

MIT Council on Educational Technology

Enabling Global Educational Experiences Using iLabs

The iLab Project, through efforts at MIT and partner institutions worldwide, have fostered the development of a variety of remote laboratories, or iLabs. While the promise of iLabs is in making remote laboratories hosted in different locations equally available to students worldwide, MIT students have until now only had access to MIT-hosted iLabs. Through this proposal, we intend to increase the variety of iLabs available to MIT students and faculty by formally providing access to experiments hosted at iLab partner institutions around the world. Further, we intend to leverage the experience of these partner institutions to provide international exchange opportunities for MIT students with the goal of fostering development of new iLabs.

Project Background

Online laboratories are experimental facilities that allow students to carry out experiments from anywhere at any time. Remote labs can enrich science and engineering education by vastly increasing the scope of experiments that students have access to in the course of their academic careers.

iLabs effectively address many of the logistical limitations of “hands-on” laboratories (equipment, space, user training, scheduling, safety and staffing constraints). Through iLabs, students can carry out their lab assignments from any location whenever it is convenient for them. Because iLabs are online 24x7, students have significantly more lab time available with greater flexibility of access. Further, as iLabs are all based on a common iLab Shared Architecture, they may be easily shared between institutions.

For more than ten years, a number of iLabs have been developed and used in credit-bearing assignments in several MIT courses. At the same time, the MIT team has partnered with a number of universities worldwide who are adopting the iLab Architecture. Through remote collaboration as well as student/staff exchanges these institutions are developing their own iLabs, increasing the number and variety of remote laboratory experiences available to students worldwide.

Current Usage of iLabs at MIT

Presently, usage of iLabs at MIT has been limited to those iLabs hosted at the Institute. These are the Microelectronics Device Characterization iLab, the Dynamic Signal Analyzer iLab and the NI-ELVIS iLab – all focusing on Electrical Engineering topics – as well as the Force on a Dipole iLab, targeted to introductory Physics courses, and the MIT Nuclear Reactor iLab which will be used in Physics and Nuclear Engineering courses. In certain cases, this penetration of iLabs into MIT curricula extends to materials available on the MIT OpenCourseWare site.

iLab Development at Partner Institutions

Through a number of initiatives, the MIT iLab Project has established partnerships with a variety of institutions around the concept of iLabs. These institutions are at various stages of the development process but two, the University of Queensland in Australia (UQ) and the Obafemi Awolowo University in Nigeria (OAU), have deployed unique iLabs which are being used in courses at their home institutions. These iLabs, specifically UQ’s inverted pendulum control and radioactivity experiments as well as OAU’s digital logic iLab, offer experiences that are potentially of value to MIT students and distinct from MIT’s iLab offerings. However, none of these iLabs have been made available to MIT students and instructors.

Increasing the Availability of iLabs to MIT Students

In this proposal we are seeking support for maximizing the potential for the iLab Project to provide a more global educational experience to MIT students. Our approach to this is threefold. First, we propose to formally provide access to those iLabs developed by iLab partner institutions. Initially, we will enable access to those iLabs hosted at UQ and OAU, but others may be included as they come online. This would immediately make new iLabs available to MIT students through the same portal that they use to access MIT's iLabs.

In order to encourage use of these iLabs, we will also provide access to curricular materials that have been developed by their host institutions. These materials will be used to demonstrate the value of the UQ and OAU iLabs to MIT faculty and inspire them to integrate those iLabs into their courses.

Second, we will seek to increase the footprint of iLabs on the MIT OpenCourseWare site. Presently, certain MIT-hosted iLabs are accessible to OCW users as a result of their use in MIT courses. In order to provide OCW users with access to the broad set of iLabs, we will seek to include iLabs as supplemental resources on the OCW site. This will allow OCW users to take advantage of those iLabs that are not necessarily associated with a specific MIT course. We expect that such deployments will provide another means of inspiring MIT faculty to employ iLabs in their courses.

Third, we propose to provide opportunities for MIT students to participate in international exchange programs through the iLab Project. The MIT iLab Project has a record of providing such experiences to MIT students: with the MISTI program we have, for several years, sent undergraduate and graduate students to universities in Uganda, Tanzania, Nigeria and China for the purpose of fostering iLab adoption at those universities. We have also successfully hosted a number of faculty, staff and students from our partner institutions. We propose to expand upon our current efforts, employing MISTI, IROP and other existing programs, to support student exchanges at iLab partner institutions that have established development teams. This will enable MIT students to work with experienced developers and observe how iLabs are used within the specific context of the host institution. This experience can then be leveraged by the broader iLab Project through new iLabs developed by participating students.

Through this proposal, the iLab Project will increase the availability of current labs and foster development of new iLabs while leveraging the international nature of the iLab Project for the benefit of MIT students.

Contributors and Major Categories of Funding

Prof. Jesús A. del Alamo will serve as the Principal Investigator for this project. Work will principally be carried out at MIT's Center for Educational Computing Initiatives and will take advantage of CECI staff time as well as student time through the UROP program. Major funding categories and estimates are as follows:

Expense Description	Year 1	Year 2	Total
- CECI Staff Support (Salaries + EB):	\$8,873	\$8,873	\$17,746
- UROP Funding:	\$17,000	\$17,000	\$34,000
TOTAL:	\$25,873	\$25,873	\$51,746

For the student exchange component of this proposal, we will seek additional support for travel expenses from MIT programs such as MISTI and IROP as well as from the relevant host institutions.