

Agora Cyber Charter Middle School
Syllabus

Course Title: Life Science
2014-2015

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Science is the field of asking “why.” It is the field of questioning everything around you and then designing an investigation to attempt to discover the answer to your questions. In school, the subject of Science allows you the opportunity to put together everything that you are learning in all of your other courses (History, Math, Literature, Language Skills) and develop your skills further in a real-world way. Science is everything and everywhere around you.

The K¹² Life Science program invites students to investigate the world of living things—at levels both large and small—by reading, observing, and experimenting with aspects of life on earth. Students explore an amazing variety of organisms, the complex workings of the cell, the relationship between living things and their environments, and discoveries in the world of modern genetics. Practical, hands-on lesson activities help students discover how scientists investigate the living world.

Through class interactions at Agora, students will perform laboratory activities in each unit of study and will gain experience with not only the process involved in a scientific investigation but also science literacy. Students will hone their skills in order to distinguish among facts, reasoned judgment based on research findings, speculation in a text and be able to analyze information gained from a variety of sources regarding its respective value and reliability.

Students will study a variety of topics in biology, including:

- The chemical building blocks of life
- Fundamentals of ecology and life’s environments
- The biology of organisms from bacteria to mammals
- The life processes of plants
- The variety of cell structure and how cells perform the tasks necessary for life
- Fundamentals of genetics

SUPPLIES:

Standard Curriculum Items-Provided by K12

- Graduated Cylinder, 100 mL
- Radish seeds
- Microscope slides (12)
- Slide cover slips (12)
- Transparencies (12)
- 3 Petri dishes & 2 agar vials
- Rhizobium bacteria
- Green bean bush seeds
- Safety Glasses
- Magnifying Glass
- Advanced Thermometer
- Microscope
- Student Pages (Green workbook pages)

CLASSROOM POLICIES AND PROCEDURES:

ATTENDANCE and PARTICIPATION:

The Agora Cyber Charter School attendance policy is designed to promote maximum achievement, develop time management skills and foster success in the online environment. We will be following the Attendance Policy as outlined in the student handbook. Please see the student handbook for details.

Asynchronous students are expected to complete lessons on their daily plan on a regular basis in order to be mark as present for class.

The teacher cannot excuse absences. All notes and technical excuses must be sent to the attendance office via k-mail.

GRADING POLICY:

Please refer to **handbook** for more information.

- Each graded assignment will be assigned a specific due date.
- After the due date or multiple attempts, teachers are permitted to request a meeting with the Learning Coach and student before unlocking or accepting late assessments/assignments.
- Extra Credit is only awarded for work above the course curriculum/assessments when all assignments/assessments are up to date. Assigning students extra credit is up to the teacher's discretion.

GRADED ASSIGNMENTS:

Grades for this course will be derived from a list of weighted categories.

- 85% of your grade will come from summative unit assessments (Units 1-10) and weekly quizzes
- 15% of your grade will come from lab reports/projects completed each unit. (1 per unit of study)

DUE DATES:

Due dates will be determined for each assignment and at teacher discretion. Please remember to check the class website and your kmail often to keep up on assignment due dates and mark them on a calendar. Failure to meet a deadline will require students to meet with the teacher in order to establish criteria for the assignment to be accepted.

CLASS EXPECTATIONS:

- Students will **ACTIVELY** participate in daily live sessions.
- Students will complete all assigned work by due date for each quarter.
- Students will check K-mail at least twice a day.
- Students will contact the teacher when completing late work.

A word from the National Science Teachers' Association on The Nature of Science and Scientific Theories (Available at <http://www.nsta.org/about/positions/evolution.aspx>)

Science is a method of explaining the natural world. It assumes that anything that can be observed or measured is amenable to scientific investigation. Science also assumes that the universe operates according to regularities that can be discovered and understood through scientific investigations. The testing of various explanations of natural phenomena for their consistency with empirical data is an essential part of the methodology of science. Explanations that are not consistent with empirical evidence or cannot be tested empirically are not a part of science. As a result, explanations of natural phenomena that are not based on evidence but on myths, personal beliefs, religious values, and superstitions are not scientific. Furthermore, because science is limited to explaining natural phenomena through the use of empirical evidence, it cannot provide religious or ultimate explanations.

