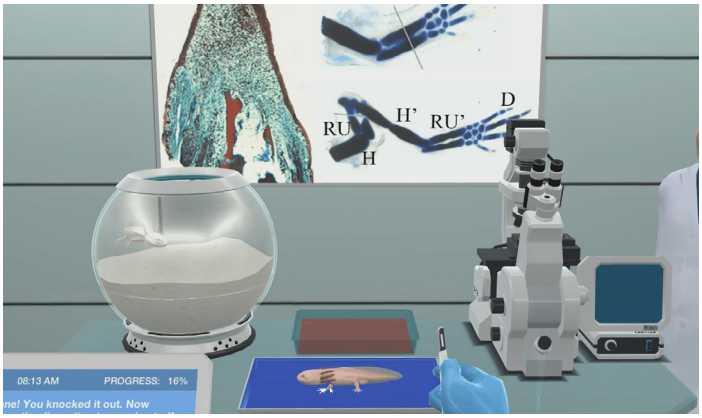
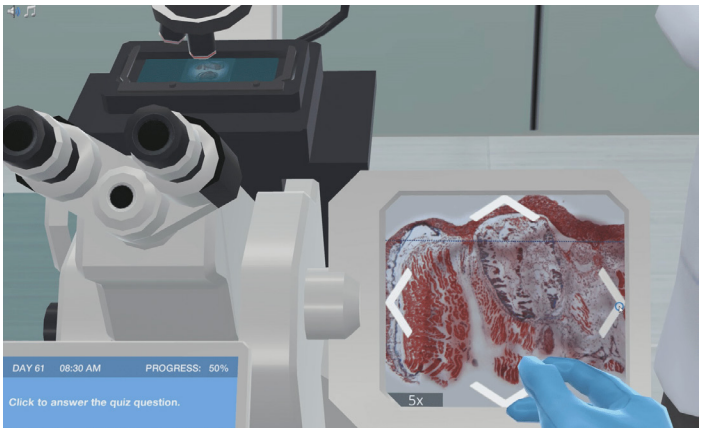
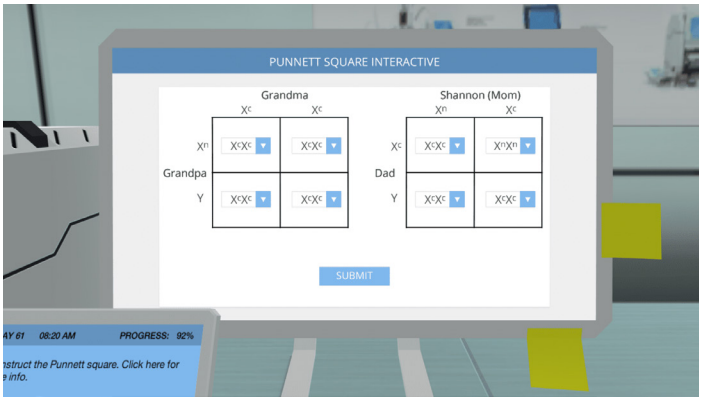
Labster Virtual Lab Simulations for Evolution and Diversity







Labster is a world-leading provider of virtual lab simulations for higher education and high schools.

The simulations are designed to let students learn by doing in a virtual laboratory, solving real-case problems. Quiz questions test the students' knowledge, supporting an inquiry-based and deep-learning approach. The students will train real lab skills in a safe virtual environment where they can safely make mistakes, and learn at their own pace.

The most basic simulations are ideal as a self-study activity since the students will review essential concepts. The more advanced simulations are designed to support the course syllabus, reinforcing concepts and giving the students an innovative tool to deepen their learning.

Labster

University Evolution and Diversity Simulations

Includes 19 simulations:

- Animal Genetics
- Behavioral Thermoregulation
- BioDiversity Simulation
- Competition
- Ecological Niches
- Ecosystem dynamics
- Embryology
- Evolution
- Food web simulation
- Foraging
- Invertebrate Model System
- Landscape Ecology
- Meiosis
- Mendelian Inheritance
- Mitosis
- Next Generation Sequencing
- Population growth [Q2 '19]
- Regeneration Biology
- Spatial Ecology

Ready to learn more?

Bring the world of science into the classroom and enable students to bring learning home with Labster's virtual science lab content. No need for additional hardware or lab equipment; access these labs on Chromebooks or any other laptops, and spark creativity in students with this innovative and interactive way to explore science.

It's a million-dollar lab, one click away.

To learn more about how you can incorporate Labster virtual labs in your teaching, visit us at www.labster.com.

Learning objectives covered in Labster's evolution and diversity simulations

Animal Genetics

Learning objectives: At the end of this simulation you will be able to...

- Explain different hereditary traits and modes of inheritance
- Construct a pedigree analysis based on observed phenotypes
- Perform genome scanning to identify candidate genes for double muscling in cattle
- Develop a DNA test for double muscling in cattle

Behavioral Thermoregulation

Learning objectives: At the end of this simulation you will be able to...

- Explain changes in microclimate over small spatial scales and predict how this would influence the energy and water budgets of an organism
- Identify ways that an organism can regulate its body temperature in a given environment and discuss the costs and benefits of each strategy
- Predict and analyze the thermoregulatory behavior of an animal in a natural environment

Biodiversity Simulation

Learning objectives: At the end of this simulation you will be able to...

