Virtual Labs

Goal of the Video: - This Video Lecture will deliver the overview of the Virtual Labs. After completion of this lecture, the students should learn the following topics related to Virtual Labs.

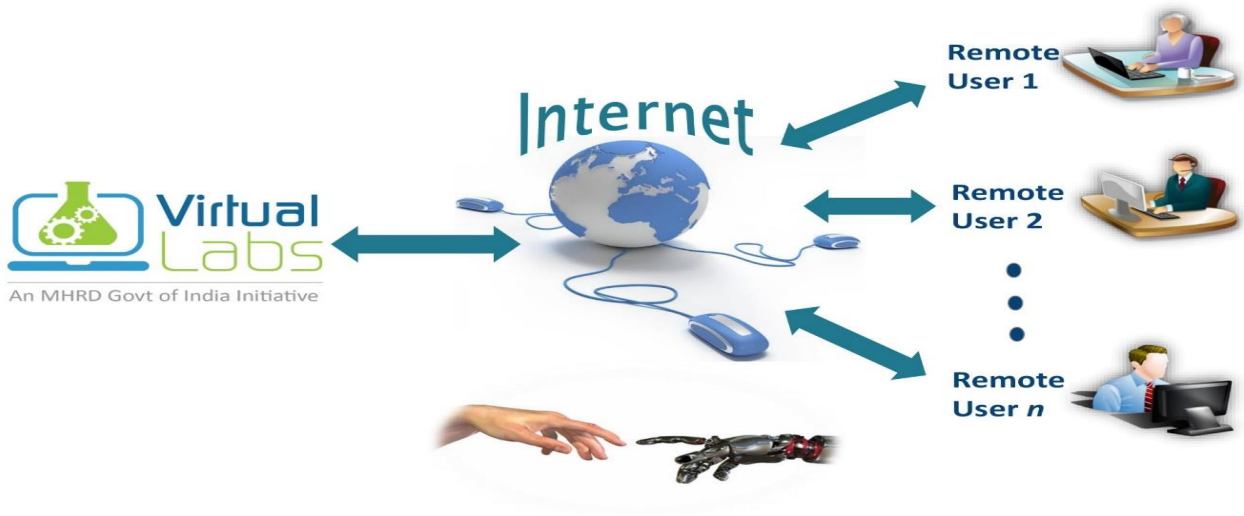
- Definition
- Introduction
- Need of Virtual Labs
- Beneficiaries of Virtual Labs
- Benefits of Virtual Labs
- Weaknesses of Virtual Labs
- Available Virtual Labs
- Conclusion
- References

Audience of the Video: - All Science and Engineering students who can take laboratory without going to Physical Laboratories.

video topic: - Importance of Virtual Labs

Key takeaways: - After watching this video, students can know the importance of virtual labs and different possibilities of implementing Virtual labs for different specializations in Simulated Environment.

Outline of Virtual Labs.



Remote users can access Virtual Labs through Laptops/Personal Computers through high speed broadband internet.

Users can go through concerned Virtual Lab website and perform various experiments in simulated environment without going to physical labs.

Virtual Labs is an initiative of Ministry of Education (MoE), Government of India under the aegis of National Mission on Education through Information and Communication Technology (NMEICT).

Introduction

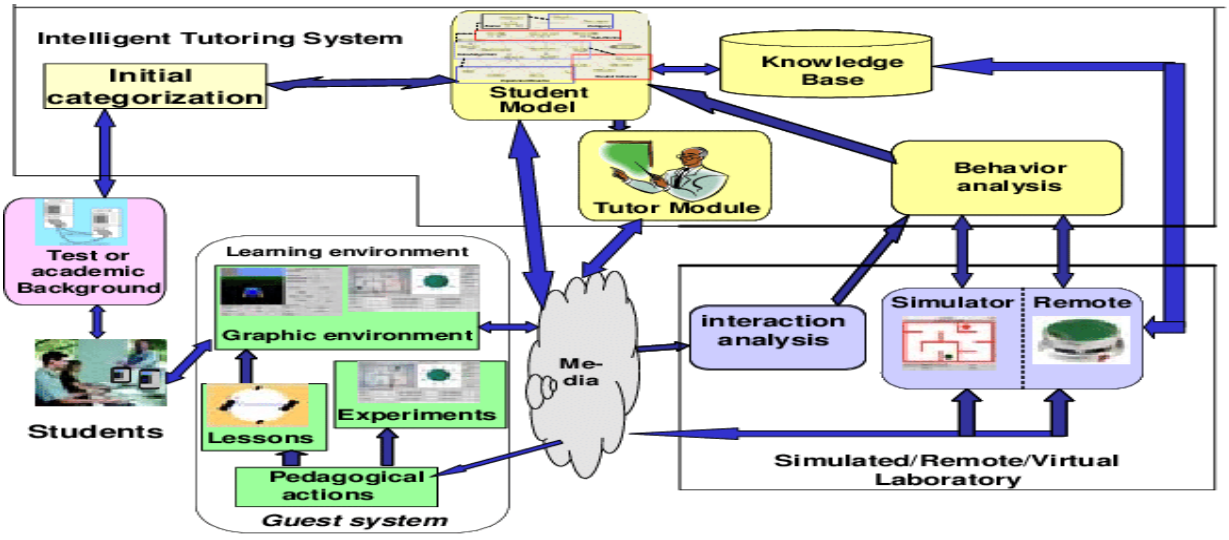
"Hi there! I'm G.Dayanandam from Government College for Men(A), Kadapa, Working as Lecturer in Computer Science in the department of Computer Science, I'm gonna teach you what are Virtual labs and various aspects of Virtual labs such as introduction, Need of Virtual Labs ,Beneficiaries of Virtual Labs, Benefits of Virtual Labs, Weaknesses of Virtual Labs, Available Virtual Labs.

