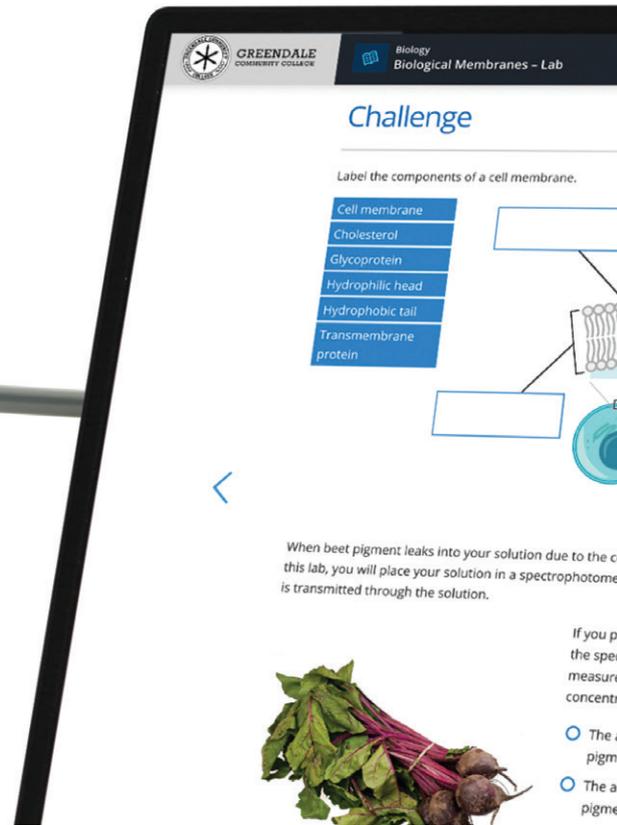




**CREATE
SHARE
INSPIRE.**

Biology Collection Overview

Engage students with hands-on experiments and lessons



Lt is a cloud-based learning platform that allows you to run biology labs without headaches.

The Lt Biology Collection includes 19 labs that encourage students to investigate core biological concepts through real-time data collection and guided inquiry.

These labs address some of the most popular topics in Introductory Biology and are supplemented with Instructor's Material, saving you from reinventing the wheel and supporting you in lab preparation. The Lt grading interface further saves you time with many autograded question types, allowing you to focus on more rigorously assessing student comprehension and application.

Designed with Core Competencies in Mind

Media-rich labs in the Biology Collection focus on the principles of active learning, and were developed to align with the core competencies laid out in the *Vision and Change in Undergraduate Biology Education: A Call to Action* report. Co-developed with Vernier, the labs encourage scientific literacy by asking students to predict outcomes, collect and analyze data, and draw evidence-supported conclusions.

Assessment questions have been created in accordance with Bloom's taxonomy to ensure diverse and rigorous assessment, and students are exposed to real-world applications of biological concepts to enhance motivation.

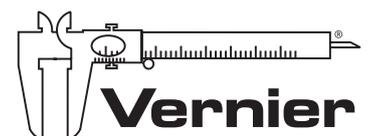
 Improved efficiency

 Improved results in theory and clinical practice

 Increased student engagement

 Increased student pass rates

In partnership with



For nearly forty years, Vernier has created award-winning technology, software, and data-analysis tools for education. Their products are trusted by universities and colleges around the world. Whether you are introducing your students to enzymes or exploring primary productivity, Vernier technology is the right fit for your laboratory.

"The photosynthesis labs (in Lt) were perfect."

- **Corban Goodman**,
Laboratory Coordinator,
La Sierra University, USA



Supporting Students at Varying Skill Levels

As with all labs in Lt, content can be easily adapted to meet your course requirements. Many of the biology labs include guided inquiry extensions that allow students to choose and investigate a research question and complete a built-in lab report. These extensions increase academic rigor and promote lab skills, often required in Majors courses, but can be quickly removed to accommodate courses without these requirements, such as in Non-Majors courses or where lab time is limited.

Whether fully online or on campus, Lt has you prepared for uncertainty. Students can complete labs remotely, using our built-in example data, or in the lab environment, using Vernier's suite of Go Direct® sensors to record biological phenomena in real time.

