

LabTutor Case Study



Client: University of Western Sydney (UWS), Australia

Situation: Australia's newest school of Medicine wanted technologically-advanced equipment for their physiology laboratory that also provided cost savings. Most importantly, the new equipment needed to maximize the student learning experience.

Solution: PowerLab LabTutor Systems

PowerLab LabTutor Systems Engage Students in Learning and Reduce Laboratory Costs

The School of Medicine at the University of Western Sydney has chosen PowerLab LabTutor Systems as the key teaching tool for the physiology component of the medical course. "There is no doubt that there is nothing of comparable quality to LabTutor, and it is clearly the best fit for our new medical school," said Professor Vaughan Macefield, Head of Physiology.

More than two hundred students use 32 PowerLab 26T LabTutor Systems for the human physiology section of a five-year undergraduate medical degree. Students use LabTutor software to record and analyze physiological data using the Blood Pressure, ECG & Heart Sounds, ECG & Peripheral Circulation, Cardiovascular Effects of Exercise, Breathing, Respiratory Airflow and Volume and Diving Response LabTutor experiments.

Student feedback has been positive. "Students enjoy recording their own data because it is immediately relevant and interesting. They also like doing experiments themselves without any introductions or assistance from a demonstrator," said Professor Macefield. "In a recent survey conducted by the university, students expressed a unanimous view that they wanted to do more LabTutor experiments,"

The integrated systems with LabTutor software have also provided significant cost and time savings. Lab classes of 55 students complete their physiology experiments within a two-hour period, with only one supervising academic. Using different data acquisition equipment, this lab class would require up to four demonstrators and three hours to complete the same experiments.

Due to the enormous success of the PowerLab LabTutor Systems, UWS more than doubled its number of LabTutor Systems for student use within the first twelve months of its program.

Background information

Course: School of Medicine, University of Western Sydney. The course commenced in 2007.

Educator: Professor Vaughan Macefield, Head of Physiology.

Students using PowerLab LabTutor Systems: More than 200 students completing the first and second years of the Medical course use thirty-two PowerLab 26T LabTutor Systems for the human physiology section of a five-year undergraduate medical degree.

Experiments performed: In their first year students use LabTutor software to record and analyze physiological data using the Blood Pressure, ECG & Heart Sounds, ECG & Peripheral Circulation, Cardiovascular Effects of Exercise, Breathing, Respiratory Airflow and Volume and Diving Response LabTutor experiments. Second year students conduct experiments including Muscle, Electromyography, Reflexes and Reaction Times, Sensory Physiology and Water Balance. **Lab time for each experiment:** Two hours of lab time is allocated to performing and completing each human physiology experiment. Within this period, students connect equipment, acquire physiological data, perform analysis and submit the LabTutor report questionnaire.

Interview with Prof. V. Macefield

What features and/or benefits swayed you in the direction of PowerLab with LabTutor software?

Equipment that is technologically advanced and cost effective equipment is a priority for the new school. The PowerLab LabTutor System is an obvious choice for physiological experiments. I like the ease of use and immediate start. The background information included within the LabTutor interface gives students the information they need to contextualize their experiments, and to proceed without a general introduction and verbal instruction on how to set up the equipment. By allowing students to work independently and virtually eliminating set-up time, the PowerLab LabTutor Systems have allowed us to reduce staffing requirements for the new school. I can run a practical class of 55 students with only one academic. Students ask relevant questions on the physiology, rather than questions related to setting up the equipment. A three hour prac can now be run comfortably in two hours, with some students completing all exercises and the report in only 90 minutes.

How are the LabTutor experiments integrated into the course?

We allocate LabTutor experiments to relevant weeks so they can complement the material covered in lectures and Problem Based Learning (PBL) components.

How does LabTutor help students with their understanding of scientific principles?

LabTutor is very effective in helping students to understand scientific principles. In today's ECG and Peripheral Circulation experiment, students recorded electrical signals associated with cardiac contraction, having had lectures on the underlying physiology. Now they can see the physiology in action. Importantly, they can understand the significance of a good signal/noise ratio. Unlike classes using simulation-based experiments with pre-recorded data, the students themselves are in control of the quality of the recording. They understand the need to avoid artifact and measure carefully using cursors. As for the physiology, during the course of the class the students reach an understanding of the sequence of events between electrical events in the heart and the mechanical events recorded in the periphery. They measure the latency from the R-wave of the ECG and the distension of blood vessels in the finger pad, and begin to understand how the mechanical events differ in different parts of the vascular tree. It is wonderful to see students question the shape of the signal they are recording.

