



NANSLO

NORTH AMERICAN NETWORK
OF SCIENCE LABS ONLINE

The North American Network of Science Labs Online—Expanding Student Access to STEM Fields

The North American Network of Science Labs Online (NANSLO) is an alliance of cutting-edge science laboratories that provide students enrolled in higher education science courses with opportunities to conduct their lab experiments on state-of-the-art science equipment over the Internet. From any computer, students can log into one of the labs' web interfaces and manipulate the controls on a microscope or other scientific equipment, participate in conversation with lab partners, ask for assistance from a knowledgeable lab technician in real time, and collect data and images for their science assignments.

Addressing Education and Workforce Needs. Higher education institutions must graduate more students in the science, technology, engineering, and math (STEM) fields than ever before to help their nations remain globally competitive. Yet, too many institutions' slam the STEM door in the face of many interested students by failing to put high quality laboratory science courses online. For students who cannot go to campus for a lab course because of their rural location or family and work obligations, a STEM degree is out of reach. Ironically, the world for which we are preparing today's STEM students requires more technical and computer skills than ever before. Sophisticated online labs can help prepare them for a world in which doctors increasingly use computer-driven robotic tools to perform the most delicate of surgeries, healthcare professionals leverage technology to provide care at a distance to maintain a patient's quality of life at home, air traffic controllers rely on complex algorithms sorting thousands of data points in an instant to guide airplanes safely across the skies, and bankers deposit checks from images taken with smart-phones on the other side of the country just seconds before. Increasingly our world is one in which place does not matter; the ability to work remotely using sophisticated technology-enabled equipment does.

NANSLO's Scientific Equipment. NANSLO's labs feature high quality scientific equipment whose controls are enabled through software and robotics manipulated by students over the Internet. State-of-the-art Nikon microscopes, spectrometers, and air tracks equipped with cameras are included in the current inventory so students can see how the equipment moves in response to their keyboard clicks on a web interface to the instrument's control panel. Via NANSLO's premium equipment, some colleges may give their students access to higher quality equipment than they could provide to them due to financial limitations.

NANSLO's Lab Activity Collection. Working with faculty across its network, NANSLO has developed a collection of web-based lab activities focused on introductory biology, allied health, chemistry, and physics courses. Each activity's description contains information on its history, learning objectives, a set of guidelines for faculty on how to prepare students for the specific lab activity, and lab procedures for students to use in conducting the experiment. Links are also included to video tutorials that explain in more detail how to use the controls on the web interface for the relevant scientific equipment. All the materials are openly-licensed with a *Creative Commons-By* attribution so that faculty can adapt them to

better suit their needs and those of their students. Among the growing list of lab activities in the collection is introduction to microscopy, mitosis and meiosis, emission spectroscopy, Beer-Lambert Law, uniform motion and accelerated motion. Interested faculty is encouraged to contact NANSLO lab managers about needs for other new web-based lab activities.

See <http://www.wiche.edu/nanslo/lab-activities> for links to these lab activities.

How Faculty and Students Use NANSLO. Using NANSLO's online scheduling system, faculty select the parameters for their students' participation in NANSLO. This includes selecting a specific lab activity from the collection, a window of time for one of the labs to be available to his/her students, the number of students that can work together as a group, and how long each group of students will have to conduct an experiment. The system generates a link for the faculty member to pass along to students. Each student uses this link to select an appointment date and time and to access the lab to conduct the experiment. At the appointed time, each student, using the lab's web interface, takes control of the robotically-controlled equipment, discusses the activity with lab partners, takes a turn controlling the equipment to perform the experiment, and collects data and images for analysis and completion of the lab assignment.

Who's involved? The NANSLO network's hub is based at the Western Interstate Commission for Higher Education (WICHE) in Boulder, CO. WICHE serves as the public's primary resource for information about NANSLO, coordinates communication among the network's lab partners, provides the centralized scheduling system, and oversees selected contracting and financial transaction services for the partners. Three labs – referred to as nodes – are currently on the NANSLO network. The Colorado node is located at Red Rocks Community College, the Montana node is located at Great Falls College Montana State University, and the British Columbia node is located at North Island College. Other nodes with different equipment and lab activities supporting a growing number of scientific disciplines are expected to be added over time.

NANSLO's Financial Model. NANSLO was established in 2011 by WICHE and its higher education institution partners with a grant from the Next Generation Learning Challenge, a program funded by the Bill and Melinda Gates Foundation and William and Flora Hewlett Foundation. Many of the network's current activities are funded through 2016 by a U.S. Department of Labor's TAACCCT grant establishing the Consortium for Healthcare Education Online (CHEO). Eight institutions in five states are working with NANSLO to develop new web-based lab activities for their students enrolled in CHEO's allied health courses. In the future the network's activities will be funded through a fee-for-service model by which institutions inside and outside the network will be able to contract for lab services for their students. NANSLO will continue to seek grants to research the most effective ways to teach science lab activities online and to increase the network's capacity and services. Ultimately, NANSLO's goal is to expand student access to high quality online lab courses while lowering the cost of those courses for both institutions and students.

More Information on NANSLO. For more information on NANSLO, please contact Sue Schmidt at 303.541.0220 (sschmidt@wiche.edu) or go to our website at www.wiche.edu/nanslo.