The Living Earth with Labs

Edgenuity, Inc ()

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Pending

Submission Feedback

APPROVED

Basic Course Information

School(s) Offering This Course:

School Name	Course Learning Environment	Transcript Code(s)	
Edgenuity, Inc ()	Online	Abbreviation	Course Code

Title:	The Living Earth with Labs
Transcript abbreviations:	
Length of course:	Full Year
Subject area:	Laboratory Science (D) / Biology/Earth & Space Sciences
UC honors designation?	No
Non-honors equivalent course:	{{ getNonHonorsEquivalentDisplayValue() }}
Non-honors exemption details:	
Prerequisites:	Algebra I (co-requisite if course is taken in grade 9) (Required) English Language Arts 9 (co-requisite if course is taken in grade 9) (Recommended) None
Co-requisites:	None

Integrated (Academics / CTE)?	No
Does your course include lab activities in your course description?	Yes
Grade levels:	9th, 10th, 11th, 12th
Course learning environment:	Online

Online course self assessment

A. Content (13)

B. Instructional Design (11)

C. Student Assessment (7)

D. Technology (11)

E. Course Evaluation and Support (10)

Course Description

Course overview:

This Course Overview is not available on the A-G Course Management Portal. For more information about this course, you need to contact the institution that authored this course.

> This compelling full-year course engages students in the study of life and living organisms and examines applications of biology and biochemistry in the natural world. It encompasses traditional concepts in biology and encourages exploration of new discoveries in this field of science. The components include biochemistry, cell biology, cell processes, heredity and reproduction, the evolution of life, taxonomy, ecology, and human impacts on the environment. The course includes

teacher-supervised, hands-on laboratory activities that involve inquiry, observation, analysis and write-up and account for twenty percent of class time, and the content emphasizes the application of scientific thinking to the real world and was specifically designed to meet the Next Generation Science Standards.

Course content:

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Ecosystem Interactions and Energy

In this unit, students examine interactions that occur between organisms and the environment, including identifying the importance of the cycles of matter to ecosystems. Students explore relationships between organisms in ecosystems, including predator-prey and symbiotic relationships. In addition, students analyze the flow of energy through an ecosystem, and how various factors such as density-dependent, density-independent, birth rate, and death rate affect population size and growth. In this unit and throughout the course, students are assessed through formative assessment as embedded assignments and checks for understanding during instruction, formal assessments at the end of each lesson, unit, and semester, and formal written laboratory reports, essays, and projects.

Unit Assignment(s):

Cycles of Matter

Students develop and use models by completing a project in which they develop a scientific model that illustrates the role of photosynthesis and cellular respiration in the carbon cycle. The model also examines how carbon cycles between the Earth's four spheres. Then students also produce a detailed written description of the content contained in the model and submit their projects for teacher review.

Population Growth

Students ask scientific questions, analyze data, and construct scientific explanations by conducting research to determine how factors such as climate, resources, and habitat size affect the carrying capacity and biodiversity of a specific ecosystem. Students ask how humans affect biodiversity and utilize evidence from their research to support their answer. They also ask what will happen to the populations in the ecosystem if a scenario continues for the next century, and why these predictions are possible. Students produce a written report of the conclusions they drew from their research in response to the scientific questions, including detailed evidence to support their responses.

Energy Flow in Ecosystems

Students utilize a model of the trophic levels within an ecosystem to describe the transfer of matter and flow of energy between organisms. Students produce a written explanation that utilizes appropriate scientific evidence and discusses how biomass is transferred when one organism eats another, what happens to the energy that is not transferred between organisms, and why fewer organisms are found at the top of an energy pyramid.

🧪 Unit Lab Activities:

Lab: Interdependence of Organisms

The classroom teacher guides students to develop a hypothesis based on the question, “How can the presence of one species benefit another in the same ecosystem?” Students then conduct a classroom experiment in which they grow two groups of lima bean plants, one in soil with worms and one in soil without, to examine how the presence of the worms impacts the health of the plants, while making predictions and participating in class discussions. Upon completing the experiment students produce a final draft of a detailed lab report in which they analyze their findings, utilizing mathematics and computational thinking as they consider variability and error when assessing the relationship between observation and theory.

