

Virtual Labs on DIKSHA: Concept, Purpose, Type, Development and Dissemination Process



Ms. Suman Ninoriya, Project Manager
and

Ms. Priyanka Monde, Module Lead
Education Technology Unit
C-DAC Mumbai

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C-DAC, Mumbai



Think

Try to enter for three words come in your mind for Virtual labs.

- Click on the link given in chat box.

<https://www.menti.com/al2cgd12fin9>

Agenda

- Virtual Labs : Introduction
- Need for Virtual Labs
- Ecosystem of Labs
- OLabs: An example of Virtual Labs for schools
- Demo
- Developing a lab
- Adopting Virtual Labs

Labs in education

- Laboratories recognized as important devices in the learning process.
 - Hands on feel of the lesson learned
 - Connecting the theory to the real life.
 - Focus on the experiment as a key paradigm in science
 - Better internalization of the content
 - Tell me, I will forget
 - Show me, I may remember
 - Involve me, I will understand



Active
Learning

Virtual labs

One of the recommendation in the NEP 2020.

Virtual labs and remote labs to the rescue..

Virtual labs: simulation labs, usually computer simulation is important aspects of the labs

Remote labs: expensive equipment can be manipulated remotely; enables sharing of such resources.

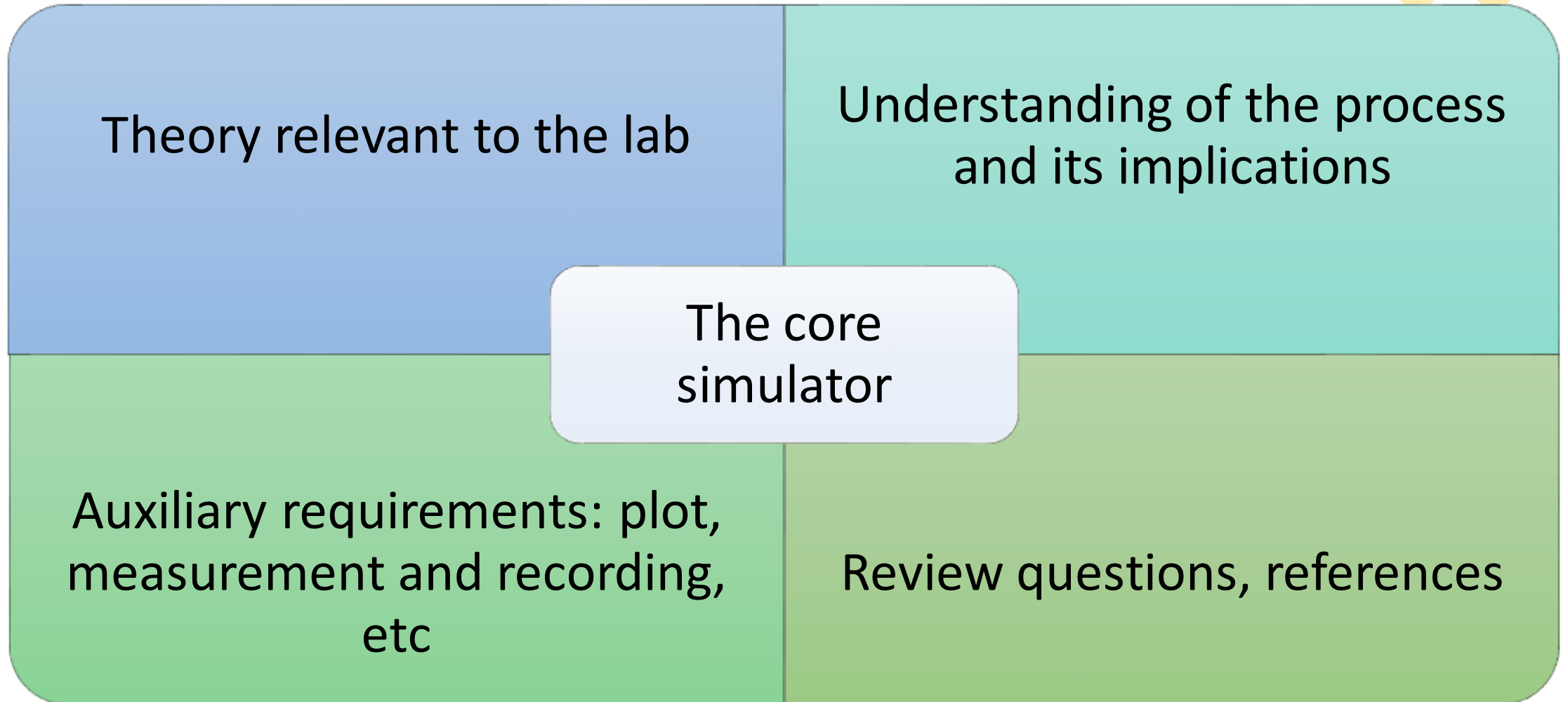
Virtual labs

- Simulation (e.g O Labs)
- Unconstrained availability; trivial cost once developed
 - Development cost can be high
- Simulation **attempt to** mimic the reality—but not actually the reality
- Affordances
 - There are boundaries ignored (Spring linearity region)
 - Can manipulated the timescale (Slow down very fast reactions, speed up the very low)
 - There are also new opportunities (Pendulum Moon or Jupiter)



See as amplifiers, not replacements!

