

The Go-Lab ecosystem

nextlab

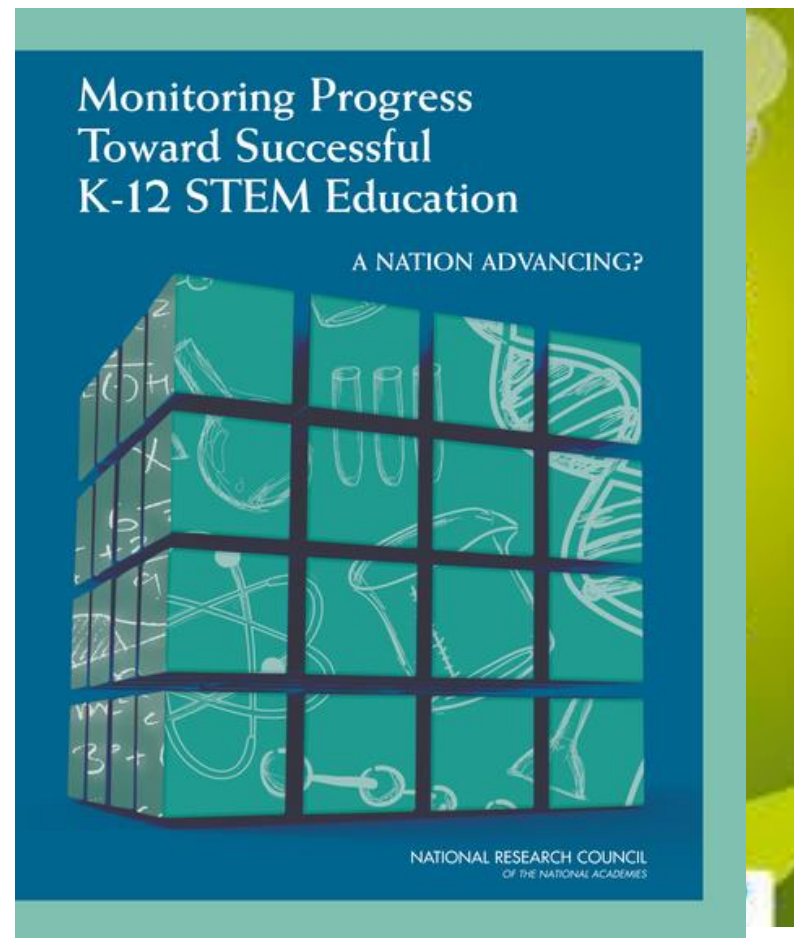
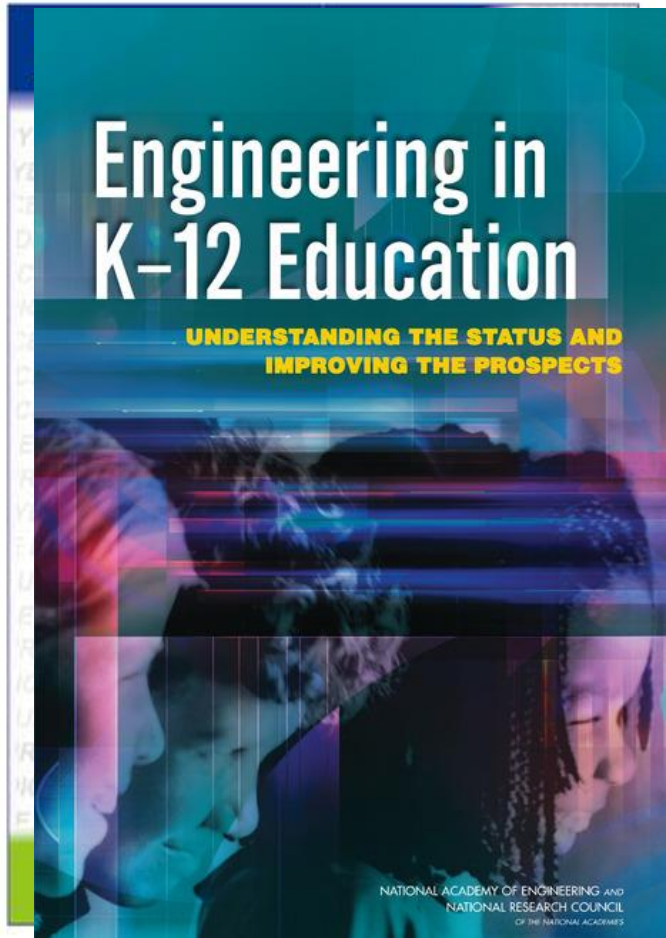


