

# PhET Interactive Simulations:

## Free resources to support STEM education

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For additional information, contact:

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# Objectives

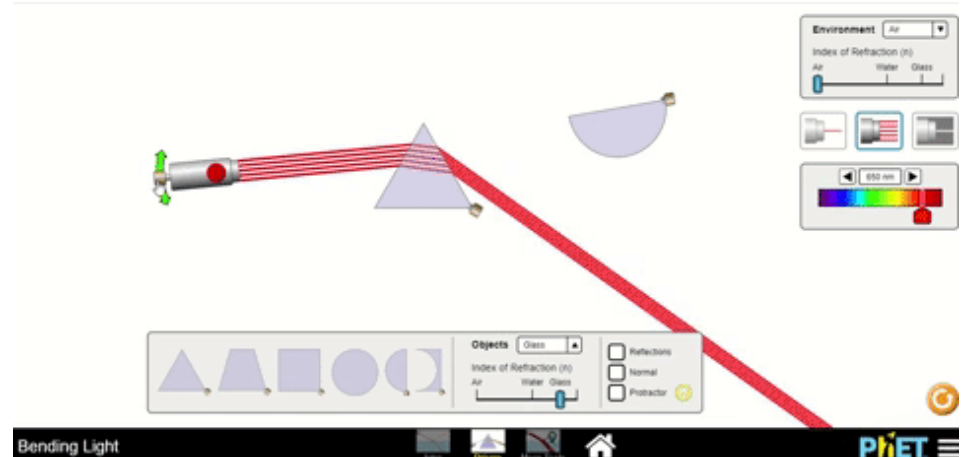
- **Access** PhET simulations and resources.
- **Experience** PhET simulations as a tool for teaching and learning.
- **Make connections** with a local PhET expert in the country context
- **Reflect** on opportunities to integrate PhET resources into the education system

# Interactive Simulations

To learn science and mathematics



2001 Nobel Prize in Physics



Founded by Carl Wieman in 2002  
**PhET** (**Ph**ysics **E**ducation **T**echnology)

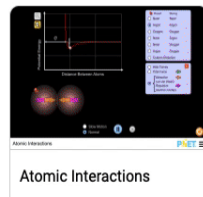
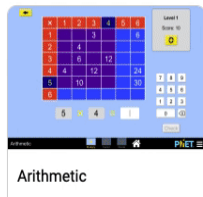
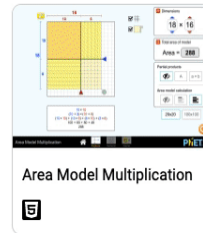
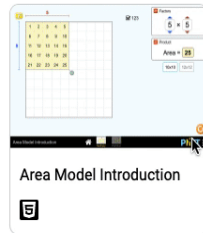
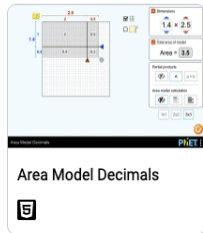
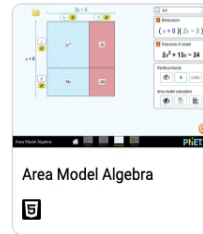
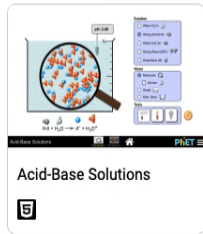
# Goal: To make STEM learning more:



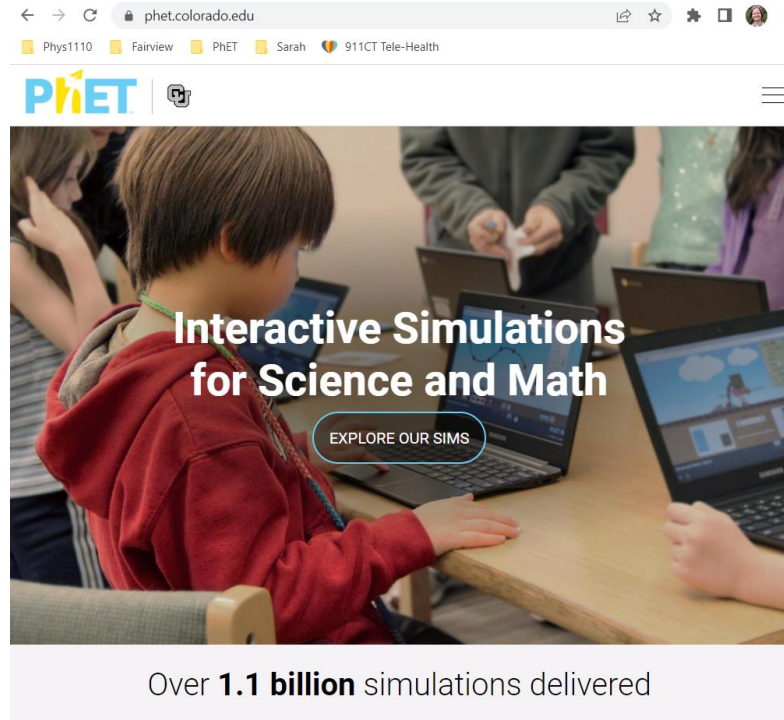
- **ENGAGING:** Interact & discover key ideas
- **RELEVANT:** Connect to everyday life
- **ACCESSIBLE:** Intuitive and understandable
- **EFFECTIVE:** Use STEM practices and develop understanding
- **PERSONALIZED:** Student agency