When students conducted the previous experiment, Blood Pressure, they not only learned the scientific principles applicable to the experiment, they also learned about physiological variability within a group. By tabulating the

data obtained from the LabTutor experiment, students could see how their values compared with those of their peers. The students found the experiment relevant and interesting. They really enjoyed it. In addition, the data obtained served as the basis of a subsequent lecture on statistics.

Are there any particular features of LabTutor software that have made a big difference to your course?

The step-by-step instructions and the immediate data collection have made our practicals shorter and easier to run. We allocate two hours to each practical, which is around half the time allocated to conducting these types of experiments in other universities. As I mentioned, many students are able to finish their experiments, analyze their data and complete their reports within an hour and a half.

Previously you would need to spend time educating physiology classes about amplifier gains, filter settings and connecting leads prior to starting each experiment. Invariably, things would go wrong and demonstrators could spend much of the class sorting out hardware, connecting components to the right parts. We want our students to learn physiology rather than spending time on hardware issues. As medical students going into the clinic, rather than physiology students going into research, they do not really need to understand gain and filter settings. LabTutor is an efficient use of time.

The speed at which students complete LabTutor experiments is comparable to simulated experiments. However, the comparison stops there. Providing students with pre-recorded data is not useful. Students get bored. Students learn more when they can observe and analyze their own data.

What type of cost savings does the PowerLab LabTutor System provide?

This is a new institution with a deficit, so cost savings are very important. Firstly, the PowerLab LabTutor Systems are very well priced. Secondly, there is a large cost saving in salaries. Normally, for fifty students doing these types of practical classes you would need to employ four demonstrators for each three to four hour session. Last year, a nearby institution paid around \$200,000 for casual staff helping in this capacity. By contrast, time efficiencies offered by LabTutor have provided the university with annual cost savings that far exceed their actual cost.

How did you first find out about PowerLab systems?

I first saw PowerLab system being used at Yale University in 1992. I began using PowerLab Chart Systems for my neurophysiology research, at the Prince of Wales Institute, in 1994. I know most medical schools in Australia use PowerLab with Chart software and I am very familiar with the system, but LabTutor is a brilliant development that makes Chart even easier to use for teaching purposes. There is no doubt that there is nothing of comparable quality to LabTutor, and it is clearly the best fit for our new medical school.

If my students were majoring in Physiology, PowerLab with Chart software would be my choice for advanced courses. Indeed, all of my research students and visiting postdocs, use Chart and Scope software for their data acquisition and analysis.

Considering this is a new course, are there any plans to make any changes in the near future?

Yes, I have significantly increased our number of PowerLab LabTutor Systems. Last year our lab practicals were run in two sessions with an equipment ratio of 4-5 students per PowerLab. I have changed this to a ratio of to 2-3 students per PowerLab. This has provided greater efficiencies, increased student participation and created a better learning environment. We were able to make these changes when the faculty moved from temporary accommodation in Liverpool to our custom built premises in Campbelltown.

Do your students like PowerLab LabTutor Systems?

Students are very impressed. In a recent survey conducted by the university, students expressed a unanimous view that they wanted to do more LabTutor experiments.

What features do students seem to enjoy?

Students enjoy recording and analyzing their own data because it is immediately relevant and interesting. They also like doing experiments themselves without any introductions or assistance from a demonstrator. In addition, by doing experiments on themselves rather than on animals, there are no ethical issues raised.

Would you recommend the PowerLab LabTutor System to other educators?

Yes, I thoroughly recommend it. The PowerLab LabTutor System is fantastic. Make it easy on yourself.

Biography

Professor Vaughan Macefield is the Foundation Chair in Physiology at the new School of Medicine, University of Western Sydney. Previously Vaughan had been an NMHRC Senior Research Fellow at the Prince of Wales Medical Research Institute since 1994 and Conjoint Associate Professor in the Faculty of Medicine, University of New South Wales (UNSW). He studied at UNSW and completed his PhD in neurophysiology in 1986. He then undertook advanced training in human neurophysiology in Sydney, Sweden and the U.S. Vaughan has specialized in recording from single nerve fibres via microelectrodes inserted into the peripheral nerves of awake human subjects. He is known nationally and internationally as a world expert in recording the firing properties of human sympathetic neurones in health and disease and as a leading investigator in human sensorimotor control.