



VISÃO ATUAL SOBRE LABORATÓRIOS REMOTOS



cieti
centro de inovação
em engenharia
e tecnologia industrial



Instituto Superior de
Engenharia do Porto

Gustavo Ribeiro da Costa Alves



Estrutura

- Objectivos fundamentais dos laboratórios (Educação em Engenharia)
- Modelo de ensino / aprendizagem laboratorial
 - *Hands-on*, laboratórios virtuais (simulação) e laboratórios remotos
- Um pouco de história
- Visão atual
- A etapa em curso | Futuro

The Fundamental Objectives of Engineering Instructional Laboratories



- **Lyle D. Feisel** and George D. Peterson, “A Colloquy on Learning Objectives For Engineering Education Laboratories”, Proceedings of the American Society for Engineering Education, p. 12, 2002.
- **Lyle D. Feisel** and Albert J. Rosa, [“The Role of the Laboratory in Undergraduate Engineering Education,”](#) Journal of Engineering Education, pp. 121-130, January 2005.

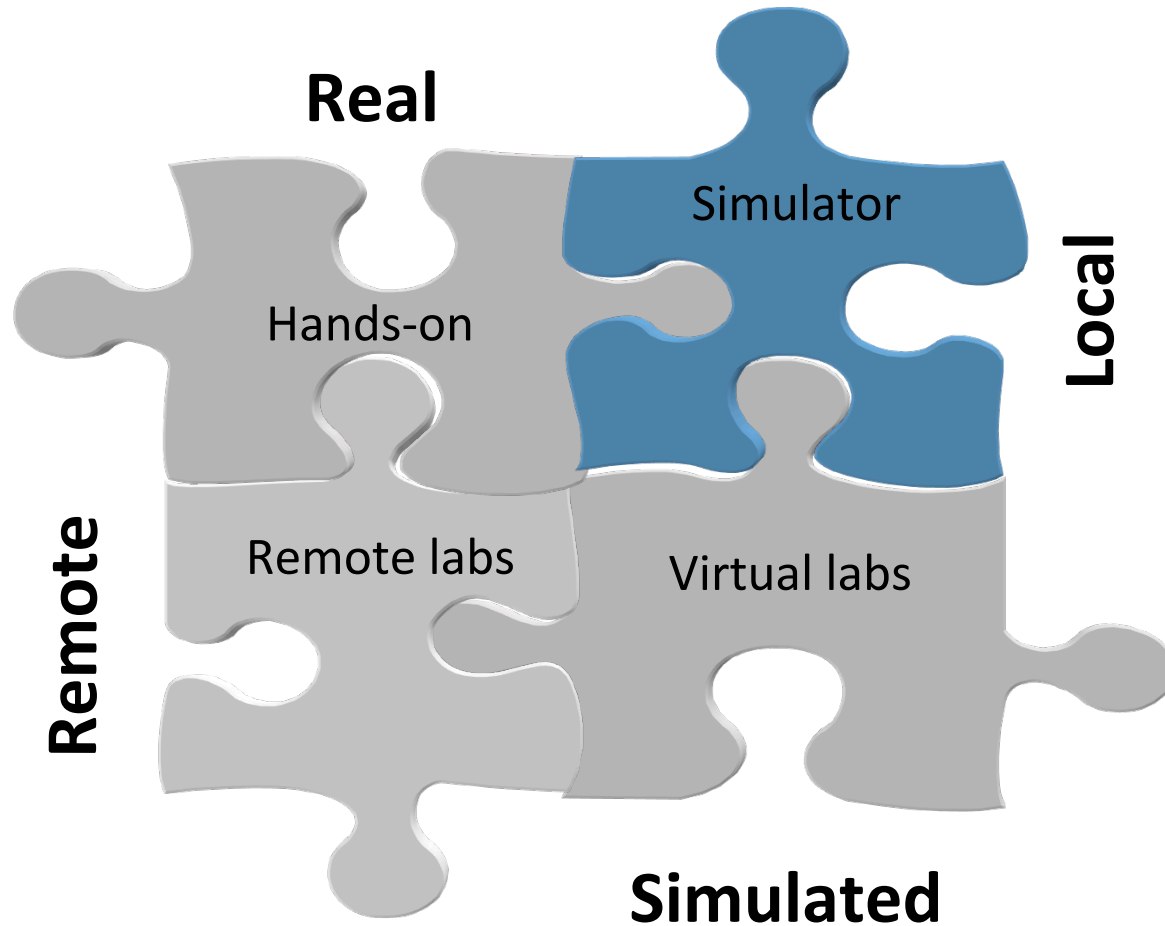
Objective 2: Models

Identify the strengths and limitations of theoretical models as predictors of real-world behaviours. This may include evaluating whether a theory adequately describes a physical event and establishing or validating a relationship between measured data and underlying physical principles.