Earth’s Atmosphere: Photosynthesis and Respiration

In this unit, students examine how the chemistry of earth’s atmosphere and oceans have changed over geologic time, as well as interactions between the four spheres of the Earth system, including the cycles of matter. Students then identify the elements most commonly found in living organisms and compare the structures and functions of the four major macromolecules. Students then outline the steps of the light-dependent and light-independent reactions in photosynthesis, as well as compare and contrast the two reactions of photosynthesis. Students complete this unit by examining the processes of aerobic and anaerobic cellular respiration and describing the importance of cellular respiration to living organisms.

💻 Unit Assignment(s):

Cellular Respiration

Students complete a project in which they analyze scientific models and construct scientific explanations by utilizing various models to identify the main steps of cellular respiration and glycolysis, model the production of Acetyl-CoA, determine inaccuracies in a model of the electron transport chain, and identify the correct order of the steps of aerobic cellular respiration. Students produce a detailed written explanation of the evidence they gather in the assignment, conduct

additional research on chemosynthetic organisms guided by research questions, and revise their written explanations to include the new information and explain what they learned, and finally evaluate their projects before submitting them to the teacher.

🧪 Unit Lab Activities:

Lab: Identifying Nutrients

The classroom teacher guides students to develop a hypothesis based on the question,,"Which macromolecules are present in the mystery food sample," as well as make predictions regarding what their results may be. Students then investigate various food samples for the presence of macromolecules using indicator solutions and positive controls. Throughout the investigation, the teacher reinforces important information and guides students through the effective use of scientific tools and technology, as well as facilitates class discussion regarding experimental results. Upon completing the experiment, students produce a detailed lab report in which they analyze their findings, utilizing mathematics and computational thinking as they consider their results and possible sources of error.

Evidence of Common Ancestry and Diversity: Part 1

Within this unit, students will begin their investigation of the common ancestry and diversity of organisms on Earth, specifically focusing on how the structure of the Earth has changed over time and how processes on Earth affect its organisms. Students will examine the theories of continental drift and plate tectonics and describe their relationship to the study of ancient organisms. Students will also identify methods utilized to approximate the age of fossilized organisms, as well as explain how processes such as erosion and deposition have affected the Earth's inhabitants over time.

💻 Unit Assignment(s):

Plate Tectonics

Students first review the evidence for plate tectonics and the results of the movement of these plates on Earth. Students review several examples and analyze the types of plate boundaries that appear all over the world through photographs and exploratory questions. Then students produce a short writing that allows teachers to assess their understanding of and ability to apply the lesson content. In the writing students explain how plate tectonics have changed Earth's surface over time, using examples and including information such as the different types of plate boundaries and what happens at each plate boundary in the creation of landforms over time.

Unit Lab Activities:

Lab: Modeling Water Erosion

The classroom teacher models the data that students will record during this lab and then facilitates the lab while students work in pairs or small groups to plan and carry out a scientific investigation. In this investigation, students utilize a stream table with sediment samples including sand, pebbles, and rocks of varying sizes to model differing stream processes and observe stream behavior. Throughout the investigation, students will work with the teacher to formulate hypotheses that predict how factors such as water velocity, water volume, and sediment size affect the power of a stream or river to cause erosion. During the lab the teacher presents variations of the lab for extended activities and facilitates a class discussion after the experiment to help students make comparisons and draw conclusions. Finally, students analyze the data they collected in order to draw conclusions and produce a detailed lab report about the effects of factors on stream erosion and behavior.

Evidence of Common Ancestry and Diversity: Part 2

This unit introduces students to evolutionary theory and its importance within biology. Students begin by examining Darwin's theory and the main points of natural selection, and participate in a laboratory activity to investigate how natural selection acts as a mechanism for evolution. Students then compare other mechanisms for evolution, including genetic drift, gene flow, and how directional, disruptive, and stabilizing selection affect biological diversity. In addition, students examine how new species are formed through biogeographic isolation, and analyze scientific evidence that supports the theory of evolution. Finally, students determine how evolutionary history impacts the classification of organisms over time.