Make **learning STEM** more like **doing STEM**

# Over 100 HTML5 simulations



# All Free from the Website



The image shows a browser window with the URL phet.colorado.edu. The browser's address bar and tabs are visible. Below the browser, the PhET logo is displayed. The main content area features a photograph of children in a classroom using laptops. Overlaid on the photo is the text "Interactive Simulations for Science and Math" and a button that says "EXPLORE OUR SIMS". Below the photo, a white box contains the text "Over 1.1 billion simulations delivered".

phet.colorado.edu

Phys1110 Fairview PHET Sarah 911CT Tele-Health

**PHET**

Interactive Simulations  
for Science and Math

EXPLORE OUR SIMS

Over **1.1 billion** simulations delivered

6

# All Free from the Website

English



## Explore the website

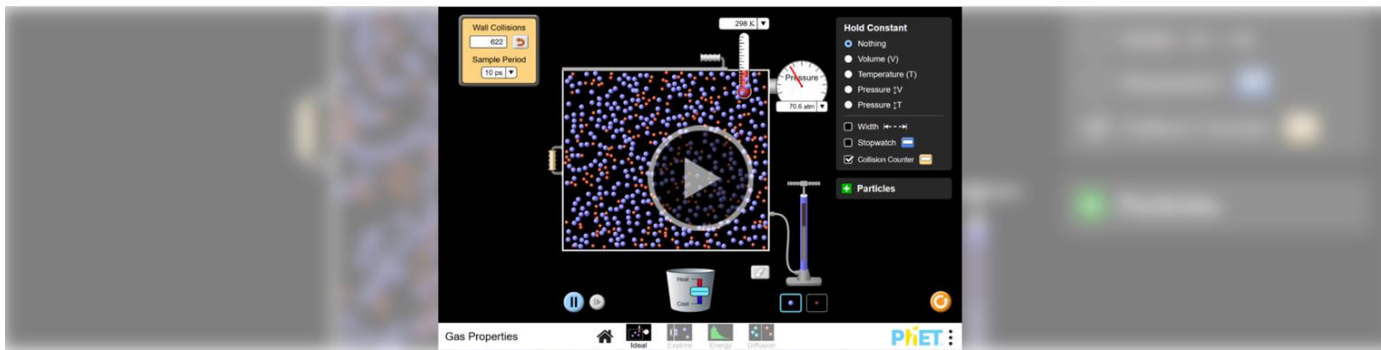
What one simulation can you find that is relevant to your country's STEM education goals?

**Translations** are available in 120 languages from the [Translations page](#).

# Teacher Resources



SIMULATIONS TEACHING RESEARCH ACCESS & INCLUSION [DONATE](#)



## Gas Properties



[About](#) [Teaching Resources](#) [Activities](#) [Translations](#) [Credits](#)



PhET is supported in part by













# Translations



LANGUAGE ▾	LANGUAGE (TRANSLATED) ▾	TOTAL ▾	HTML5 ▾	JAVA ▾	FLASH ▾
Afrikaans	Afrikaans	18	10	7	1
Akan	Akan	2	2	0	0
Albanian	shqipe	148	101	47	0
Amharic	Amharic	144	103	39	2
Arabic	العربية	149	106	41	2
Arabic, Morocco	العربية (المغرب)	104	104	0	0
Arabic, Saudi Arabia	العربية (السعودية)	89	54	31	4
Armenian	Armenian	75	58	17	0
Aymara	Aymara	1	1	0	0

# Inclusive Features

## INCLUSIVE FEATURES ×

- Inclusive Features
  - Alternative Input 
  - Camera Input 
  - Interactive Description 
  - Interactive Description on Mobile Devices 
  - Sound and Sonification 
  - Voicing 
  - Pan and Zoom 
  - Interactive Highlights 

# Offline Access

## Offline Access

- ▶ Desktop/Laptop Computer **Free**
- ▶ Chromebook
- ▶ iPad



**\$0.99 USD** for the **PhET App** to support PhET maintenance, but you can download individual simulations from the website for free.