GO-LAB

Roadmap

- A need for engaging education
- Active learning/inquiry learning/online labs
- Embedding inquiry/online labs
- The Go-Lab ecosystem
 - Sharing platform
 - Authoring platform
 - Tutoring platform
- Simulations for University level physics
- Examples

We need engaging (science and engineering) instruction



Forms of engaged learning

Experiential

Anchored instruction

Problem-based

Exploratory

Peer tutoring

Inquiry Learning/
Online Labs

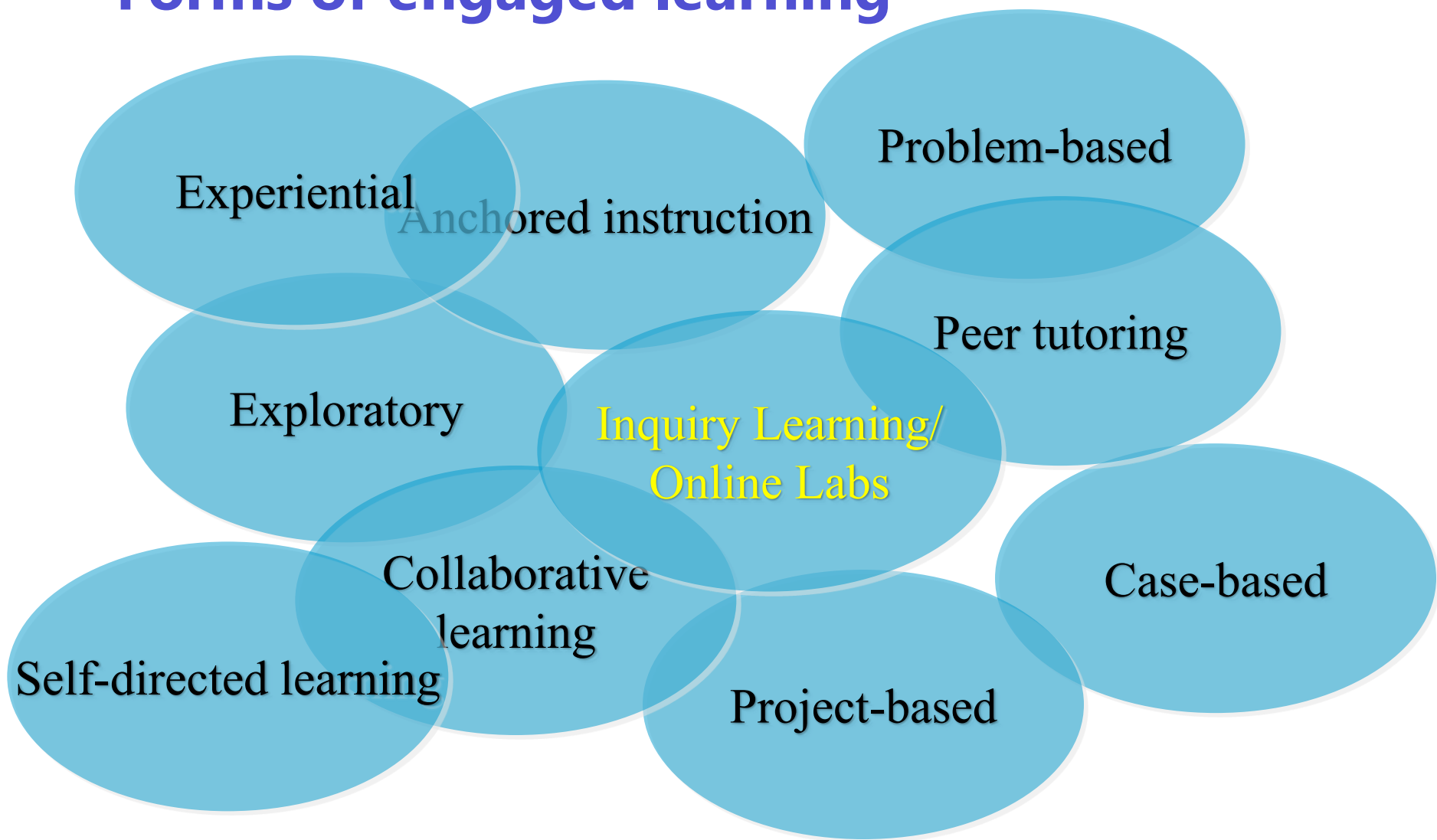
Collaborative
learning

Case-based

Self-directed learning

Project-based

Forms of engaged learning



Experiential

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learning

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Inquiry learning

Inquiry is an approach to learning that involves a process of **exploration**, that leads to **asking questions** and making **discoveries** in the search for **new understandings**