Unit Assignment(s):

Evolutionary Relationships

Students learn about evolutionary relationships through a series scenarios and questions. They first answer questions about classification systems to review the history and better understand DNA analysis and evolutionary relationships. Then students use cladograms to answer additional questions to identify derived characteristics. The questions are a graded assignment that assesses understanding of lesson content and guides students to develop a hands on understanding of the impact of evolutionary history by exploring which species are most closely related and what characteristics they possess.

Biogeographic Isolation

Students interpret scientific data, as well as obtain and communicate data by completing a project in which they research and analyze the speciation of Galapagos Island finches. Upon completing their research, students evaluate the data collected to formulate a written response to questions to apply factors that affect evolution and make predictions about how the species would have changed given different environmental factors. Students must write detailed responses and support each response and prediction with evidence from their research.

🧪 Unit Lab Activities:

Lab: Natural Selection

Students begin by forming a hypothesis about how the relative abundance of different food sources might impact bird populations with different beak structures over time. The teacher helps students explore natural selection scenarios, following several flocks of birds with different beak structures that compete for various types of food through multiple generations of bird populations in order to compare the results. Then the teacher helps students to recreate the scenario in the lab where students separate into three groups to represent three flocks of birds to compete for several types of food like sunflower seeds, raisins, and grains of rice using different types of utensils such as pairs of forks, spoons, and knives to use like a beak with a cup to represent the bird's stomach. After each experiment students record the data for each flock and each type of food in a table and use mathematics and computational thinking in group discussion to determine flock size to the third generation. Finally, students reflect on the lab to determine if the hypothesis was supported and write a detailed lab report.

Inheritance of Traits: Part 1

This unit builds the foundation for student understanding of the genetic code and its relationship to trait inheritance. Students initially examine the discovery of the genetic code and describe the relationship between DNA, genes, and chromosomes. Students then analyze the structure of chromosomes, including the roles of crossing over and independent assortment in meiosis and trait inheritance. In addition, students identify common types of DNA mutations and the effects of these mutations on the characteristics of living organisms, including how harmful environmental factors affect DNA.

💻 Unit Assignment(s):

DNA Mutations

Students engage in argument from evidence by completing a project in which they investigate and analyze claims about the causes of inherited genetic variation being genetic or environmental. Then they utilize their own prior knowledge to make a personal claim regarding a cause of inherited genetic variation, and defend this claim using additional scientific evidence in a written research paper. This assignment both assesses student understanding of lesson content and requires them to analyze and synthesize the information in real world application.

Genetic Code

Students complete a project in which they ask scientific questions to enhance their understanding of the role of DNA and chromosomes in the expression of heritable traits. In order to answer their questions, students conduct scientific research and compose a written document that includes their questions and answers based on the evidence found. This assignment enables students to build on what they learned in the lesson about genetic code.

🧪 Unit Lab Activities:

Lab: Mouse Genetics (One Trait)

Students participate in a laboratory investigation to explore the relationship between genotype and phenotype. Students work in pairs or small groups to conduct systematic observations about dominant and recessive alleles and use appropriate laboratory tools to gather, analyze and interpret data while the teacher reinforces important information and guides students through the effective use of Punnett squares. Throughout the investigation, students will work with the teacher to formulate hypotheses that predict the effects of the genes of parental mice on the fur color of offspring mice. Students also apply mathematics and computational skills by calculating percentages and analyzing possible sources of experimental error. Upon completion, students compose a lab report which communicates results of their scientific investigation and proposes methods for improving upon the overall experimental design.

Inheritance of Traits: Part 2

In this unit, students continue their examination of trait inheritance, specifically examining the role of genetics in inheritance. Students initially identify the importance of Gregor Mendel to the field of genetics, and examine his role in the development of the laws of inheritance. Students then apply their knowledge of these laws to Punnett squares and determine possible inheritance patterns seen in monohybrid and dihybrid crosses. Students then expand their examination of genetics to patterns of non-mendelian inheritance, including analyzing examples of polygenic traits, incomplete dominance, codominance, and sex-linked inheritance. Finally, students participate in a lab which demonstrates how alleles are passed independently of one another using the law of inheritance to describe how two separate traits are inherited in an organism.