# Play with a simulation for 5 min.

Groups of 3!

## Energy Skate Park (Science)

The screenshot shows the Energy Skate Park simulation interface. On the left, an 'Energy' panel displays a pie chart and a table of energy values:

Energy	Value
Kinetic	1526.0 J
Potential	1458.5 J
Thermal	42.8 J
Total	3027.3 J

Below the table, it shows 'Height = 2.48 m' and 'Speed = 7.13 m/s'. The main area shows a skater on a track with a pie chart representing energy distribution. On the right, there are control panels for 'Friction' (None to Lots), 'Gravity' (1.0 to 26.0 m/s<sup>2</sup>), and 'Mass' (5 to 100 kg). A QR code is overlaid on the bottom right of the simulation interface.

## Center and Variability (Math)

The screenshot shows the 'Center and Variability' simulation interface. The title is 'How does each kick influence the mean and median?'. It features a 'Line Plot' with a horizontal axis labeled 'Distance (in meters)' ranging from 1 to 15. The plot shows data points (x's) at 6, 10, 11, 13, and 14. A purple triangle indicates the 'Mean = 11.3 m' and a red bracket indicates the 'Median = 13 m'. Below the plot, a skater is shown kicking soccer balls onto a field. A QR code is overlaid on the bottom right of the simulation interface.

# What do you notice? What do you wonder?

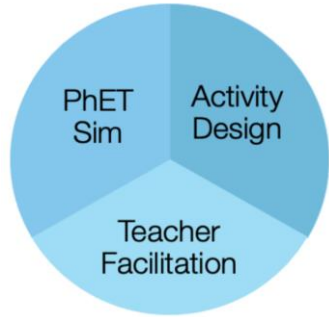
## Energy Skate Park (Science)

The screenshot shows the Energy Skate Park simulation interface. On the left, an energy panel displays: Kinetic: 1526.0 J, Potential: 1458.5 J, Thermal: 42.8 J, Total: 3027.3 J. A central panel shows a skater on a track with a height of 2.48 m and speed of 7.13 m/s. On the right, a control panel includes checkboxes for Pie Chart, Speed, and Stick to Track; sliders for Friction (None to Lots) and Gravity (1.0 to 26.0 m/s<sup>2</sup>); and a Mass slider (5 to 100 kg). The bottom navigation bar includes 'Energy Skate Park', 'Intro', 'Measure', 'Graphs', 'Playground', and the PhET logo.

## Center and Variability (Math)

The screenshot shows the Center and Variability simulation interface. The title is 'How does each kick influence the mean and median?'. It features a line plot with 'Distance (in meters)' on the x-axis (1 to 15). The plot shows 9 data points (kicks) at distances 6, 6, 10, 11, 13, 13, 13, 14, and 15. A red horizontal line indicates the Median = 13 m, and a purple horizontal line indicates the Mean = 11.3 m. Below the plot, a skater is shown kicking a ball, with buttons for 'Kick 1' and 'Kick 5'. A control panel on the right includes checkboxes for 'Predict Median', 'Predict Mean', 'Median', and 'Mean', and a '9 Kicks' indicator. The bottom navigation bar includes 'Center and Variability', 'Median', 'Mean & Median', 'Variability', and the PhET logo.

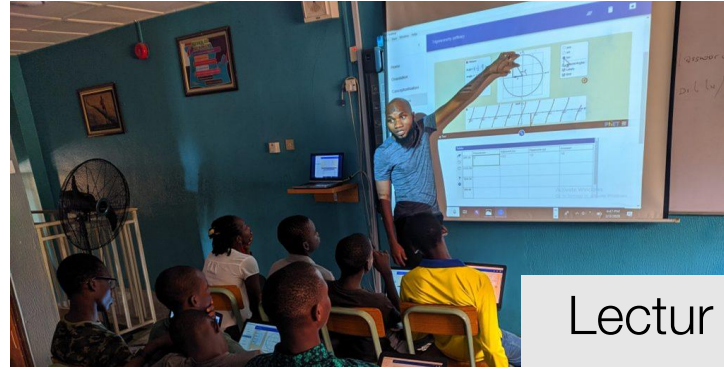
# Sim-based Learning *through student-centered pedagogies*