Eco-system of virtual labs



Virtual Labs – Examples

*(initiatives by
govt of India)*

- **Virtual labs -**
 - Initiative by IITs
 - simulation-based Labs in various disciplines of Science and Engineering.
 - <https://www.vlab.co.in/>
- **Online labs (OLabs)**
 - Online
 - <https://diksha.gov.in/virtuallabs.html>
 - www.olabs.edu.in
 - Offline OLabs Windows installer- Available on request
 - Mobile app OLabs android app—Available on Mobile seva app store

Online Labs-OLabs [Virtual labs]

212 labs
available on
Diksha

*more being
added..*

Science-Class 6-8

Physics -Class 9-12

Chemistry -Class 9-12

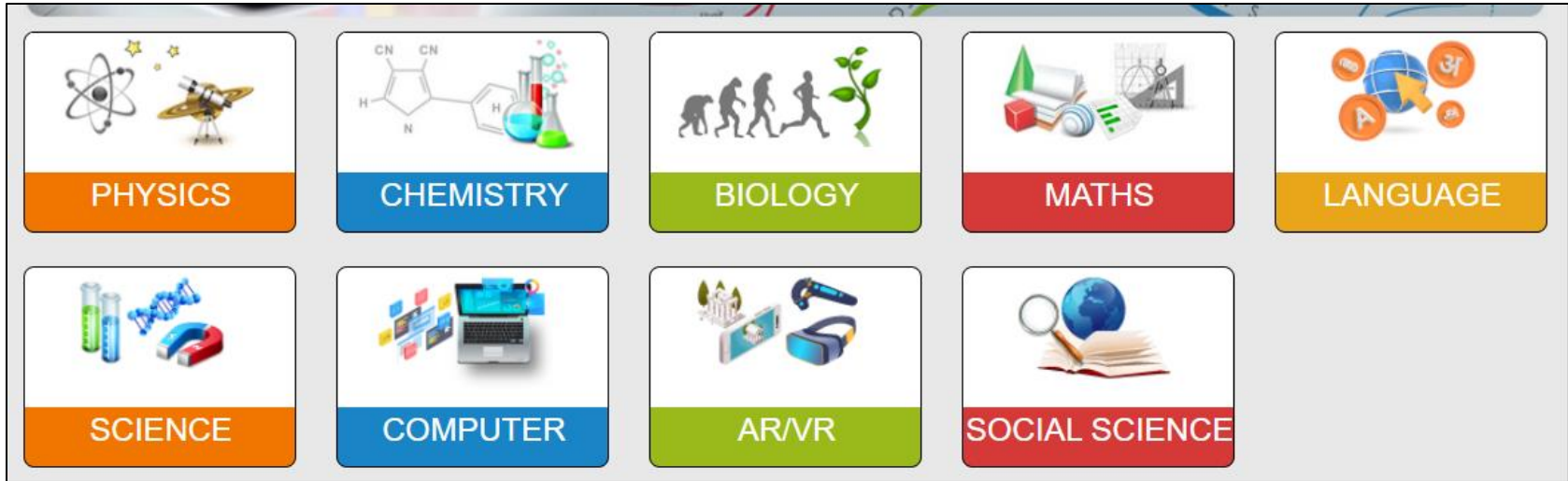
Biology - -Class 9-12

Math- -Class 7-12

Language (English and Sanskrit)-Class 7-10

Social Science-Class 6-9

Subjects Available



Labs available in languages



Features of OLabs

Provides a complete
eco-system for the
lab

Consistency in
terminology across
the tabs.

Compliance with the
NCERT curriculum

Content reviewed
and approved
by CBSE teachers

High degree of
interactivity for the
learner and multiple
affordances

OLabs: A glimpse of lab

Variants

Ohm's law and resistance

Theory Procedure Animation Simulator Video Viva Voce Resources Feedback

Ohm's Law

Select the metal: Silver

Length of the wire: 10cm

Diameter of the wire: 0.2mm

Resistance of the rheostat: 1

Show result

Reset

Show circuit diagram

Developed by Amrita University Under research grant from Ministry of Electronics and Information Technology

Voltage (V)	Current (I)	Resistance (R)
		NaN

Lab specific affordances



In each lab, a set of affordance are provided based on the requirements of the lab.