Objectivo 2: Modelos

Identificar as potencialidades / limitações dos modelos teóricos como ferramentas de previsão de comportamentos do mundo real. Pode incluir a capacidade de avaliar se uma dada teoria é capaz de descrever adequadamente um dado evento físico e ainda estabelecer ou validar uma relação entre dados obtidos por medição e princípios físicos subjacentes.

Hands-on, remote and virtual labs



- Criteria

- Type of access

- Local
 - Remote

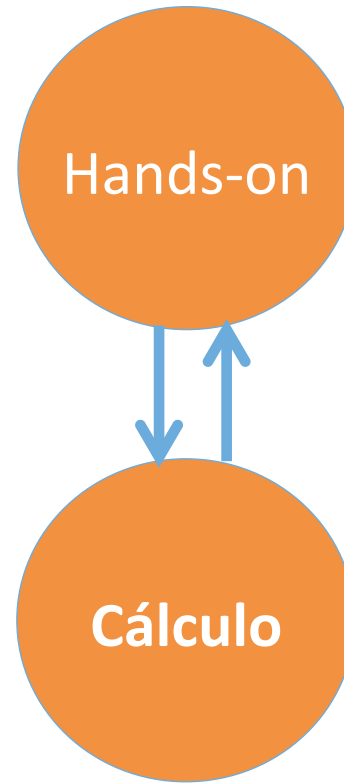
- Nature

- Real
 - Simulated

- Experimental skills vs. lab type

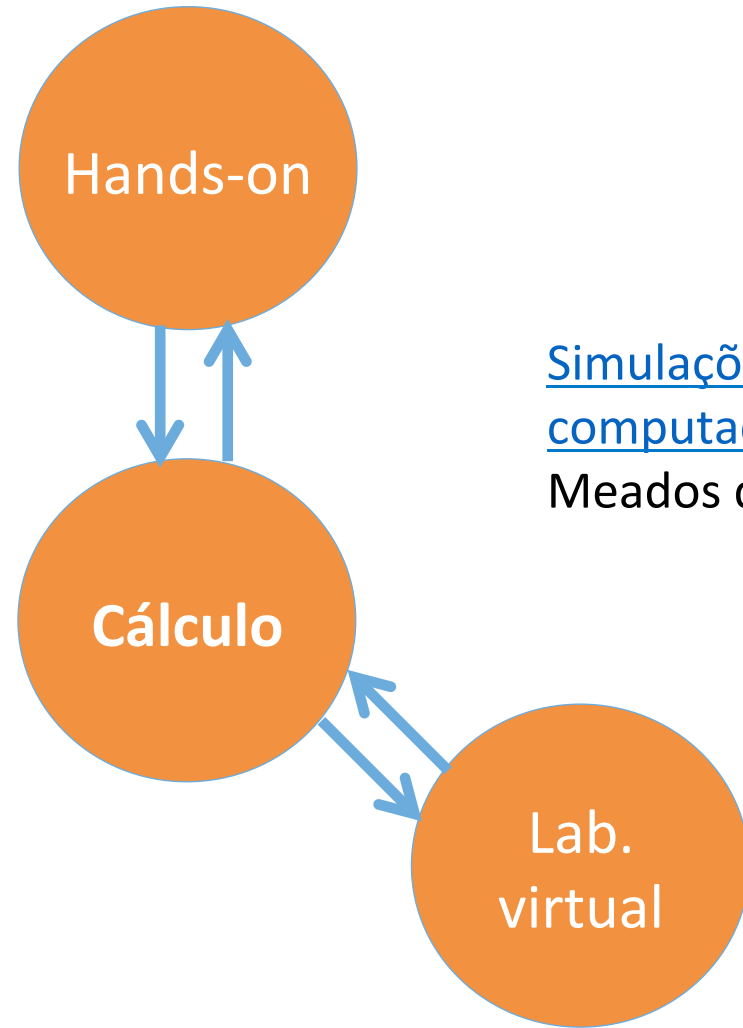
- [Soysal \(2000\) - EE](#)
 - Ma & Nickerson (2006)