# Flexible in Contexts



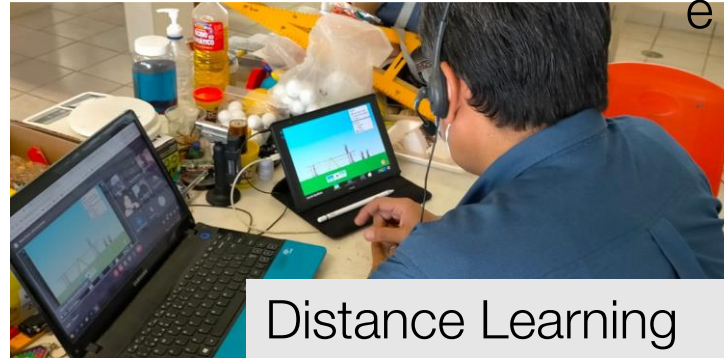
Pre-Lab



Lecture



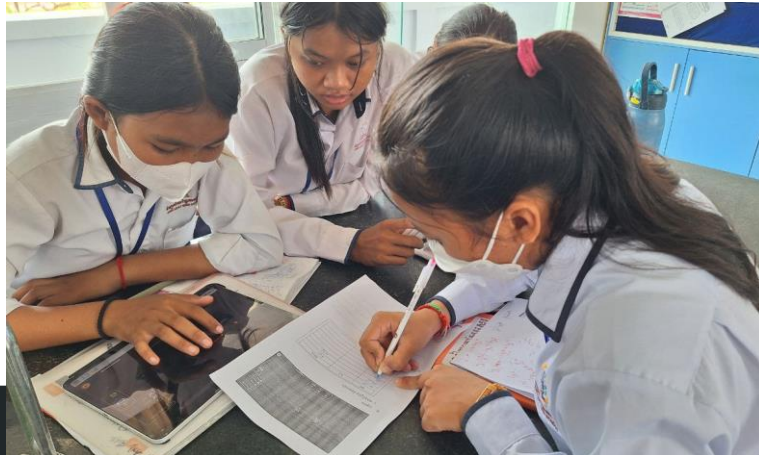
Activity/Lab



Distance Learning



# PhET in Cambodia

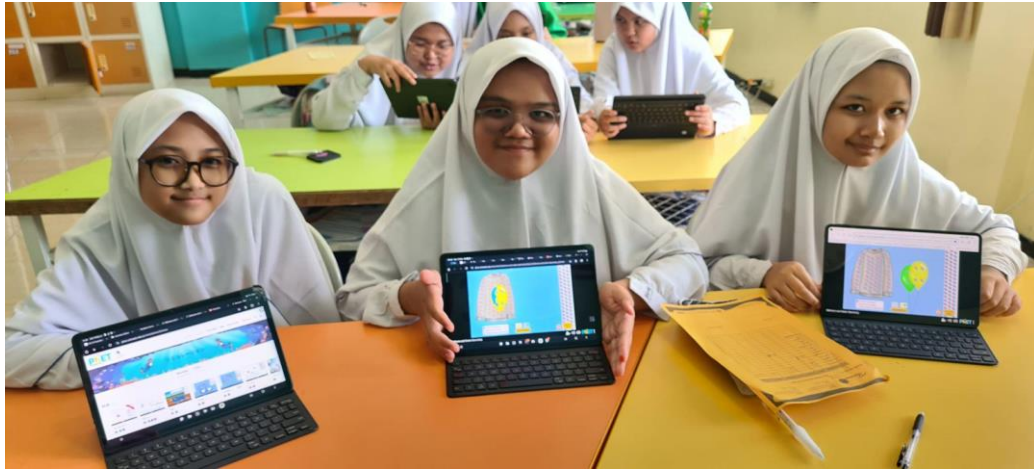


Experienced PhET user:

**Phun Soklim**

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# PhET in Indonesia



Experienced PhET user:

- **Helmi Pakas**
- [helmipakas.rivai@gmail.com](mailto:helmipakas.rivai@gmail.com)



# PhET in the Philippines



Experienced PhET user:

- **Glenn S. Mendoza**
- [glenn2040@hotmail.com](mailto:glenn2040@hotmail.com)

