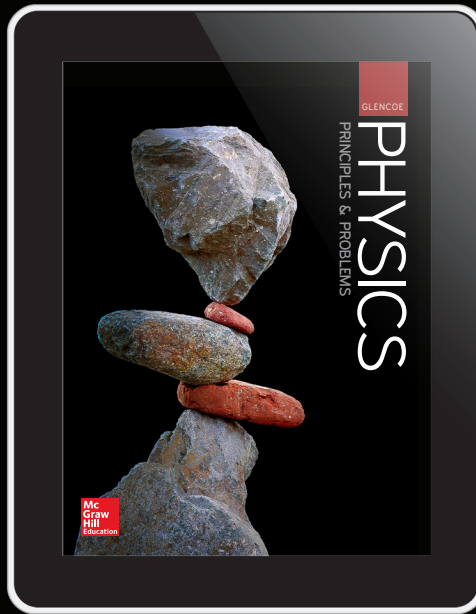
Customized, comprehensive, and expertly-crafted solutions translate into meaningful program success.

The screenshot displays the McGraw Hill Education Physics Teacher Center interface. On the left is a dark sidebar with a menu of options: ConnectED, Class Management, Resources, Assignment Tracker, Calendar, My Files, Home, Plan and Present, Assessment, Standards, Professional Development (highlighted), Glossary, Notebook, My Messages, and My Discussions. The main content area is titled 'PHYSICS' and 'TEACHER CENTER'. Below this, the 'Professional Development' section is active, showing a list of resources on the left: Implementation Support, Dinah Zike/Foldable Videos, Science and Engineering Practices Videos (highlighted), Digital Instruction Videos, On-Demand Webinars, and Blueprints for Success. The right side of the main area features a grid of video thumbnails, each with a title like 'Asking Questions...' and 'Developing and U...'. A 'Media' window is open in the foreground, showing a video of Carol K. Baker, Ed.D., with a red overlay containing her name and title: 'Carol K. Baker, Ed.D. NGSS Writing Team Member Director of Curriculum for Science and Music'.

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Sample and Discover Online
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