Modelo ensino/aprendizagem laboratorial



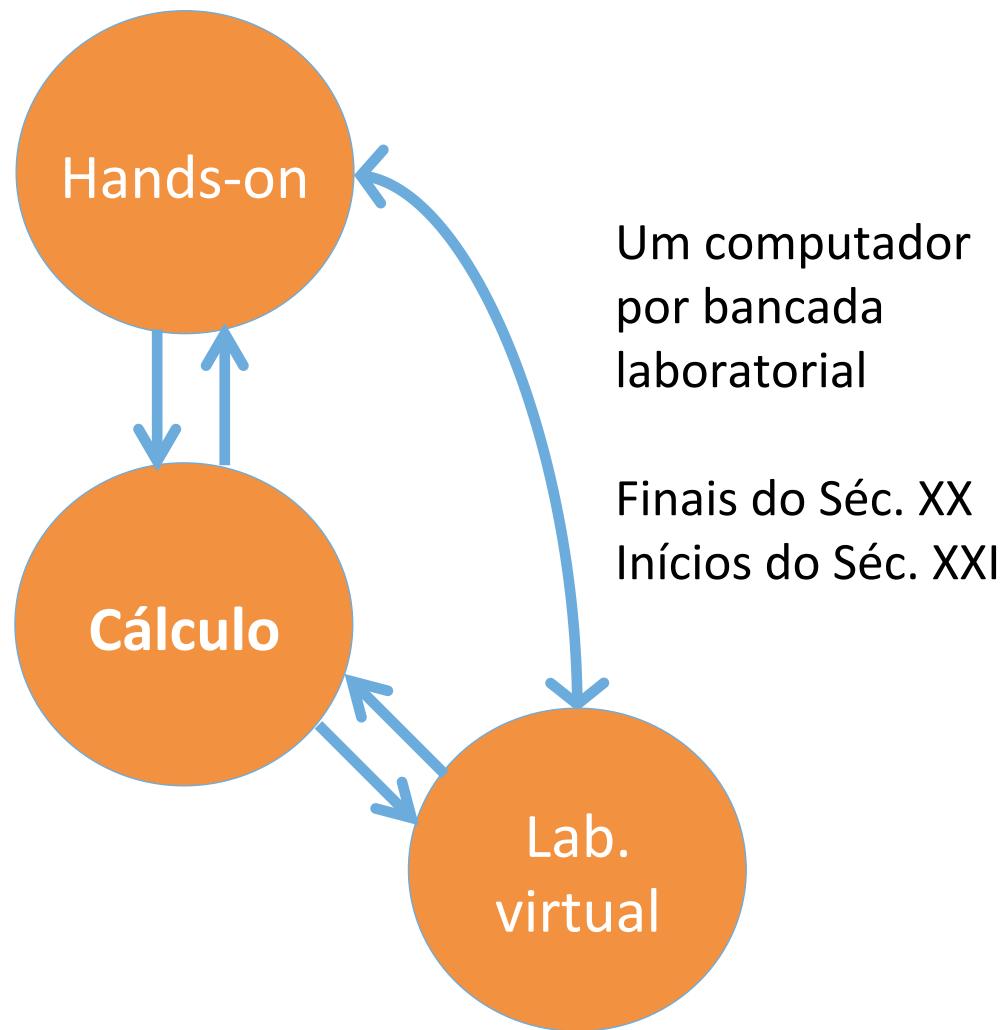
Primeiras Escolas
de Engenharia
Séc. XVIII

