

S & T

Virtual laboratories in mainstream education



The Hindu VIRTUES: Virtual laboratories provide personalised modules to students. Photo: S. Mahinsha

Even as staunch experimentalists disbelieve it, the use of information and communication technologies to do a laboratory experiment independent of a student's location is fast becoming a reality. In short, virtual reality technologies are revolutionizing the educational system.

Amrita Vishwa Vidyapeetham is launching a series of workshops on their newly developed Virtual Labs. These labs were developed under the research grant from the National Mission on Education through ICT, Ministry of HRD. Amrita is a partner in the National Mission project on Virtual laboratories coordinated by IIT Delhi in partnership with 10 other institutes including IITs (Kanpur, Kharagpur, Bombay, Madras, Roorkee, Guwahati), IIIT Hyderabad, NIT Suratkal, COE Pune and Dayalbagh University.

The objective of this national mission project is multi-faceted – to provide high quality personalized and interactive knowledge modules over the internet, intranet and through satellite communication to all the learners in higher education institutions in an anytime, anywhere mode. It is provided free of cost.

According to Dr P. Venkat Rangan, Vice Chancellor, Amrita University, faculty at these institutions would use these virtual laboratories in tandem with theory courses. Virtual Labs are powerful technological interventions that will allow all educational institutions and students equal access to real life laboratory experimentation.

Virtual labs are a fusion of creative engineering and objective conceptualization techniques to yield an interactive experience. Building a virtual lab involves systematically sequencing experimental steps using physics-based modeling and/or best procedural practices coupled with effective visualization in order to simulate reality. But the experience does not end there.

Varying parameters, observing the natural interactions in the same way as one would in a real lab, these virtual laboratories model actual behavior in close proximity. Professor Ranjan Bose, Department of Electrical Engineering, Virtual Labs Project Coordinator at IIT Delhi, says “What's new about the virtual labs is that it recreates not only the realistic output as in lab experiments, but they give the students an actual feel of the experiments too. It sits at the intersection of university laboratory practices, e-learning, and interactive environments. Any student can have access to an experiment via the internet, and that is what makes it unique.

Virtual Labs are the solution to the lack of access to expensive yet critical instruments for the purposes of scientific studies which is a significant challenge to geographically remote and economically constrained institutes.

This project endeavors to enthuse students to conduct experiments by arousing their curiosity, and provide an opportunity to learn both basic and advanced concepts through remote experimentation.

Laboratory equipments can be accessed online through a user-friendly graphical interface to execute experiments similar to those conducted in labs. The data collated from the experimentation can be recorded online, reviewed and graded by teachers located anywhere, anytime.

By augmenting the virtual labs with a plethora of web-based resources equipped with various learning tools such as videos, animations, demonstrations, quizzes and simulators, these labs have also begun to serve as an online

community hub to share and enhance conceptual knowledge.

Prof. Girijavallabhan, Professor Emeritus, International School of Photonics, CUSAT, a person who has built several laboratories over a period of four decades, says, "Virtual labs are an interesting venture by all these premier institutions to disseminate high quality education. I am sure it will enhance the hands-on experience by complementing real laboratory practices."

A detailed hands-on introductory workshop for faculty members from various colleges and university departments is scheduled to be held on January 7, 2011 at Amritapuri campus of Amrita University.

The goal of this Amrita initiative is to bring together academicians, researchers, and experts to train faculty members from over 20 institutes from both Kerala and other States.

Participating institutions include Government, semi-private and private colleges in addition to a number of engineering institutes.

The workshop will also help train the faculty to trigger the imagination and inquisitiveness of students and supplement the curriculum with these powerful e-learning and self-learning tools.

To help faculty with authoring tools that will speed up Virtual labs development and also to give standard look and feel, Amrita has been entrusted to develop a Virtual Collaborative platform that will provide a single unified interface to more than 200 Virtual Labs. Such a collaborative platform is the first of its kind.

Amrita's Virtual Labs, called VALUE (Virtual & Accessible Laboratories for Universalizing Education) focus on developing biotechnology and biomedical engineering, physical sciences, chemical sciences, computer science and engineering and mechanical engineering labs with other partners. Neurobiology was one of the early labs developed in the biotechnology area. For the neurophysiology course that included 27 postgraduate students at Amrita School of Biotechnology, studies were done on students using virtual labs. The results revealed a dramatic reduction in the lab time required by these students to conduct an experiment during the actual lab sessions.

The Virtual Labs Project also includes development of simulation and remote equipment based labs in various engineering disciplines such as electronics and communication engineering, chemical engineering, civil engineering and other science disciplines at both the undergraduate and post graduate levels.

There is a major Virtual Labs initiative at MIT, Cambridge under a project called iLabs. According to Dr Krishnashree Achuthan, Principal Investigator from Amrita, the objective is to collaborate with projects like iLabs.

Shri N.K. Sinha, Mission Director, NME ICT and Additional Secretary, MHRD, insists on addressing scalability as part of the deliverables is to ensure that more than five lakh students have access to these virtual laboratories. The mission hopes to bridge the digital divide among urban and rural teachers/learners and empower those who have hitherto remained untouched by the digital revolution.

See www.vlab.co.in <http://www.amrita.edu/virtuallabs/> for more details.

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