# PhET in Vietnam





Experienced PhET user:

- **Dao Thi Hong Quyen**
- [hongquyen90@gmail.com](mailto:hongquyen90@gmail.com)

# Promotes Student-Centered Learning

Sim Lessons	Non-Sim Lessons
<p>Exploring new mathematical ideas</p> <p>Inventing strategies</p> <p>Sharing own ideas</p>	<p>Practicing standard procedures</p> <p>Recalling facts</p> <p>Appealing to rules</p>



Atabas, S. et al. (2020). A tale of two sets of norms: Comparing opportunities for student agency in mathematics lessons with and without interactive simulations. *The Journal of Mathematical Behavior*, 58, 100761.

# Asia Engagement

22M+ online sessions by Asian users in 2022.

Countries with the **highest numbers of access** to the PhET website include the following:

- Indonesia (3.9M)
- Philippines (2.9M)
- India (2.2M)
- UAE (1.9 M)
- Japan (829K)
- China (702K)
- Hong Kong (476K)

PhET simulations include **translations** in the following languages:

**Bengali:** 104

**Chinese (simplified):** 96

**Chinese (traditional):** 108

**Chinese (Hong Kong):** 35

**Gujarati:** 108

**Hindi:** 106

**Indonesian:** 36

**Japanese:** 99

**Kazakh:** 80

**Khmer:** 19

**Korean:** 108

**Lao:** 45

**Malay:** 96

**Marathi:** 61

**Mongolian:** 105

**Persian:** 103

**Russian:** 91

**Sinhalese:** 40

**Tamil:** 82

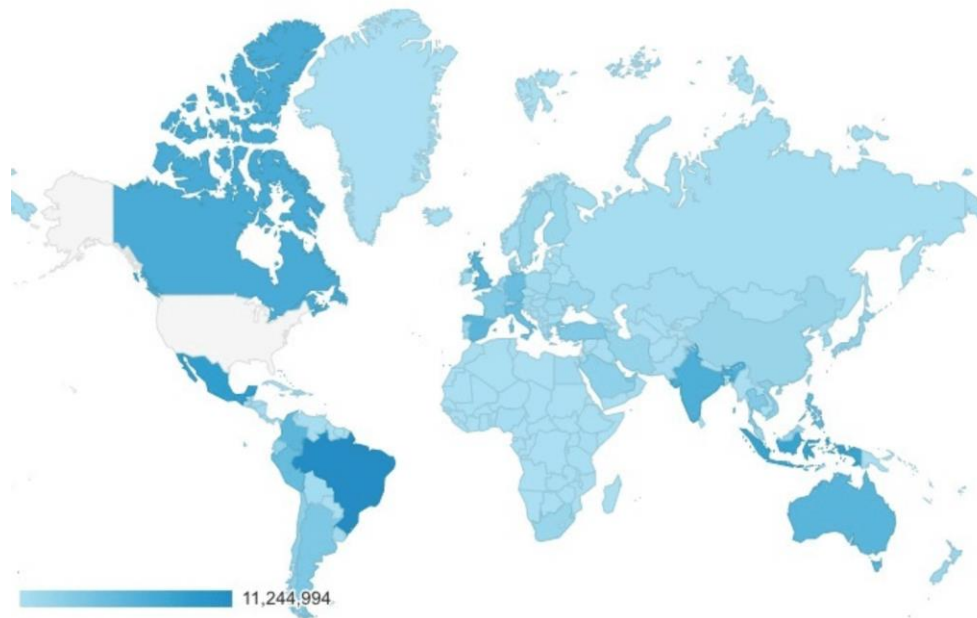
**Telugu:** 108

**Thai:** 75

**Urdu:** 39

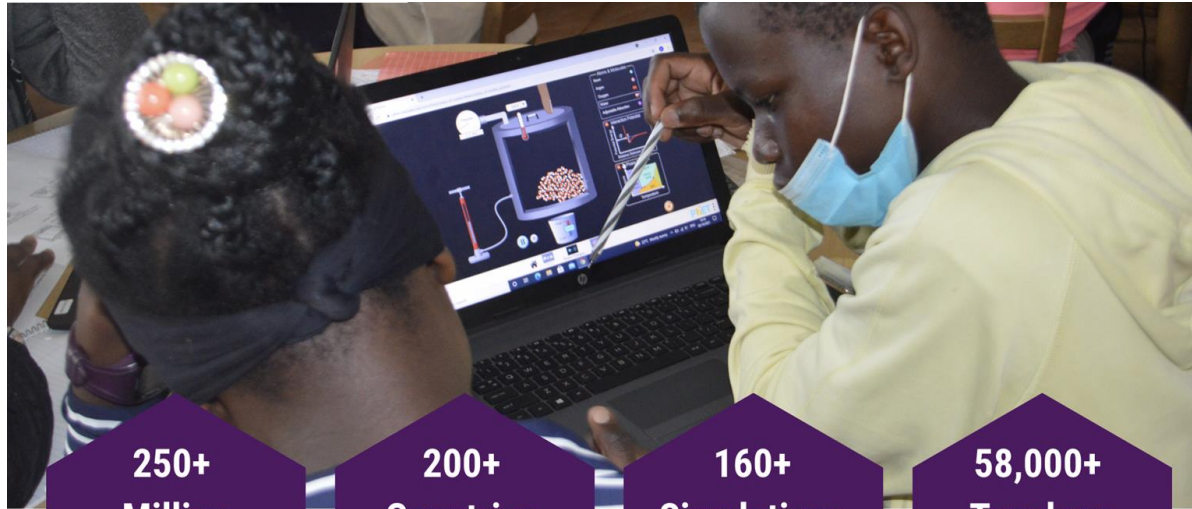
**Uzbek:** 108

**Vietnamese:** 107





# PhET Global: Professional Training for Teachers



**250+**  
**Million**  
sim sessions per year

**200+**  
**Countries**  
usage footprint

**160+**  
**Simulations**  
open access,  
121 languages

**58,000+**  
**Teachers**  
reached through  
PhET Global programs

Yidan Prize  一丹獎  
Carl Wieman, PhET Founder  
2020 Yidan Prize for Education Research

in partnership with   
mastercard foundation

# PhET Teacher Workshop

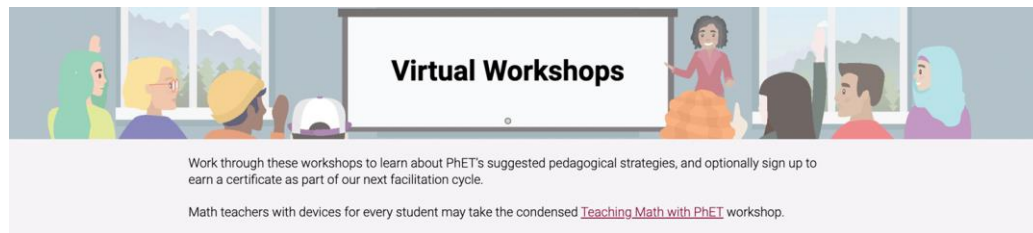