Modelo ensino/aprendizagem laboratorial



Simulações em computador
Meados do Séc. XX

Modelo ensino/aprendizagem laboratorial



Modelo ensino/aprendizagem laboratorial

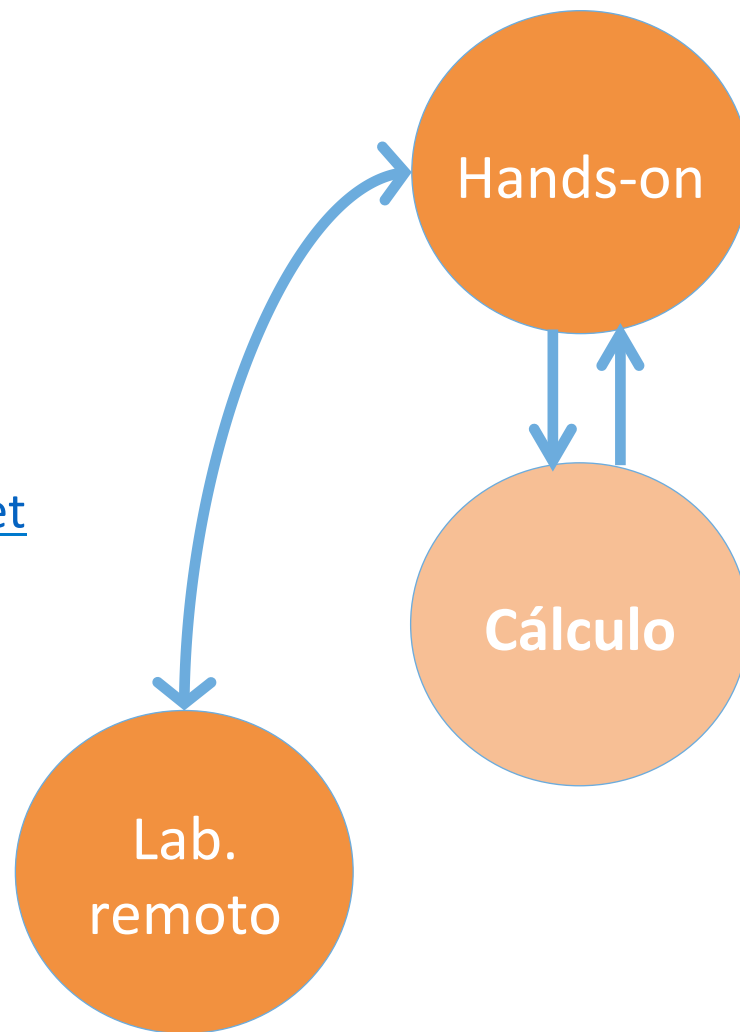


Instrumentação controlada por computador