Section by section Overview.

Introduction: - During Pandemic situation, students are unable to attend their practical classes physically. So, if they want to do experiments through online, there is only one solution i.e Virtual Labs.

- Virtual Labs don't require any physical infrastructure
- Virtual Labs saved lot of time and effort
- Virtual Labs enable students and teachers do their experiments to achieve their goals.
- But Virtual Labs require only any PC/Laptop with High Speed Broad Band Connection Only.

Architecture of Virtual Lab: -



When you observe this architecture of Virtual Lab, Students can access Virtual Labs though media such as internet. They can use guest system components such as learning environment, graphics environment, lessons, experiments etc. participants can test academic background by intelligent tutoring system.

Need of Virtual Labs: There are different challenges in physical labs. They are

- Challenge #1: Limited lab access i.e. Due to Social distance during pandemic or high cost of Specialized equipment, participants are not able to complete lab techniques.
- Challenge #2: Limited time in the lab i.e. Due to limited time duration for practical class, students feel pressure for completing experiment.
- Challenge #3: Low student motivation and engagement i.e. Class room teaching is passive learning environment which leads to reduce studnets' motivation in understanding real world relevance of what they are learning. This may lead some of students may be drop out.
- Challenge #4: Teaching complex topics i.e. without active visual tools, it is very difficult to teach complex topics
- Challenge #5: Making mistakes in high risk environments i.e. Safety is of the utmost importance when working in a lab. Due to unpreparedness and unawareness about equipment, there may be risk if anything wrong happens.
- Challenge #6: Ethics i.e. For experiments that test or dissect parts of animals or conduct ethical hacking experiments in cyber security, many questions involving ethics that teachers must consider.
- Challenge #7: Unprepared students and knowledge gaps i.e. With little to-no lab access, many students feel low confidence to carry out experiment, due to unpreparedness, there is a chance of knowledge gaps.

Beneficiaries of Virtual Labs: - All students, Teachers and Researchers of all types of colleges such as Science and Engineering colleges are beneficiaries those are not having sufficient labs or it is a complementary for those who are having well established laboratories.

Benefits of Virtual Labs:- It is a complete Learning Management System i.e students can avail various tools for learning, including additional web resources, video lectures, animated demonstration and self evaluation. Some of the benefits are

- As a visual aid to teach complex concepts Ex. A visual immersive experience can make it easier for students while explaining complex concept such as DNA structure
- To refresh students' knowledge before teaching new material i.e. using simulations students can be refreshed with previous topics.
- As a pre-lab exercise i.e. Before doing any experiment, Virtual labs can be used to teach safety measures, techniques and procedures for doing any experiment.
- To provide lab work to courses with no existing lab component
- To facilitate online learning i.e. Online Learning enhances overall class participation grade through assessments and quizzes.
- As a post-lab exercise i.e. Students can analyze their results.

Weaknesses of Virtual Labs :-

- They require computer devices with high specifications.
- They require professional programmers with strong skills in different programming languages.
- They also require a team of experts in the scientific material, teachers, and experts in psychology.
- One of the negative effects of Virtual Labs is that it reduces the direct interaction between different parties involved in virtual labs.

Available Virtual Labs:-

S.No.	Name of the Department	Name of the Virtual Lab	Description of the Virtual Lab	Web link of the Virtual Lab
1.	Multi Disciplinary	Vlabs	Virtual Labs for Multi Disciplinary.It is an initiative of Ministry of Education (MoE), Government of India under the aegis of National Mission on Education through Information and Communication Technology (NMEICT).	https://www.vlab.co.in
2.	Biology	Biology Simulations	Biology Simulations.	https://www.biologysimulations.com/
3.	Physics	HTML5 Physics Simulations	Manipulate systems and experiment with climate change, motion, forces, gravity, momentum, energy, and rotation.	http://physics.bu.edu/~duffy/HTML5/index.html

4.	**Multi Disciplinary**	**LabXchange**	**Curates and creates world-class digital labs, delivered on a free, online platform that lets you integrate your learning and research experiences.**	**https://www.labxchange.org/explore**
5.	**Chemistry**	**Chemix**	**Chemix is an online editor for drawing science lab diagrams.**	**https://chemix.org/**

Conclusion:-

- The virtual labs are one of the most important applications of e-learning.
- As it provides a virtual learning and teaching environment that aims to develop practical skills of the students.
- And since they are available through the Internet, the student can conduct many experiments without being restricted to a specific location or specific times as It is the case when using real laboratories.

Refernces:-

- https://www.vlab.co.in/about-us
- https://libguides.mines.edu/oer/simulationslabs
- https://library.csi.cuny.edu/oer/virtuallabs-simulations
- https://virtuallabs.merlot.org/
- https://vikaspedia.in/education/interactive-resources/virtual-labs-for-science-and-engineering
- https://en.wikipedia.org/wiki/Virtual_Labs_(India)
- https://linfield.libguides.com/c.php?g=1013634&p=7352386
- https://www.labster.com/the-complete-guide-to-virtual-labs/
- https://blog.praxilabs.com/2020/04/22/all-you-need-to-know-about-virtual-labs/
- "A Semi-Open Learning Environment for Mobile Robotics" by L. Enrique Sucar1, Julieta Noguez2, Gilberto Huesca2 and Eric Rodríguez3