Based on "Foundations", Vol, 2, NSF, 2000

The role of technology




Online labs

Laboratory Available solutions

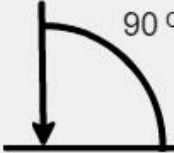
Input Parameters

Projectile Diameter




Value:

Trajectory Angle



Value:


Projectile Velocity



Value:


Projectile Density

Porous Rock



Target Density

Sedimentary Rock



Reset Submit ? Distance from crash site 0 km

PHET
INTERACTIVE SIMULATIONS
University of Colorado Boulder
HTML5 GAMES

Home
Simulations - View All
Physics
Chemistry
Earth Science
Life Science
Math
Cutting Edge Research
By Grade Level
All Sims
Translated Class
For Teachers
Stay Connected
How to Run Simulations
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About PHET

Central Forces

1. Gravity
2. Spring
3. Electrostatic
4. Magnetic

Scaling

1. Coulomb's Law
2. Gauss's Law
3. Charge

IOC

Reference Frame

Time: 4.82

VIRTUAL LABS

An Initiative of Ministry of Human Resource Development (MHRD) Under the National Mission on Education through ICT

Name of Lab: Broad Area:

PARTICIPATING INSTITUTES

- IIT DELHI
- IIT BOMBAY
- IIT KANPUR
- IIT KHARAGPUR

Objectives of the Virtual Labs:

1. To provide remote-access to Labs in various disciplines of Science and Engineering. These Virtual Labs would cater to students at the undergraduate level, post graduate level as well as to research scholars.
2. To entice students to conduct experiments by arousing their curiosity. This would help them in learning basic and advanced concepts through remote experimentation.
3. To provide a complete Learning Management System around the Virtual Labs where the students can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self-evaluation.

Announcements

- IIT Guwahati on 10-11 Jan 2015
- 3. Click here for IGCs Registration
- 4. Click here for IGCs Login
- 5. Click here for VLAB

Virtual Lab

You will need to create 100ml of the buffer solution. The actual lab workstation has a number of weak acids and conjugate bases to help you in this process. When you have completed making your buffer solution, use the form at the bottom of the page to check your answer.

100ml of the buffer solution has a pH of 4.41!

Virtual Lab

1.0 M CH_{3COOH}
1.0 M CH_{3COO⁻}

Learn.Genetics
GENETIC SCIENCE LEARNING CENTER

Virtual Labs

DNA EXTRACTION
DNA is extracted from human cells for a variety of reasons. Try this virtual laboratory to extract DNA from human cells.

USE ELECTROPHORESIS
Sort and measure DNA strands by running your own gel electrophoresis experiment.

OnlineChemLabs 2.0.0

7. INTRODUCTION

ChemCollective.org

ChemCollective
Online Resources for Teaching and Learning Chemistry

REOURCES BY TOPIC

- Analytical Chemistry
- Biotechnology
- Chemistry
- Kinetics
- Equilibrium
- Acid-Base Chemistry
- Solubility
- Organic Chemistry
- Physical Chemistry
- Properties of Solutions

REOURCES BY TYPE

- Virtual Labs
- Augmented Problems
- Tutorials
- Scenario-Based Activities

RESOURCE TOPIC: Acid-Base Chemistry

Strong Acids and Bases

Augmented Virtual Labs

Determine the Concentration of the Unknown Strong Acid

Perform a titration using an indicator to determine the concentration of an HCl solution.

Concept Tests

Acid-Base Chemistry and Buffers Concept Test

Concept Test
These concept tests can be used as part of in-class activities to help students reason about pH, acids, bases and buffer solutions.

[Scenario-Based Activities]

[ChemVista] Acid-Base Chemistry: pH and Swimming Pools

Students are put in a scenario where they are the lifeguard at their neighborhood pool, and it is their job to not only keep the swimmers safe, but also to ensure that the pH of the pool is kept within the recommended range.

SimQuest

SimQuest: An alternative way of learning
Out now: SimQuest 6.4

Download the SCIENCE magazine (Vol. 312, 28 April 2008)

News

SimQuest 6.4 is out now
SimQuest 6.4 includes improved animations, graphs, and logic (and much more)!