Séc. XX - Finais dos anos 60

Controlo via Internet

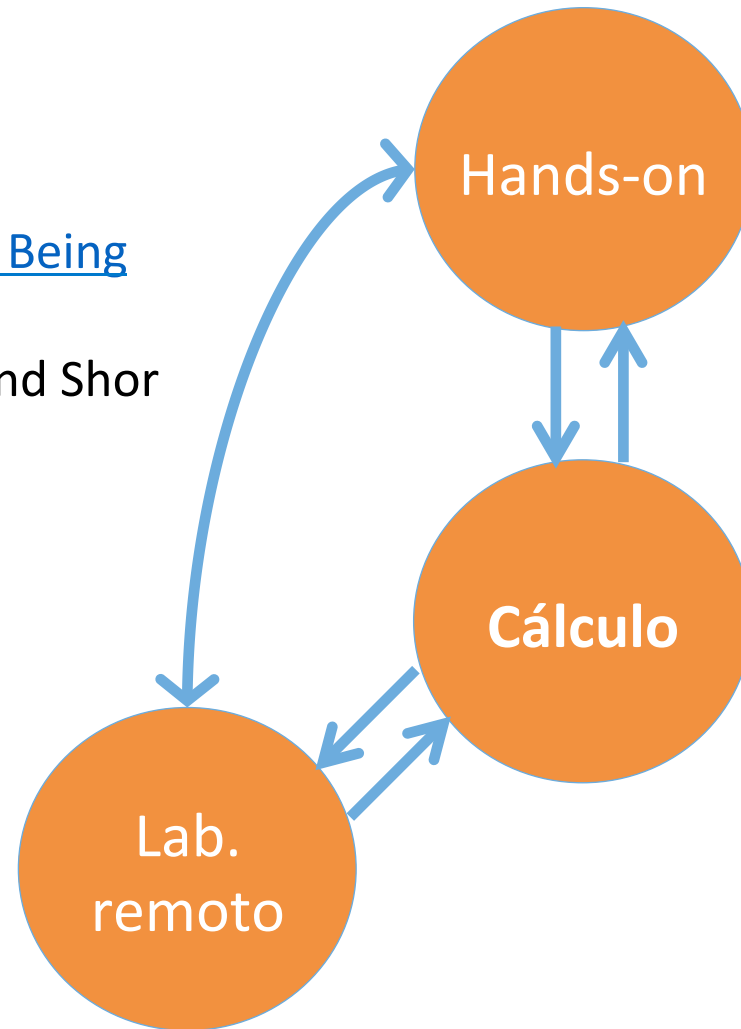
Séc. XX - Década de 90



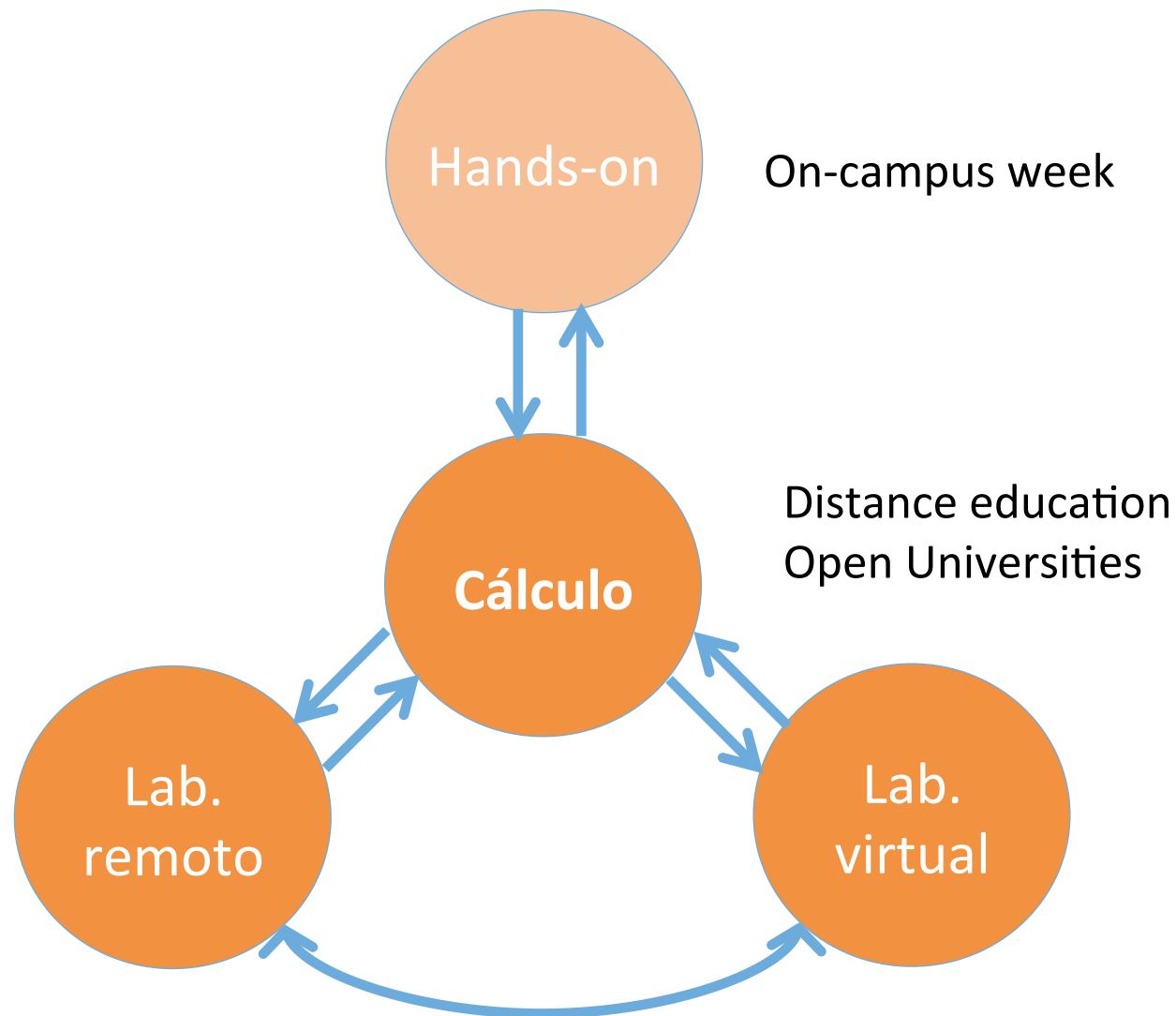
Modelo ensino/aprendizagem laboratorial



Second-Best to Being There (SBBT)
Aktan, Bohus and Shor
(1996)