**Self-Paced** or **Facilitated**

**15-60 hours**

**Co-Certified**

<https://phet.colorado.edu/en/teaching-resources/virtual-workshop/>

*Currently available in English, but can be translated with support.*



## Introduction to PhET

Learn how to access and share PhET simulations with your students and explore the features that make PhET sims a powerful tool for science and mathematics teachers.

🕒 2 hours



## Whole-Class Strategies

Learn strategies for how to use PhET in circumstances where you are presenting a simulation in front of the whole class using a projector, interactive whiteboard, or sharing your screen online.

🕒 3 hours



## Math Activity Design

Learn strategies to create sim-based inquiry activity sheets for math classes where students have direct access to simulations on a singular or shared device.

🕒 5 hours



## Science Activity Design

Learn strategies to create sim-based inquiry activity sheets for science classes where students have direct access to simulations on a singular or shared device.

🕒 5 hours



## Facilitating PhET Simulation Use

Learn how to effectively design a learning sequence that makes use of PhET's simulations for mathematics and science

🕒 6 hours

# Partnership Opportunities

1. **Use our Creative Commons OERs**
2. **Intro to PhET Simulations** (webinar)
3. **Virtual Workshop** (self-paced or facilitated)
4. **Asia / Country-level PhET Ambassador**
  - Dedicated professional development for school systems, teacher education programs, etc.
5. **Asia / Country-level PhET Fellowship**
  - Extensive 18-month leadership program to develop a country-level network of 15-20 teacher experts who provide professional development across the country.

Learn more: [phet-global@colorado.edu](mailto:phet-global@colorado.edu)



Asia / Country-level PhET Ambassador



# Reflection

1. What STEM education needs in your country could be supported by PhET's resources?
2. What else would you like to know about PhET and its use in your country?



Thank you!

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