GOALS: TO MAKE STEM LEARNING MORE ....

ENGAGING  Interact and discover key ideas.
RELEVANT  Connect to everyday life.
ACCESSIBLE Intuitive and understandable.
EFFECTIVE  Use STEM practices.
Develop conceptual understanding.
PERSONALIZED  Students direct their learning.
THROUGH POWERFUL PEDAGOGICAL TOOLS

**Build an Atom**
Grades 5 thru College
~6M uses/yr
A next-generation HTML5 PhET Sim

**Circuit Construction Kit**
Grade 5 thru College
~6M uses/yr
Released in HTML5 (Oct 2017)

**ENGAGING ENVIRONMENT**
**INTUITIVE INTERFACE**
**HIGHLY INTERACTIVE**
**SCAFFOLDED THROUGH DESIGN**
**ACCURATE, DYNAMIC VISUAL REPRESENTATIONS**
**REAL WORLD CONNECTIONS**
**SHOWS THE INVISIBLE**
**REAL-TIME, ANIMATED FEEDBACK**
**ALLOWS ACTIONS NOT POSSIBLE IN THE REAL WORLD**
MILESTONES AND AWARDS

2002  Founded by Carl Wieman, Nobel Laureate in Physics
2005  Published first study of PhET effectiveness in the college classroom
2006  50 sims; licensed CC-BY; 1.8 million uses
2008  Expansion to chemistry and translation infrastructure
2010  Expansion to middle-school science sims
2011  100 sims; 600 activities; 30 publications; 25 million uses/year
2013  Published first HTML5 PhET sim, with touch and tablet support
2015  Expansion to math, STEM assessment, and accessibility. Published first PhET-iO prototypes.
2018  149 sims; 1800 activities; 60 publications; 100 million uses/year; 93 languages
Published several accessible sims (with full screen-reader and keyboard access)

2006  Visualization Challenge
2007  The Tech Awards  $50,000 Prize
2011  STARS REIMAGINE EDUCATION  $25,000 Prize
2015  wise awards winner 2017  $20,000 Prize
2017  APS physics  Excellence in Physics Education  $5,000 Prize
2018  

PHET TEAM MEMBERS

Kathy Perkins
Director
BA, MA, PhD Harvard University
Associate Professor, CU Boulder
Joined PhET in 2003
Directed PhET since 2008

Carl Wieman
Founder and Senior Advisor
Nobel Laureate in Physics
Professor, Stanford University
Chair, NAS Board on Science Education (2004-9)
Associate Director of Science at OSTP (2010-12)

2019 PHET TEAM
15 FULL-TIME, 21 PART-TIME TEAM MEMBERS

K12 and College Education Specialists
150+ years of teaching and experience in STEM education

Sim Design Experts
100+ years of design and study of PhET sims

Software Development Team
50+ years of PhET sim development

Education Researchers in STEM learning
60+ articles on PhET sim design and learning

Content Experts/PhDs
in physics, chemistry, and math

Quality Assurance Team
of dedicated undergraduate assistants

plus Administrative, Marketing, Graphic Design,
Fundraising team members

http://phet.colorado.edu/en/about/team
CURRENT POSITION AND IMPACT

Simulations: 152 sims; 73 sims in HTML5
(79 legacy sims to move to HTML5)
License: CC-BY
Teacher resources: 1800+ lessons; PD videos & docs
Widespread usage: >100 million sim uses/yr
Broad user base: K-12 and college, worldwide
Global adoption: Sims in 93 languages
Used in 200 countries/territories
Product Integration: 20+ companies using PhET CC-BY
e.g. Pearson, STEMscopes, Nearpod
Software code: Innovative HTML5 solution
Impact data: 60+ publications on design,
classroom use, and effectiveness
SIM TRANSLATIONS - 93 LANGUAGES

Arabic  Latvian  Spanish
Chinese  Greek  Vietnamese

All translations completed by our volunteer translator community.
## WEBSITE TRANSLATIONS - 43 LANGUAGES

<table>
<thead>
<tr>
<th>Arabic (Saudi Arabia)</th>
<th>German</th>
<th>Persian</th>
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<tbody>
<tr>
<td>Basque</td>
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<td>Gallegan</td>
<td>Norwegian Nynorsk</td>
<td>Vietnamese</td>
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</tbody>
</table>
GLOBAL USAGE

~32% of PhET usage is international.