The most important scientific explanations are called "theories." In ordinary speech, "theory" is often used to mean "guess" or "hunch," whereas in scientific terminology, a theory is a set of universal statements that explain some aspect of the natural world. Theories are powerful tools. Scientists seek to develop theories that

- are firmly grounded in and based upon evidence;
- are logically consistent with other well-established principles;
- explain more than rival theories; and
- have the potential to lead to new knowledge.

The body of scientific knowledge changes as new observations and discoveries are made. Theories and other explanations change. New theories emerge, and other theories are modified or discarded. Throughout this process, theories are formulated and tested on the basis of evidence, internal consistency, and their explanatory power.

Science Course Outline

Organisms – Unit 1

From giant redwoods to tiny algae, and from lumbering elephants to "no-see-em" gnats, the diversity of life on earth delights, startles, and amazes. But all living things share some common characteristics. What are the characteristics of life? What is the chemical basis for life? What molecules support life? In this Unit you'll explore these questions and more.

- Introduction to Life Science
- Diversity of Life
- Challenges of Life
- Characteristics of Life
- Classification of Living Things
- Domains of Life
- Chemistry of Life
- Single-Celled Organisms
- Multicellular Organisms

Cells – Unit 2

They're everywhere, and they control our lives. What are they? Alien invaders? No. They are cells. They are inside us and all around us, in every living thing on earth. They are constantly growing, reproducing, communicating, and using energy. They sense, respond, and adapt to their environment. You've probably never thought much about cells, but there's much to discover about their intriguing lives.

- The Cell
- Differing Cells
- Cell Organelles
- Looking at Cells
- DNA Makes RNA Makes Proteins
- Plant and Animal Cells
- Cells and Energy
- Diffusion and Osmosis
- Cell Division
- Mitosis

Living Systems – Unit 3

Organisms must meet many challenges to survive. The systems in multicellular organisms are like the different parts of a computer. Just as all the parts of a computer must function individually so that the computer will work, all the systems in an organism work together in a coordinated manner to keep the organism alive. What are these systems? How are they related? This unit will explore living systems and how they function.

- From Cells to Organs
- Muscular and Skeletal Systems
- Respiratory System
- Circulatory System
- Digestive and Excretory Systems
- Immune System
- How Systems Work Together
- Comparison within Species
- Continuation of Species
- Cells for Reproduction
- Life Cycles

Interdependence of Life – Unit 5

Look at everything in an aquarium. How do you think each of the organisms in the aquarium survives? If you were to draw a diagram of the interactions that take place in an aquarium, you would see a complex series of relationships. In the living world, no organism can survive by itself. Living things depend on other organisms and their environment to supply them with their needs.

- Organisms and Their Needs
- Staying Balanced
- Responses
- Ecosystems
- Populations
- Cycles in Nature
- Energy Flow in Ecosystems
- Food Chains
- Food Webs
- Competitive Relationships
- Cooperative Relationships

Adaptation and Change – Unit 6

Every organism lives in a particular type of environment. In this unit, we will explore how populations change over time to survive in their environments, and what happens when the environment changes.

- Change Over Time
- Structural Adaptations
- Behavioral Adaptations
- Extinct or Endangered?
- Changes in Ecosystems
- Rates of Environmental Change
- Population Changes
- The Human Factor

Genetics – Unit 7

Individuals that reproduce sexually have many characteristics that make them different from each other. In this unit, you will learn about the mechanisms responsible for these differences.

