



VIRTUAL LABORATORIES

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ABSTRACT

An effective virtual laboratory can promote conceptual understanding, especially in microscopic and abstract concepts. This ability to increase the visual impact and experience during an experiment and to visualize what is taking place can really help with student understanding. In this article we discuss virtual laboratories, advantages and disadvantages of virtual laboratory, laboratory work, virtual experimentation and simulation, creating virtual lab, challenges of online learning for students, components of the virtual laboratory, best virtual labs.

Virtual labs are interactive, digital simulations of activities that typically take place in physical laboratory settings. Virtual labs simulate the tools, equipment, tests, and procedures used in chemistry, biochemistry, physics, biology, and other disciplines. Results revealed by the study of Kapici et al. (2019) confirmed that the combination between hands-on labs and virtual labs gives better outcomes than using virtual labs alone and that virtual labs are as effective as hands-on labs for acquiring new knowledge and developing students' inquiry skills.

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Advantages and disadvantages of virtual laboratory.

Advantages of virtual laboratories:
Enhances students' enthusiasm for learning through interactivity

Disadvantages of virtual laboratories:
Physical, practical skills that are expected of an engineer are not honed

Virtual laboratory explains the use of virtual laboratory. In the most general terms, a virtual laboratory is a computer-based activity where students interact with an experimental apparatus or other activity via a computer interface.

The challenges you faced in taking online laboratory courses. The students also reported some challenges that they faced during their online classes. These include anxiety, depression, poor Internet service, and unfavorable home learning environment, which were aggravated when students are marginalized and from remote areas.



Virtual labs develop conceptual understanding, support student engagement and STEM accessibility. Laboratory work is essential for developing students' observational skills and helping them better understand the experimental foundations of natural sciences.

Advantages and Disadvantages of Lab experiments. Tighter control of variables. Easier to comment on cause and effect, relatively easy to replicate, enable use of complex equipment, often cheaper and less time-consuming than other methods.

Lab Experiment

Strength: It is easier to replicate (i.e. copy) a laboratory experiment. ...

Strength: They allow for precise control of extraneous and independent variables. ...

Limitation: The artificiality of the setting may produce unnatural behavior that does not reflect real life, i.e. low ecological validity.

Virtual experimentation and simulation—the use of mathematical models and computer-based simulations. to replicate the behavior and performance of physical systems and traditional experiments—has been steadily growing over the past two decades, driven by continual developments in technology and techniques. It was found that the remote web-based labs were frequently accessed during the night hours, and the students preferred this flexibility. Further, a larger variety of lab experiments (including ones normally too expensive or dangerous) can be offered remotely. This is another advantage over traditional labs.

Creating Virtual Lab: Launch the New Virtual Lab wizard, Specify a virtual lab name and description, select a host, select a datastore, set up a proxy appliance, select

networking mode, create isolated networks, specify network settings.

Challenges of Online Learning for Students:

1. Ineffective Time Management.
2. Lack of Instant Communication.
3. Not Receiving Timely Feedback.
4. Not Receiving Clear Instructions or Expectations.
5. Share Time Management Apps and Resources for Students.
6. Utilize Educational Technology (“EdTech”)
7. Increase Peer Review.

Use these steps to install and use the virtual lab software on Windows and Mac computers.

Download and run the VMWare Horizon Client installer for your computer. Use Versions. Accept the default settings until you reach Default View Connect Server.

There are three kinds of virtual labs:

- Remote Triggered Labs.
- Measurement Based Labs.
- Simulation/ Modeling Based Labs.

IOS (opens in new tab) Android (opens in new tab) apps are also available. Seven free virtual labs, designed for high school and college students, cover lizard and stickleback evolution, bacterial identification, clinical lab testing, neurophysiology, transgenic flies, and cardiology.

Laboratories can be very dangerous, especially if you've never set foot in one before. “A virtual laboratory is a computer-based activity where students interact with an experimental apparatus or other activity via a computer interface.”

Results of laboratory experiments tend to be reliable, as the conditions created (and thus results produced) can be replicated. - Variables can be measured



accurately with the tools made available in a laboratory setting, which may otherwise be impossible for experiments conducted 'in the field' (field experiments).

Components of the Virtual Laboratory

- Software ingredients. Objective C. Tcl.
- Computational network manager. The Script Editor.
- Object inspection. Navigation in the inspection manager. Viewers.
- Time. The hierarchy of time managers. Tcl scripts and time.
- Archiving.
- Documentation.

To install the Virtual Lab, click on the link below. Once the file (vlab. zip) has downloaded to your computer, unzip the file. Once the file is unzipped, double click the file vlab.exe.

Virtual lab is defined as a virtual teaching and learning environment aimed at developing students' laboratory skills. They are one of the most important e-learning tools.

Best virtual labs.

- Labster: Best virtual lab software overall. (Image credit: Labster) ...
- Explore Learning Gizmos: Best for support. (Image credit: Explore Learning) ..
- PhET Interactive Simulations: Best for resources. (Image credit: PhET) ...
- NOVA Labs: Best for quality and fun content. (Image credit: PBS) ...
- Inq-ITS: Best for NGSS learning.

Virtual lab refers to a virtual teaching and learning environment aimed at developing students' laboratory skills. As one of the most important eLearning tools,

they allow the student to conduct various experiments without any constraints to place or time, in contrast to the constraints of real labs. Physical distances and the lack of resources make us unable to perform experiments, especially when they involve sophisticated instruments. Also, good teachers are always a scarce resource. Web-based and video-based courses address the issue of teaching to some extent. Conducting joint experiments by two participating institutions and also sharing costly resources has always been a challenge. With the present day internet and computer technologies the above limitations can no more hamper students and researchers in enhancing their skills and knowledge. Also, in a country such as ours, costly instruments and equipment need to be shared with fellow researchers to the extent possible. Web enabled experiments can be designed for remote operation and viewing so as to enthuse the curiosity and innovation into students. This would help in learning basic and advanced concepts through remote experimentation. Today most equipment has a computer interface for control and data storage. It is possible to design good experiments around some of this equipment which would enhance the learning of a student. Internet-based experimentation further permits use of resources – knowledge, software, and data available on the web, apart from encouraging skillful experiments being simultaneously performed at points separated in space (and possibly, time).

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