Download SimQuest 6.4
English and Italian

Free SimQuest membership
SimQuest members can download over 20 simulations

All you need to do is register and login with the provided username and password. For more information, click here.

Virtual Labs of Amrita Vishwa Vidyapeetham

Biotechnology and Biomedical Engineering
Bioinformatics, Cell Biology, Immunology, Lab Management, Molecular Biology, Population Ecology, Biochemistry Virtual Labs.

Chemical Sciences
Physical Chemistry, Organic Chemistry, Inorganic Chemistry Virtual Labs.

Physical Sciences
Mechanics, Thermodynamics, Optics, Electricity and Magnetism, Basic Physics, Modern Physics Virtual Labs.

Computer Science
Computer Science

Mechanical Engineering
Mechanical Engineering

Library of Labs

Library of Labs
Library of Labs

Wide Functions

- Define Experiment
- Virtual Labs
- Wide Projects

EU-HOU

Remotely Controlled Laboratory Experiments in Mechanics, Electromagnetism and Optics

Classroom experiments and activities

Remotely Controlled Laboratory Experiments - Classical Physics

It is not always possible to set up a classroom experiment. Lack of time or funds to set up an experiment? Do not panic! Nowadays, internet opens completely new possibilities by allowing users to perform live laboratory experiments in many of the same way as operating a remotely controlled laboratory or calibration system.

Professor Hansjörg Zopf from Technical University in Kaiserslautern in Germany is the main contact person for the EU-HOU project.

Library of Labs

Library of Labs

Library of Labs
Library of Labs

Library of Labs
Library of Labs

Library of Labs
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Library of Labs

Library of Labs
Library of Labs



Are online labs effective?

- Inquiry-based learning with online labs (and simulations) shows an advantage over expository instruction
- Students in online labs gain the same level of knowledge or a more advanced level of knowledge than students who learn in a real laboratory
- Online labs are only effective when well structured and designed, this is guidance, e.g., scaffolds included

de Jong, T. (2006). Computer simulations - Technological advances in inquiry learning. *Science*, 312, 532-533.

de Jong, T., Linn, M.C., & Zacharia, Z.C. (2013). Physical and virtual laboratories in science and engineering education. *Science*, 340, 305-308.

The Go-Lab innovation

- Many single applications
- Repositories of labs
 - PhET Chemcollective Physlets PhysicsInteractives
- Repositories of labs with embedding
 - Online Chem Labs AMRITA
- Repositories with embedding and scaffolding
 - SimQuest
- Repositories with embedding, “scaffolding” and authoring facilities
 - WISE
- Federation with embedding, interactive scaffolding, authoring facilities, and authoring support
 - Go-Lab

Inquiry Learning Space

Hoe werken tandwielen?

< Oriënteren Informatie vergaren Hypothesen formuleren Hoe werk je met Gearsketch? Onderz >

C Tijdens de volgende les(sen) leer je wat tandwielen zijn en hoe ze precies werken. Tandwielen vindt je terug in allerlei toepassingen, maar hoe werken ze nu precies?

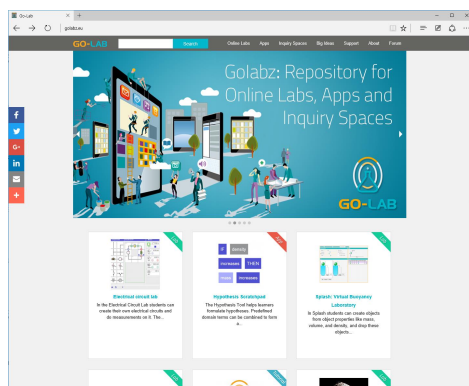
Je gaat deze lessenserie alleen doorwerken op je eigen laptop. Als eerste opdracht mag je gaan brainstormen over welke objecten allemaal tandwielen gebruiken om goed te werken. Hiervoor maak je gebruik van de conceptmapper tool, met deze tool kan je relatief snel een conceptmap (soort van woordweb) maken. Hoe deze tool precies werkt zie je in de onderstaande YouTube-video.

Hoe werk je met de concept map.