Modelo ensino/aprendizagem laboratorial

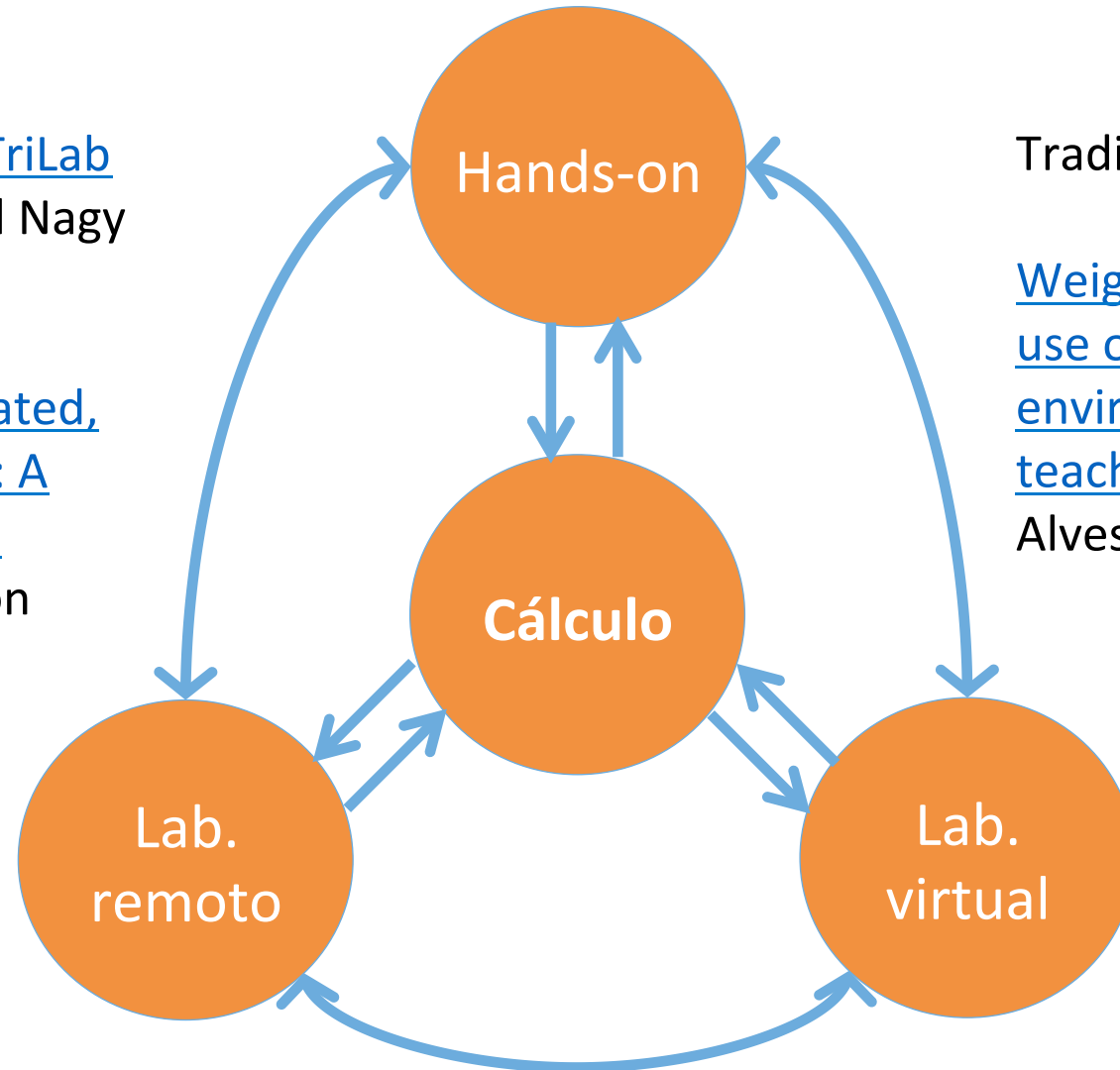


Modelo ensino/aprendizagem laboratorial



[Developing the TriLab](#)
Abdulwahed and Nagy
(2010)

[Hands-on, simulated,
and remote labs: A
literature review](#)
Ma and Nickerson
(2006)



Traditional universities

[Weighting and sequence of
use of different lab
environments in the
teaching-learning process](#)
Alves et al. (2008)

Um pouco de história (global)



Computers & Education 98 (2016) 14–38



Contents lists available at [ScienceDirect](#)

Computers & Education

journal homepage: www.elsevier.com/locate/compedu



Large and small scale networks of remote labs: a survey

Gustavo R. Alves, Manuel G. Gericota

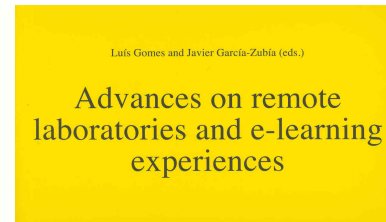
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CrossMark

J. Comput. Educ.

DOI 10.1007/s40692-016-0068-z



CrossMark

Virtual and remote labs in education: A bibliometric analysis

Ruben Heradio ^{a,*}, Luis de la Torre ^b, Daniel Galan ^b,
Francisco Javier Cabrerizo ^a, Enrique Herrera-Viedma ^c, Sebastian Dormido ^b

Computers & Education 87 (2015) 218–237




Contents lists available at [ScienceDirect](#)

Computers & Education

journal homepage: www.elsevier.com/locate/compedu



A review of contemporary virtual and remote laboratory implementations: observations and findings

Tareq Alkhalidi¹  · Ilung Pranata¹ · Rukshan I. Athauda¹



CrossMark

Learning outcome achievement in non-traditional (virtual and remote) versus traditional (hands-on) laboratories: A review of the empirical research

James R. Brinson

Um pouco de história (Portugal)



experiment@portugal

HOME

ABOUT US
ONTOLOGY
LABORATORIES
PARTNERS
CONTACTS

Hidro

exp@pt Calendar

September 18-20, 2013
[2nd Experiment@ International Conference](#)

November 17-18, 2011
[1st Experiment@ International Conference](#)

January 7, 2011
[Workshop of the presentation of the Experiment@Portugal project](#)

experiment@portugal makes available the national potential in online experimentation based in the remote and virtual Labs of higher education institutions in Portugal, which are available in the platform [pt.lab2go](#)

This Web site aims to disseminate and to promote the online experimentation, offering diversified information and by allowing a quick evaluation in the interest of many of its contents.

experiment@portugal also contributes for diffusion of concepts, using the international ontology recommended by the [GOLC \(Global Online Laboratory Consortium\)](#).

In addition, experiment@portugal also aims to enable and to foster conditions for sharing resources with Portuguese speaking countries, for improving the collaborative work between higher education institutions, between secondary schools and for sharing resources with industry by contributing for lifelong learning and for training.

It also promotes the national consortium, with structure and critical mass for international prominence, which has been established within the Experiment@Portugal project, funded by [Calouste Gulbenkian Foundation](#) (November 2010-October 2011).