High use countries: 38 countries with >100,000 sessions/yr

High use languages: 30 languages with >100,000 sim runs/yr

Top 25 countries by online use:
Canada, United Kingdom, Brazil, Australia, Spain, Germany, Turkey, France, Mexico, Italy, Colombia, India, Netherlands, Denmark, Thailand, Argentina, Sweden, China, Indonesia, Greece, Philippines, Singapore, Finland, New Zealand, Belgium

U.S. data excluded from map
GLOBAL IMPACT

BURUNDI

INDONESIA

CAMBODIA

SAUDI ARABIA

MEXICO

NIGERIA
PhET simulations are integrated into Kolibri from Learning Equality – providing offline use of simulations to broad populations, including refugees.

Learnira is training teachers in Nigeria to use PhET simulations and distributes PhET’s offline installer for classrooms without internet.
PHET IS INNOVATING IN MATH

EXISTING K12 MATH SIMS

21 math-focused sims, e.g. Fractions

MATH EXPANSION: ALGEBRAIC THINKING

6th-9th grade focus for developing algebraic thinking
Research on design and classroom implementation
Published sims:
- Function Builder
- Unit Rates
- Expression Exchange
- Proportions Playground
- Graphing Slope-Intercept

NSF GRANT #1503510, 2015-2019: Teaching and Learning Algebraic Thinking Across the Middle Grades: A Research-based Approach Using PhET Interactive Simulations
INNOVATING IN ACCESSIBILITY

INCLUSIVE DESIGN FOR INTERACTIVE SIMULATIONS

Keyboard navigation
Auditory descriptions
Sonification

ENABLING EXPLORATION AND DISCOVERY FOR...

Students with cognitive disabilities
Students with physical disabilities, including low or no vision

John Travoltage: First accessible PhET simulation
Published May 2017

NSF GRANT #1503439, 2015-2017: Ramping Up Accessibility in STEM: Inclusively Designed Simulations for Diverse Learners
NSF GRANT #1621363, 2016-2019: Sonified Interactive Simulations for Accessible Middle School STEM
NSF GRANT #1621363, 2018-2021: Highly Adaptive Science Simulations for Accessible STEM Education

http://phet.colorado.edu/en/accessibility
INNOVATING IN ASSESSMENT

FORMATIVE AND SUMMATIVE ASSESSMENT

Going beyond content to measure
STEM practices and thinking
Problem solving strategies

Engage students in and observe
their experimentation cycle
and their reflective practices.

Example of Circuit Construction Kit: Black Box

In collaboration with Dr. Carl Wieman, Stanford University
GORDON AND BETTY MOORE FOUNDATION GRANT: Pioneering Next-Generation Assessments of Science Learning
BUILDING A SUSTAINABLE BUSINESS MODEL

Paid Partnership Agreements around our free Creative Commons licensed sims:

iPad and Android Apps for School and Parent Sales:

Business-to-business Licensed Products:

Individual donations:
Examples of publications also attached ....
Future work to ....

INCREASE ACCESS TO AND IMPACT OF PhET’S POWERFUL STEM LEARNING TOOLS
Fuel access and reach through the redesign and redevelopment of popular legacy sims into HTML5
Integrate effective sim-based learning into curriculum and instruction, more broadly, worldwide
Advance teacher professional development (at scale) for effective sim-based instruction

ADVANCE PHET-iO INNOVATION AND IMPACT
Use PhET-iO’s advanced capabilities and backend data to advance personalized-learning environments
Use PhET-iO to advance embedded assessments and assess hard-to-measure attributes

BRING SIM-BASED INQUIRY TO MATH:
Expand efforts to support algebraic thinking development in the grades 6-10
Build a suite of 15 simulations for K-2 mathematics, focused on engaging and developing early number sense in all students

INCREASE ACCESSIBILITY FOR STUDENTS WITH LEARNING DIFFERENCES:
Advance technology, pedagogy, and research for students with diverse learning differences
Expand the suite of PhET simulations with accessibility features
600 MILLION SIMULATION RUNS (and growing)....

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