- Sample for biodiversity
- Use Quadrat, camera trap and Pitfall traps
- Assess and compare biodiversity using the biodiversity index
- Identify species with a dichotomous key
- Prioritize sampling

Competition

Learning objectives: At the end of this simulation you will be able to...

- Identify competition between species and quantify the strength of competition between two species
- Establish evidence of competition in an agricultural environment

Ecological Niches

Learning objectives: At the end of this simulation you will be able to...

- Quantify a species realized niche
- Set up an experiment to compare the effect of simple variables on a species niche
- Experimentally determine a species fundamental niche
- Visualize niches using an n-dimensional hypervolume
- Measure the extent to which acclimation expands a species' niche
- Determine how trade-offs affect the boundaries of a niche

Ecosystem dynamics

Learning objectives: At the end of this simulation you will be able to...

- Understand how the respiratory and cardiovascular system responds during exercise.
- Understand how cardiac output and blood pressure can be measured.
- Understand how heart rate, stroke volume, cardiac output and total peripheral resistance change with exercise.
- Interpret data to assess possible cardiovascular problems during exercise

Embryology

Learning objectives: At the end of this simulation you will be able to...

- Understand the advantages and disadvantages of the mouse and chicken models
- Understand the different developmental stages and compare them between organisms
- Understand the molecular pathway responsible for forming forelimbs or hindlimbs

Evolution

Learning objectives: At the end of this simulation you will be able to...

- Understand how populations evolve by adapting to their environment
- Understand the basic mechanisms of evolution
- Understand evolution as the foundation of biology and show evidence for it
- Use DNA sequencing and phylogenetic trees to identify an unknown creature
- Deal with common misconceptions about the theory of evolution

Food Web Simulation

Learning objectives: At the end of this simulation you will be able to...

- Understand food webs
- Explain the differences between different trophic cascades
- Calculate the amount of energy needed for maintenance

Foraging

Learning objectives: At the end of this simulation you will be able to...

- Understand the concepts of optimal foraging theory, foraging currency and daily budget
- Predict a foraging model using a model of energy gain given a tradeoff between energy and nutrients.
- Correct the model with field studies identifying additional environmental factors
- Compare the behavior of risk-prone individuals in a stress situation versus controls (risk-sensitivity)

Invertebrate Model System

Learning objectives: At the end of this simulation you will be able to...

- Explain the importance of C. elegans as an invertebrate model system in medical research
- Perform a forward genetic screen
- Use sequencing data to discover the genes of interest

Landscape Ecology

Learning objectives: At the end of this simulation you will be able to...

- Determine factors that affect the location of patches within a landscape
- Calculate species extinction rates using species-area and endemics-area theory
- Estimate species extinction and colonization rates in a heterogeneous landscape
- Explain the impact of landscape spatial heterogeneity on population dynamics

Meiosis

Learning objectives: At the end of this simulation you will be able to...

- Understand assisted reproduction technology
- Understand the basic principle of meiosis
- Use the microscope to observe the phases of meiosis and understand their main characteristics
- Understand the main differences between mitosis and meiosis

Mendelian Inheritance

Learning objectives: At the end of this simulation you will be able to...

- Explain how traits are passed on from parents to their offspring and what causes variation between siblings
- Describe Mendel's Laws of Inheritance in color deficiency
- Compare and predict the phenotypes of offspring with given genotypes using Punnett squares
- Analyze dominant and recessive alleles, and how they play a part in an individual's biological make-up

Mitosis

Learning objectives: At the end of this simulation you will be able to...

- Understand and visualize basic concepts about eukaryotic cells such as main cellular components and DNA packaging by immersive animations
- Understand the key characteristics of the cell cycle´s different stages: interphase (G1, S and G2) and mitosis
- Use different microscopy techniques to observe the phases of the mitosis and understand their main characteristics:
  - Prophase
  - Metaphase
  - Anaphase
  - Telophase
- Understand the cell cycle checkpoints and the molecules that control them (cyclins and cyclin-dependent kinases)
- Understand the main differences between mitosis and meiosis

Next Generation Sequencing

Learning objectives: At the end of this simulation you will be able to...

- Understand the different steps in sample preparation, cluster generation, sequencing and data processing
- Understand the characteristics of ancient DNA
- Understand that Single Nucleotide Polymorphism (SNP) can be tightly correlated to a specific physical feature

Population growth

Learning objectives: At the end of this simulation you will be able to...

- Assess the population structure using data from mark-recapture to estimate the average age of death and fecundity
- Predict the growth of a population using a mathematical model

Regeneration Biology

Learning objectives: At the end of this simulation you will be able to...

- Understand that the ability to regenerate tissues varies throughout vertebrates
- Describe what a blastema is and the cell types that compose this structure
- Understand the concept of positional information in regenerative biology

Spatial Ecology

Learning objectives: At the end of this simulation you will be able to...

- Map the distribution of species over a region and identify hotspots for biodiversity.
- Relate patterns of biodiversity to abiotic or anthropogenic conditions.
- Describe and explain gradients in abiotic factors in an area.