💻 Unit Assignment(s):

Sex-linked Inheritance

Students read an informational text to develop a better understanding of sex linked genes then apply what they learn in the article to produce a short writing that explains why women are often carriers of X-linked traits but rarely affected by them. Students then extend this understanding by analyzing scenarios, responding to questions, and submitting their responses. Students analyze inheritance patterns for several pedigrees to explain genotypes of them, their parents, and hypothetical children

🧪 Unit Lab Activities:

Lab: Mouse Genetics (Two Traits)

Students begin by forming hypotheses about whether and how, if a mouse inherits a particular form of one trait, the inheritance of the other trait will be affected. Students then participate in a laboratory experiment to understand the effect of the inheritance of one trait on the inheritance of a second trait. Students work in pairs or small groups to collect data to see if it supports the hypothesis. Upon completion of the experiment, students apply mathematics and computational skills to analyze the collected data and predict the offspring of a specific pair of organisms, as well as calculate ratios of predicted offspring and convert ratios to predicted percentages. Students then utilize the data collected to compose a detailed written laboratory report.

Structure, Function, and Growth (From Cells to Organisms): Part 1

In this unit, students study the characteristics of living organisms, including cellular structure and the importance of organelles in cellular functions. Students also examine how cells maintain homeostasis and the importance of homeostasis to living organisms, and complete a laboratory activity to analyze the role of diffusion in cellular homeostasis. In addition, students describe the role of DNA replication in transmitting genetic information, as well as analyze the similarities and differences between DNA and RNA and explain the relationship between transcription, translation, and protein synthesis. Finally, students identify the stages of mitosis and describe the importance of mitosis to living organisms.

💻 Unit Assignment(s):

Cell Differentiation and Specialization

Students develop scientific models by completing a project in which they create an illustration that models stem cell division and differentiation. Students also formulate a written summary of the information included in the illustration, including brief descriptions of stem cells, stem cell division and differentiation, and the role of specialized cells in complex organisms.

Unit Lab Activities:

Lab: Building Proteins from RNA

Students develop a hypothesis about the protein created from DNA and then analyze and interpret data to determine if the hypothesis is supported as they investigate the structure of DNA and examine how proteins are built using the information in RNA molecules. During the investigation, students interpret the information provided in a codon wheel in order to find the correct tRNA anticodons and their corresponding amino acids. Teachers monitor student work to help them determine the anticodon they need given the large number of options, and provide variations to the lab that lead to an increased student understanding of building proteins from RNA and its applications. After the lab, students write a detailed report that includes an explanation of their results, describing how the two processes in the lab work together to produce a polypeptide, and eventual protein, based on the information provided in the DNA.

Structure, Function, and Growth (From Cells to Organisms): Part 2

In this unit, students continue their examination of organisms by explaining how organisms are classified, and identifying reasons systems of classification may change. Students then distinguish between the six kingdoms of living organisms and compare characteristics of individual taxonomic groups, including plants, protists, fungi, and bacteria. Students also compare and contrast the structures of animal and plant cells, as well as differentiate between the levels of organization in the human body and complete a laboratory activity to investigate how the systems of the human body work together to maintain homeostasis.

Unit Assignment(s):

Methods of Classification

Students practice identifying the organelles found in animal and plant cells and categorize them accordingly through a series of open ended questions that allows teachers to assess student mastery of lesson content. Students explain why vacuoles in plant cells are necessary, identify organelles, explain the importance of chloroplasts, and compare and contrast functions for a deeper understanding of organelles. At the end of the assignment students submit their written responses for a grade.

🧪 Unit Lab Activities:

Lab: Exercise and Homeostasis

Students ask scientific questions and plan and conduct an investigation to examine how heart rate changes before and after performing exercise. At the beginning of the lab the teacher demonstrates how to find heart rate, works with students to ensure investigations are feasible and effective, and makes sure the necessary resources are available. Students develop a testable hypothesis, and work with a partner or in small groups to examine differences in heart rate at rest and after performing a given exercise for a specific amount of time. Students conduct the investigation twice in order to ensure accurate data is collected, then apply scientific literacy and mathematical skills to analyze collected data and create a written laboratory report.