Lt is a fully customizable lab solution that allows you to:

- Edit pre-made content to suit your curriculum and align with your course vocabulary
- Quickly supplement labs or create new ones from your existing content resources
- Restrict access of labs to specific periods of time and grant extensions as needed
- Modify assessment questions and point values to match your academic expectations

Biology Collection

19 MODULE COLLECTION

Modules may include: Lab + Extension

Please note that 14 of the 19 labs have been developed for use with Vernier hardware. To use the hardware with Lt, you will need to download the kuraCloud Desktop Application from the ADInstruments website. For distance learning purposes, where sensors and materials cannot be supplied to students, hardware will not be required as students can analyze example data provided in Lt. Please reference the Example Data brochure for more information.

Acid Rain

Use a Go Direct® pH Sensor to measure changes in pH when CO₂ is dissolved in distilled water, and when H₂SO₄ is dissolved in distilled, fresh, and salt water, as well as a buffer.

OPTIONAL EXTENSION: Investigate how dissolved H₂SO₄ affects the pH of hard and soft water.

Animal Behavior ●

Observe behavior in *Porcellio* and *Drosophila*. Develop and test predictions as to whether these organisms have adapted to perceive and react to certain environmental changes.

Aquatic Photosynthesis

Use a Go Direct® Optical Dissolved Oxygen Probe to measure the dissolved oxygen concentration in water containing an aquatic moss under various light conditions (darkness, full spectrum, blue, and red light). Determine whether aquatic plants perform photosynthesis or cellular respiration under these conditions.

Bacterial Transformation*

Using heat-shock, transform *E. coli* with genes for Green Fluorescent Protein (GFP) and antibiotic resistance. Use arabinose to regulate the expression of the GFP gene. Calculate transformation efficiency.

**(requires the Bio-Rad pGLO™ Bacterial Transformation Kit)*

OPTIONAL EXTENSION: Investigate a research question of your choice.

Biological Membranes ●

Use a Go Direct® SpectroVis® Plus Spectrophotometer to investigate the effects of pH, temperature, detergent, and alcohols on biological membranes.

Key:

● No sensor required

● Temporarily requires the Vernier Spectral Analysis® application for data collection. Sampling in Lt will be available by Spring 2021.

Cellular Respiration

Use a Go Direct® CO₂ Gas Sensor to investigate whether germinating and non-germinating peas respire. Determine whether temperature affects the rate of respiration.

OPTIONAL EXTENSION: Investigate a research question of your choice.

Diffusion through Membranes

Use a Go Direct® Conductivity Probe to measure the diffusion of salts in solution and determine how changes in the concentration gradient and the presence of other molecules affect the diffusion rate of salt across a membrane.

OPTIONAL EXTENSION: Investigate a research question of your choice.

Enzyme Action: Testing Catalase Activity

Investigate how the concentrations of enzyme and substrate influence the reaction rate of catalase. Use a Go Direct® O₂ Gas Sensor to measure the concentration of oxygen gas formed as hydrogen peroxide is broken down.