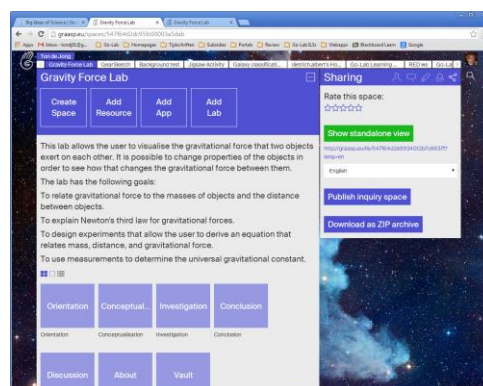
concept map

SCREENCAST-O-MATIC

The Go-Lab ecosystem



Sharing platform



Authoring platform



Support platform

The Go-Lab sharing platform (www.golabz.eu)

The screenshot shows the Go-Lab website homepage. The browser address bar displays 'golabz.eu'. The navigation menu includes 'GO-LAB', 'Search', 'Online Labs', 'Apps', 'Inquiry Spaces', 'Big Ideas', 'Support', 'About', and 'Forum'. A large banner features the text 'Golabz: Repository for Online Labs, Apps and Inquiry Spaces' and the GO-LAB logo. A vertical sidebar on the left contains social media icons for Facebook, Twitter, Google+, LinkedIn, and a plus sign. Below the banner, three featured lab cards are visible:

- Electrical circuit lab** (Lab): In the Electrical Circuit Lab students can create their own electrical circuits and do measurements on it. The...
- Hypothesis Scratchpad** (App): The Hypothesis Tool helps learners formulate hypotheses. Predefined domain terms can be combined to form a...
- Splash: Virtual Buoyancy Laboratory** (Lab): In Splash students can create objects from object properties like mass, volume, and density, and drop these objects...

Additional cards for 'Lab' and 'Tutorial' are partially visible at the bottom of the page.

New Golabz interface

GO-LAB Labs Apps Spaces Authoring Support About



Sharing and Authoring Platform

Find the largest collection of online labs, try-out interactive inquiry apps, combine labs and apps into Inquiry Learning Spaces, and share these with your students and colleagues.



LAB

Electrical Circuit Lab

In the Electrical Circuit Lab students can create their own electrical...

APP

Hypothesis Scratchpad

The Hypothesis Tool helps learners formulate hypotheses.

LAB

Gravity Force Lab

This lab allows the user to visualise the gravitational force that two...

LAB

Splash: Virtual Buoyancy Laboratory

In Splash students can create objects from object properties like mass...

APP

APP

Property	Unit	Value
Mass	kg	40 g

LAB

LAB



What makes Go-Lab unique?

- It collects online labs from around the world in one portal
- Teachers can combine each lab with texts, videos, and apps (scaffolds) in structured learning environments and very easily adapt these to their own needs
- These learning environments can be distributed to students with one click of the button
- And they can be directly shared with other teachers who can re-use them by copying and adapting
- And much much more ...

Is Go-Lab a success?

- Go-Lab sharing platform unique users:
 - 2014: 10,718 users
 - 2015: 15,152 users
 - 2016: 78,384 users
 - 2017: 53,476 users (until August)
 - 2017: 91,673 users (extrapolated)
- USA, Spain, UK, Greece, Portugal, the Netherlands, Germany, Italy, Turkey, Estonia, Switzerland, ...

Statistics



The repository contains:

- 487 Labs.
- 621 Inquiry Spaces.
- 42 Apps.

Teachers' opinions on Golabz



What do you think?

Simulations for University level physics

- Aimed at undergraduates (optionally, higher secondary education)
- Material tends to be abstract and mathematical
- Even difficult to think of appropriate visualizations (for developer and teachers)
- Much physics has a "single solution": makes inquiry difficult

Example: Vector fields

- Used in many domains (e.g., electromagnetism)
- Difficult to visualize (vectors at each point in a 3D space)
- Three talks on visualization of vector fields and field lines at Multi-media and physics conference (2017)
 - One keynote: with a virtual reality solution (walk in a vector field)
 - Dynamic visualizations are particularly hard (which field lines to select)
 - Tens of years of research
- <http://go-lab.gw.utwente.nl/production/radar/build/del.html>

Example: Quantum mechanics

- “Realistic” visualisations are dangerous because of particle-wave duality
- See Road to reality by Roger Penrose for how a prominent researcher uses drawings to illustrate (understand) abstract concepts
- Double slit demo:
- <http://go-lab.gw.utwente.nl/sources/tools/qm/qm.html>

Example: Space oddity or the taming gravity

goo.gl/SCDVvi

Example: Space oddity or the taming of gravity in an ILS

goo.gl/FyvRBT



GO-LAB