Ecosystem Stability & the Response to Climate Change: Part 1

In this unit, students examine factors that impact the stability of ecosystems, including populations of organisms in individual ecosystems. Students identify biotic and abiotic factors within an ecosystem, as well as compare and contrast positive and negative interactions between organisms and their environment. Students then examine how various environmental changes impact ecosystem stability, including explaining the stages of succession in an ecosystem and describing how succession and extinction impact the overall health of an ecosystem.

💻 Unit Assignment(s):

Succession and Extinction

Students engage in argument from evidence by conducting scientific research to investigate and evaluate the following claim: Changes in environmental conditions always result in new ecosystems and loss of biodiversity characterized by an increase in the number of some species, the evolution of new species, and the extinction of some species. Students develop a claim, support the claim with examples from both the lesson and their research, refute invalid claims, and formulate a written conclusion about the stability of ecosystems, how and what can affect the stability of ecosystems, and how changes in the environment may affect the types and number of living things in an ecosystem.

🧪 Unit Lab Activities:

Lab: Diffusion across a Semi-Permeable Membrane

Students participate in a laboratory investigation to explore the process of diffusion across a semipermeable membrane. The teacher introduces several real world examples such as salty food making people thirsty and starch breaking into glucose during digestion. Students formulate a hypothesis and examine the movement of glucose and starch molecules across a membrane utilizing Lugol's and Benedict's solutions as indicators while the teacher ensures proper use of materials and that all data is recorded. Upon completion, students analyze collected data and produce a written lab report that explains whether the hypothesis was supported based on the data they collected, also revising the hypothesis as needed and identifying what they could have done differently.

Ecosystem Stability & the Response to Climate Change: Part 2

In this unit, students examine how Earth's climate has changed throughout history, and analyze causes of short- and long-term climate change. Students also examine the impact of human activities on ecosystems, and how these activities contribute to problems such as pollution and acid rain. Finally, students plan and conduct an investigation to identify sources of water pollution and examine how pollution affects the overall quality of surface water and groundwater resources, in addition to further developing scientific literacy skills through the creation of a written lab report.

💻 Unit Assignment(s):

Human Impact on the Environment

Students define real-world problems and solutions utilizing scientific evidence by completing a project in which they conduct research to evaluate human impact on coral reef ecosystems. They utilize the research and additional scientific evidence to create a written proposal and evaluation of possible real-world solutions to reduce the negative effects of human activity on this ecosystem and its biodiversity.

🧪 Unit Lab Activities:

Lab: Effects of Human Activity on Freshwater Resources

Students plan a scientific investigation under teacher supervision to model the effects of human activity on Earth's freshwater resources. As part of the investigation, students examine sources of surface water and groundwater pollution and analyze overall water quality. While planning the investigation, students develop appropriate hypotheses, select appropriate scientific tools and techniques, identify types of data to collect, and correct for possible sources of error. During the

investigation, students utilize appropriate laboratory tools to examine how pollution affects the quality of water, as well as how pollutants move from freshwater resources into groundwater. Finally, students write a detailed lab report with their findings.

Course Materials

Multimedia

Title	Author	Director	Name of video series	Date	Website	Medium of Publication
Edgenuity Course Map	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Learning Resource
Edgenuity Instructional Videos	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Learning Resource
Edgenuity eNotes	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Learning Resource
Edgenuity eWriter Tool	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Learning Resource
Edgenuity CloseReader Interactive Reading Environment	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Learning Resource

Other

Title	Authors	Date	Course material type	Website

Title	Authors	Date	Course material type	Website
Enzymes	Royal Society of Chemistry	2004	Informational Text	[empty]
Sex-Linked Genes	Dennis O'Neil	2012	Informational Text	[empty]
Endosymbiotic Theory	Edgenuity Staff	2012	Informational Text	[empty]
Discovering the Structure of DNA	Edgenuity Staff	2012	Informational Text	[empty]
Wet Lab Guides	Edgenuity Staff	[empty]	Instructional Guides	[empty]

Supplemental Materials

Title	Content

No course materials have been added to this course.

Additional Information

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