For Ohm's law, you can change the material of wire, try variation in length and diameter of resistance wire



In Languages -English, Hindi Sanskrit

Number of sentences and words can be provided for practice
Specify the errors and remedial actions



In Social Sciences:

Use maps, Drag and drop etc to perform the activity

Feedbacks

Feedback			
Items	Result	Description	Remedy
Main Verb	✓	'main verb' is correct.	----
Helping Verb	✗	Wrong 'helping verb' chosen.	Select 'helping verb' according to selected tense and subject verb agreement.

एकवचनम् द्विवचनम् बहुवचनम्

Feedback

यह स्थान मध्यमपुरुषः में बहुवचनम् शब्द का है। कृपया सही शब्द चुने।

OK

प्रतिपुष्टि

गलत जवाब। 'विद्यालय' शब्द व्यक्तिवाचक संज्ञा नहीं है। जिस शब्द से किसी विशेष प्राणी, वस्तु, स्थान या पदार्थ का बोध हो, उसे **व्यक्तिवाचक संज्ञा** कहते हैं। जैसे- कविता, दिल्ली, रामायण।

ठीक है।

Online labs OLabs

DEMO

<https://diksha.gov.in/virtuallabs.html>

Usage Mode-1

Before the physical lab



Being prepared will help to use the limited lab time more effectively.



Use the virtual lab as a preparatory ground before the lab.

Usage mode-2

After the physical lab



More option to explore, as no resource constraints



Ask the learner to explore the virtual lab in more detail and try out more scenarios.



Use reflection in the class, with specific scenarios.



Usage mode-3

As an instructional device

- Use to explaining concepts like hooks law, focus length of a lens, etc without a lab setup as O Labs depict as a replica of lab setup.
- Demonstrate the intended behaviours using O Labs.
- Use affordances provided to try select use cases.
- Encourage the learners to try them out on their own.

Usage mode-4

For active learning strategies

Active learning strategies like flipped classroom require mechanisms to engage a class without lectures.

A lab setup replicated in the classroom can provide a fertile ground...

Stop the experiment arbitrarily and ask learners to predict what happens?

- What happens if a weight of 25Kg is put on the spring in Hook's law?
- What happens to image, as the candle moves closer to the focal point of a lens?

Deepens learning and encourages reflection.

Usage mode-5

No physical lab available—Pandemic, no infrastructure

- O Labs can also function as replacement of physical lab
 - Performing the activities envisaged.
 - Maintain lab records.
 - Getting a feel of the lab activities - *Only appearance and activities though.*



Building a virtual lab

- Core of a VL is a simulator, which is a software program, which mimics the intended behaviour
 - Like pendulum oscillation obeying the relevant rules of gravity and motion.
- Maths lab obeying all application math rules, even for the partial answers.

Steps to build a simulation



Identification of topic



Refer the manual for physical lab approach



Identify list of required UI objects



Decide

affordance required for the labs

Guidance to be provided during the simulation

Feedback on the mistakes



Develop Story board with decided approach



Develop prototype

Building the eco system

- With the simulation, we need
 - The theory/reference material corresponding to the lab for easy reference
 - The instruction on how to perform the lab activity
 - Help and feedback with respect to the conduct of lab
 - Additional resources to refer
 - Review questions

Any story board or text doc with diagram can be used.

Tools to build a virtual lab

- Scratch, GeoGebra
- Both have visual programming mechanism, and hence syntax problem will be less
- Both allow experimenting visually to support tinkering and gradual refinement

More are there but need computer programming skill to develop a virtual lab.

Demo

- GeoGebra - <https://www.geogebra.org/?lang=en>

Adopting Virtual labs

1

Provide a comprehensive eco-system to reduce time to use.

2

Understand the pedagogical aspects and adopt relevant usage pattern

3

Provide rich set of affordances and guidance

4

Integrate into the curriculum

Challenges



Evaluation of labs

No accepted standards yet for this.
Can do cost effectively with Olabs.



Proper and timely guidance in the lab



Collaboration



Immersive experience



Retaining interest



Non-science subjects

Non-science subjects



Mathematics



Languages



Social sciences [History,
Civics, Geography and
Economics]



- No real concept of a lab in these.
- Creating a lab environment could be useful.

Improved user(age) experience

Mouse to manipulate everything in the lab...

Provide more realistic and natural manipulators?

Gesture: turn the knob of the burner.

Speech

Haptic devices – two-way user interface

can help feel pressure, etc.

Looking ahead

A very satisfying experience so far. CBSE and NCERT and schools happy and looking for more.

Further work required in more classes and subjects.

And more innovations to improve effectiveness.?

Thank You!



For help and suggestion in lab design (all subjects)

- Email id: etu@cdac.in, vidyakashetu@gmail.com
- Website: <http://olabs.edu.in/>
- Facebook: <https://www.facebook.com/onlinelabs/>