Find us on Facebook

EXP.AT

The Conference Past Conferences Other Events Archive Contacts

Welcome to exp.at'17

University of Algarve
Faro, Algarve, Portugal
6-8 June, 2017

exp.at'15
University of the Azores
Ponta Delgada, Azores, Portugal
2-4 Jun, 2015

exp.at'13
University of Coimbra
Coimbra, Portugal
18-20 Sep, 2013

Um pouco de história (Portugal)



e-escola INSTITUTO SUPERIOR TÉCNICO

Labfarm.ProjectileLauncher Experimentar

Início | Biologia | **Física** | Matemática | Química | Ciências da Engenharia

e-lab Apresentação | Tópicos | **e-lab** | Ligações

Início > Física > e-lab > Experiências

Experiências

Básico Intermédio Avançado

Nesta página são indicadas as experiências a funcionar no e-lab. Em cada uma é possível aceder aos conteúdos que se relacionam com a experiência, realizada no laboratório, e que apoiam o e-lab.

Em cada experiência podem existir tópicos relacionados, ou seja, conteúdos do e-escola que apoiam a compreensão e fundamentação teórica dos conceitos das experiências.

Laboratório

Mecânica

[Gravidade \(G\)](#)
Horácio Fernandes | 22/05/2009 (30/09/2009) | Básico

[Princípio da hidrostática](#)
Horácio Fernandes | 25/06/2002 (30/09/2009) | Básico

[Estatística de dados](#)
Horácio Fernandes | 25/06/2002 (30/09/2009) | Básico

O e-escola é o portal de ciências básicas e de ciências da engenharia do **IST** TÉCNICO LISBOA

isep Instituto Superior de Engenharia do Porto

physics labfarm

Bem vindo ao portal da Experimentação Remota do ISEP!

Neste portal poderá aceder a um conjunto de laboratórios remotos sobre tópicos de Física e Eletrónica.

Como utilizar estes laboratórios remotos? [Ver +](#)



Física Remota



VISIR

Visão atual (projetos c/ dimensão alargada)



Virtual Labs VIRTUAL LABS
 An MHRD Govt of India Initiative
 An Initiative of Ministry of Human Resource Development (MHRD)
 Under the National Mission on Education through ICT



PARTICIPATING INSTITUTES

- IIT DELHI
- IIT BOMBAY
- IIT KANPUR
- IIT KHARAGPUR
- IIT MADRAS
- IIT ROORKEE
- IIT GUWAHATI
- IIIT HYDERABAD
- AMRITA UNIVERSITY
- DAYALBAGH UNIVERSITY
- NIT KARNATAKA
- COE PUNE

Labs developed by Nodal Centers
NODAL CENTERS

- ### Objectives of the Virtual Labs:
- 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.
 - To enthuse students to conduct experiments by arousing their curiosity. This would help them in learning basic and advanced concepts through remote experimentation.
 - 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.
 - To share costly equipment and resources, which are otherwise available to limited number of users due to constraints on time and geographical distances.

The Philosophy [Read More](#)

Salient Features [Read More](#)

Labs Ready For Use [Click here](#)

- ### Broad Areas of Virtual Labs
- ▶ **Electronics & Communications**
 - ▶ **Computer Science & Engineering**
 - ▶ **Electrical Engineering**
 - ▶ **Mechanical Engineering**
 - ▶ **Chemical Engineering**
 - ▶ **Biotechnology and Biomedical Engineering**
 - ▶ **Civil Engineering**
 - ▶ **Physical Sciences**
 - ▶ **Chemical Sciences**

Announcements

University, Orissa has been successfully completed on August 27, 2016.

-> State-level workshop on Virtual Labs at Global Institute of Management & Emerging Technologies, Amritsar has been successfully completed on Feb 21, 2017.

-> State-level

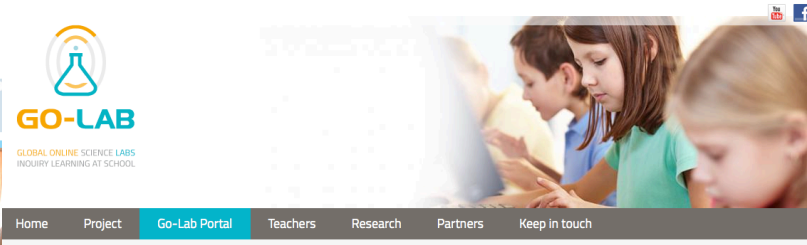
LAB FEEDBACK FORM

ASSESSMENT FORM

FAQ

SHAKSHAT PORTAL

Contact Us
support@vlab.co.in

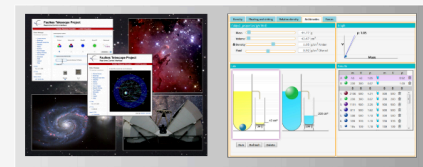


Online Labs

The **Go-Lab Portal** aims at supporting teachers and students in their inquiry learning activities offering a wide range of online tools to work on scientific problems in a virtual environment. Using the Portal, teachers can utilize online laboratories and supporting learning applications to build Inquiry Learning Spaces customized for a certain class.