- Mendel's Pea Plants
- Genes and Alleles
- Inheritance
- Punnett Squares
- Similarities Among Organisms
- Chromosomes
- Meiosis

- Meiosis and Mitosis
- Mutations
- Genetic Engineering

History of Life on Earth – Unit 8

Galaxies teeming with stars. Mysterious black holes. Exploding supernovas. The far reaches of the universe are filled with wonders. Right here on our own planet, however, is perhaps the greatest wonder of all: life. Scientists currently know of no other place in the universe where life exists. This unit explores scientists' ideas about how life originated on earth and how it has changed over its long history.

- Origin of Life on Earth
- The Theory of Evolution
- Natural Selection
- Origin of New Species
- Development of Life

A Word on Evolution as a Unifying Concept from the National Science Teacher's Association:

(Available from <http://www.nsta.org/about/positions/evolution.aspx>)

Evolution in the broadest sense can be defined as the idea that the universe has a history: that change through time has taken place. If we look today at the galaxies, stars, the planet Earth, and the life on planet Earth, we see that things today are different from what they were in the past: galaxies, stars, planets, and life forms have evolved. Biological evolution refers to the scientific theory that living things share ancestors from which they have diverged; it is called "descent with modification." There is abundant and consistent evidence from astronomy, physics, biochemistry, geochronology, geology, biology, anthropology, and other sciences that evolution has taken place.

As such, evolution is a unifying concept for science. The *National Science Education Standards* recognizes that conceptual schemes such as evolution "unify science disciplines and provide students with powerful ideas to help them understand the natural world" (p. 104) and recommends evolution as one such scheme. In addition, *Benchmarks for Science Literacy* from AAAS's Project 2061, as well as other national calls for science reform, all name evolution as a unifying concept because of its importance across the disciplines of science. Scientific disciplines with a historical component, such as astronomy, geology, biology, and anthropology, cannot be taught with integrity if evolution is not emphasized.

There is no longer a debate among scientists about whether evolution has taken place. There is considerable debate about how evolution has taken place: What are the processes and mechanisms producing change, and what has happened specifically during the history of the universe? Scientists often disagree about their explanations. In any science, disagreements are subject to rules of evaluation. Scientific conclusions are tested by experiment and observation, and evolution, as with any aspect of theoretical science, is continually open to and subject to experimental and observational testing.

A word on the inclusion of the theories of Evolution through Natural Selection in the Agora Science Curriculum

It is position of Agora Cyber Charter School that all students participating in the Middle School Life Science course should be exposed to the concepts discussed in the teaching of Evolution covered in Unit 8 of this Course. The topics covered in this unit are addressed in the Pennsylvania State Science Standards and Agora, as a public school, is required by law to ensure that all students are exposed to this material.

It is *not* the intention of the School or the teachers who teach this subject to interfere with individual personal beliefs or to attempt to force a set of beliefs on its students. Instead, it is the intention to ensure that students are exposed to the material so as to understand a unifying concept that is commonly accepted by the scientific community.

All content discussed in this unit comes from current commonly accepted scientific theory. Topics that do not pertain to commonly accepted scientific theory cannot and shall not be addressed in this class.

The goal of Agora Cyber Charter School and its teachers is to provide the best possible educational experience for each student. In order for this goal to be met, there is also a need for students to assume personal responsibility for their behavior in class. Students share with the school community responsibility for developing Agora Cyber into a school that exemplifies high standards and excellence. If a student chooses not to act in accordance with class expectations while participating in live class sessions, administrative action will be required in order to ensure the best possible educational experience for all students participating in the class session.

Science Investigation – Unit 10

NOTE: Unit 10 will be split up and taught throughout the school year instead of all at once at the end of the year. This will allow students to practice their skills using the scientific method and data collection/analysis throughout the other units of study during the school year.

- Scientific Methods
- Design and Set Up Your Experiment
- Data Collection
- Data Analysis
- Reporting Conclusions

Dear Parent/ Guardian:

If you have any questions about your child's progress in the class or other concerns, please kmail me or call me at 717-395-9613.

Mrs. Heidi Lucier
Life Science