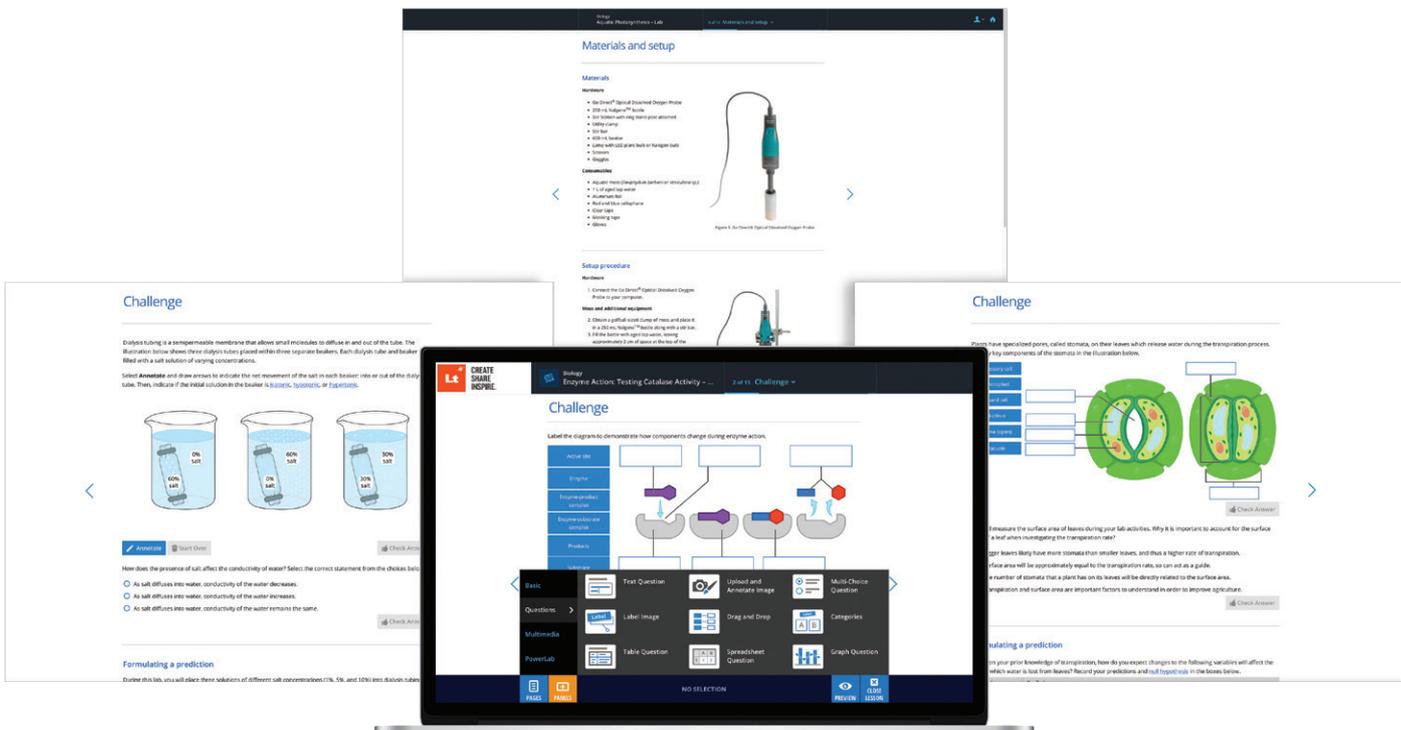
OPTIONAL EXTENSION: Investigate a research question of your choice.

Genetics of *Drosophila* ●

Demonstrate basic genetic principles using the model organism *Drosophila melanogaster*. Use Punnett squares to draw conclusions about what sort of cross has occurred and calculate chi-square statistics to test null (H₀) and alternative (H₁) hypotheses.

Interdependence of Plants and Animals

Use a Go Direct® pH Sensor and a Go Direct® Optical Dissolved Oxygen Probe to investigate how O₂ and CO₂ are exchanged among plants, snails, and surrounding water, in both light and dark conditions.



Limitations on Cell Size

Use a Go Direct® Conductivity Probe and agar cubes as cell models to investigate how altering surface area while maintaining constant volume affects the rate of material exchange with the environment.

Metabolization of Sugars by Yeast

Use a Go Direct® CO₂ Gas Sensor to determine how the metabolization rate of yeast changes with glucose concentration, and whether yeast are capable of metabolizing a variety of sugars (sucrose, glucose, fructose, and lactose).

OPTIONAL EXTENSION: Investigate a research question of your choice.

Mitosis and Meiosis

Draw each stage in the processes of mitosis and meiosis. Explore sources of genetic variability and errors in cell division. Examine histological slides, and compare and contrast the processes of mitosis and meiosis.

Photosynthesis

Use a Go Direct® SpectroVis® Plus Spectrophotometer to measure the effects of darkness and heat on photosynthetic rate. Use atrazine to observe how inhibitors affect photosynthesis.

OPTIONAL EXTENSION: Investigate a research question of your choice.