The **online laboratories** offered by Go-Lab can be remotely-operated or virtual. **Remote labs** can be used by the students to gather data from a real physical laboratory setup, including real equipment, from remote locations. Those labs include, for example, the **WebLab-DEUSTO Aquarium**, whose main learning objective is the Archimedes' Principle. There, students can throw balls filled with different liquids in an aquarium (using a web interface) to observe different buoyancy behaviors. Another example is the **Faulkes Telescope** that offers a database of astronomical pictures as well as the opportunity for the students to remotely operate the telescope and to take their own pictures of the cosmos.

The other kind of online labs are **virtual labs**. They enable the students to simulate real equipment and experiments. Virtual labs include, for instance, **Galaxy Crash** simulating collisions of galaxies to make it possible to compare them to students' predictions that are made in advance for the experiment; **LHC Game** simulating the whole process of a particle accelerator like the Large Hadron Collider used at **CERN**; and **Splash**, the virtual buoyancy laboratory, in which students can learn in a virtual way about Archimedes' Principle simulating the same experiment as conducted with the remote Aquarium lab described above.



Next-Lab Project

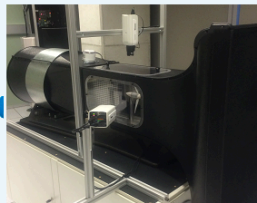
Next-Lab (Next Generation Stakeholders and Next Level Ecosystem for Collaborative Science Education with Online Labs) is a European research project co-funded by the European Commission in the framework of the **Horizon 2020 Programme**. Next-Lab focuses on introducing inquiry-based science education (IBSE) in schools and continues the mission of the project **Go-Lab**, promoting innovative and interactive teaching methods in primary and secondary schools.

Next-Lab provides a varied portfolio of advanced online learning tools in science topics, which contains hundreds of virtual and remote science laboratories, inquiry learning applications and Inquiry Learning Spaces. Furthermore, there is an authoring tool for teachers they can use to create own cross-curriculum learning scenarios and share them with their students.

Using Next-Lab, students benefit from the rich, challenging learning experiences, shaping their science and technology knowledge together with social competencies. The innovative tools of Next-Lab guide students through the research process, helping them to acquire in-depth understanding of scientific topics as well as 21st century collaboration and reflection skills.




Remote Labs Enriching digital education

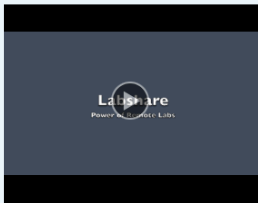


Wind Tunnel

To allow students to visualise and measure parameters associated



Engineering Mechanics & Materials Rig



Labshare Channel

Click here to see additional videos of the experiments in action

The Labshare Institute

The Labshare institute was wound up by mutual agreement in early 2015. This website, the rig catalogue and the Labshare helpdesk are now maintained by the UTS remotelab group. Please submit requests for trials, feedback and support requests as per instructions 'getting started'. If you require UTS remotelab consulting services, please proceed as for 'support' but change the subject line to 'request consulting services'.

Partnered with:



As seen in:



- | | | | | |
|------------------------------------------|----------------------------------------|---------------------------------|----------------|----------------------------------|
| About | Catalogue | Resources | Remote Labs | Getting started |
| TLI People Services Partnerships Sectors | Rig catalogue Lesson catalogue Library | Community Publications Newsroom | About Benefits | Getting started Support Feedback |



Visão atual (market places)



LabsLand [Home](#) [Labs](#) [About](#) [Register](#) [Log in](#)

Welcome to LabsLand

Empowering **STEM** training through the LabsLand Network for remote experimentation

LabsLand - English

Visão atual (redes | federações)



Workshop “Why building a VISIR Federation?”

Stakeholders’ meeting

Welcome address: VISIR+ and PILAR projects



Co-funded by the
Erasmus+ Programme
of the European Union



Gabriel Díaz Orueta, Elio Sancristóbal,
*Félix García Loro and **Manuel Castro***



03 – 07 – 2017

A etapa em curso | Futuro



- Criação de federações de Laboratórios Remotos
- Evolução do modelo de negócio associado
 - Aumento da oferta e da procura
- Laboratórios remotos = parte da missão das Instituições de Ensino Superior
- Amadurecimento de algumas tecnologias associadas
 - Realidade virtual combinada com acesso a equipamento real (e.g. jogos digitais)
 - Modelos híbridos (virtual | remoto)
 - Dispositivos hápticos | percepção de odor | etc.



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Obrigado pela atenção!