Population Dynamics

Monitor yeast population growth by measuring the turbidity of a solution with a Go Direct® SpectroVis® Plus Spectrophotometer and performing yeast cell counts using a microscope.

OPTIONAL EXTENSION: Investigate a research question of your choice.

Population Genetics and Evolution

Investigate a genetically inherited trait, calculate allele frequencies using the Hardy-Weinberg formula, and compare classroom allele frequencies to North American averages. Examine the effects of natural selection, heterozygous advantage, and genetic drift on allele frequencies.

The Visible Spectra of Plant Pigments

Measure the visible absorbance spectra of plant pigments and synthetic colorings with a Go Direct® SpectroVis® Plus Spectrophotometer.

OPTIONAL EXTENSION: Investigate a research question of your choice.

Transpiration

Use a Go Direct® Gas Pressure Sensor to ascertain the transpiration rates of woody-stemmed plants under control and experimental conditions. Non-remote only: Use a compound microscope to complete stomatal counts.

OPTIONAL EXTENSION: Investigate a research question of your choice.

Turnip Peroxidase

Use a Go Direct® SpectroVis® Plus Spectrophotometer to investigate how enzyme and substrate concentrations affect the rate of peroxidase-catalyzed reactions. Determine V_{max} , $\frac{1}{2} V_{max}$, and K_m using a Lineweaver-Burk plot.

OPTIONAL EXTENSION: Investigate a research question of your choice.

“Me and my students loved the Mitosis and Meiosis lab! All activities that my students did satisfied our learning objectives. The editing part was very easy and user-friendly. All my students were able to login and complete the lab without any problem at all. Honestly, I wouldn’t change anything.”

Idelisa Ayala, Associate Professor, Broward College, USA

Describe the outcomes of the parental cross you received by completing the Punnett squares to show the possible allelic combinations for this gene in the F1 generation.

SS Male
S S

SS Female
S S

SS Male
S s

SS Female
S S

Change Image Annotate Start Over Check Answer

Describe the phenotypes of the *F1 D. melanogaster* from the previous page, and compare these observed results to the expected genotypes in the Punnett squares.

Enter your answer here

How can Lt help?

Educators

Easy lesson authoring

Building media-rich lessons is simple. Drag-and-drop a range of content types to create interactive exercises, including multiple choice questions, short form written answers, and image annotation.

Collaborative

Share content and workload with your fellow educators and teaching assistants. Set varying levels of access to allow others to review content, add content, or publish revisions online.

Flexible grading

Automatically grade quizzes while keeping the flexibility to add feedback and positive reinforcement, and manually grade written assessments.

Onboarding

Our Instructional Design team can convert and edit your existing content and lessons to make them even better in Lt.

Administration

Simple setup

Lt needs only an internet browser to allow course administration, authoring, and publishing. Our data acquisition app, used for sampling, installs in 30 seconds.

Analytics

Our analytics allow you to view class progress in each lesson and across your course, and provide valuable insights about where and how students are interacting with course material.

Secure and scalable

Totally secure, Lt is hosted on Amazon Web Service's encrypted servers with guaranteed 99% uptime and the ability to maintain speed as more students login to Lt.

Students

Learn anywhere

Lt's cloud-based platform means students can learn on almost any device that connects to the internet. Whether they use iOS or android, tablet, mobile, or laptop, lessons will be resized and optimized to look great.

PowerLab integration

In the lab, students can record and view their own physiological signals live on screen with PowerLab and sampling panels in Lt that can record Pulse, Spirometry, ECG, Blood Pressure, and more.

Learn from real patients

For future health professionals, our patient cases allow students to follow a real patient from initial presentation to diagnosis and management. Expert healthcare professionals provide their views throughout the journey and students can practice note-taking and reflection.

Future proof

Lt is automatically updated with new features by our team of engineers, developers, and education specialists.

Getting started with Lt

Custom training and specialist support

Whether you need help with lab installation and setup, IT training, Lt training or specialized support, we can get you up and running even faster with an add-on package of training and support services.



**90-DAY
FREE TRIAL**

Sign up now adi.to/lt

Visit our website or contact your local ADInstruments representative for more information

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