HOUSTON ISD
AP BIOLOGY
COURSE SYLLABUS

I. Course Setting:

School: Public high school in a large urban city with a diverse population

Prerequisites: Biology and Chemistry (or concurrently enrolled in Chemistry)

Instructional Materials: text books and lab manuals

- Urry, Cain, Wasserman, Minorsky, Jackson, Reece. *Campbell Biology in Focus.* Pearson Education Inc., 2014
- *AP Biology Investigative Labs: An Inquiry-Based Approach.* New York: College Board, 2012
- *AP Biology Lab Manual.* New York: College Board, 2001

Additional supplemental materials from:

- Hillis, David M., Heller, H. Craig, Sadava, David, Price, Mary V. *Principles of Life*. Sinaur Associates, Sunderland, MA, 2012
- www.yourbioportal.com

II. Course Overview:

AP Biology is a college-level general biology course taught in a high school setting. All students have taken a full year of general biology and chemistry, or concurrently enrolled in chemistry. The course is based on the Four Big Ideas and uses the Enduring Understandings and Science Practices in the *AP Biology Curriculum Framework* to guide instruction and the selection of activities.

The Big Ideas:

- Big Idea 1: The process of evolution drives the diversity and unity of life.
- Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, reproduce, and to maintain dynamic homeostasis.
- Big Idea 3: Living systems store, retrieve, transmit, and respond to information essential to life processes.
- Big Idea 4: Biological systems interact, and these systems and their interaction possess complex properties.

Students will receive a copy of the big ideas and enduring understandings and be encouraged to link related enduring understandings as connections are made throughout the course. I will use the learning objectives to structure the course and use the at least one of the science practices daily as we explore the content. I intend to present a course environment that will foster curiosity, excitement, and experimentation and develop quality science practices.

I will present the material using lectures, class discussions, interactive activities, guided practice, manipulatives, independent research, and inquiry-based instructional and investigative activities with a focus on the seven science practices in both lab and non-lab activities. The lab component will comprise at least 25% of the instructional time and include a minimum of eight inquiry-based lab investigations (2 per big idea) and teacher-guided experimentation. Students will keep a notebook with a compilation of all lab notes, data collection, analysis, and conclusions. Lab assessments will include mini poster

presentations, formal lab write-ups, gallery walks with peer review, formative checks, periodic notebook checks, and lab practicals.

III. Big Ideas (examples of connections)

The big ideas will be integrated throughout the course and enduring understandings from one or two big ideas will be connected as appropriate. Students will record these connections between big ideas and enduring understandings on their own curriculum map throughout the course.

Big Ideas 1 and 4

Enduring Understanding 1.C.1: Speciation and extinction have occurred throughout the Earth's history.

Enduring Understanding 4.C.3: The level of variation in a population affects population dynamics.

- Species extinction rates are rapid at time of ecological stress. [LO 1.2] The student is able to use theories and models to make scientific claims and/or predictions about the effects of variation within populations on survival and fitness. [LO 4.26] Students will complete a comparative study on the impact of human behavior on the population of a threatened species such as California condors, Houston toads, prairie chickens, etc.

Big Ideas 2 and 4

Enduring Understanding 2.D.1: All biological systems from cells and organisms to populations, communities, and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy.

Enduring Understanding 4.A.6: Interactions among living systems and with their environment result in the movement of matter and energy.

- Organism activities are affected by interactions with biotic and abiotic factors. [LO 2.24] The student is able to predict the effect of a change of matter or energy availability on communities. [LO 4.16] Students will diagram the carbon and nitrogen cycles to model the movement of matter through an ecosystem. They will research the relationship between molecular processes and global cycles such as respiration/photosynthesis and carbon cycling and present their findings.

Big Ideas 3 and 1

Enduring Understanding 3.C.1: Changes in genotype can result in changes in phenotype.

Enduring Understanding 1.A.2: Natural selection acts on phenotypic variations in populations.

- Changes in genotype may affect phenotypes that are subject to natural selection. Genetic changes that enhance survival and reproduction can be selected for by environmental conditions. Students will collect data from a Hardy Weinberg activity and calculate allele frequencies in a population through five generations. They will repeat the process three times to illustrate the following conditions: 1) No selection, all offspring survive. 2) Homozygous recessive, lethal 3) Heterozygote advantage i.e. Sickle-cell anemia. After data analysis, the students will pose

questions regarding future generations, the role of environmental change in the changing genetic make-up of a population and discuss/predict possible outcomes.

Big Ideas 4 and 3

Enduring Understanding 4.A.3: Interactions between external stimuli and regulated gene expression result in specialization of cells, tissues and organs.

Enduring Understanding 3.B.1: Gene regulation results in differential gene expression, leading to cell specialization.

- Environmental stimuli can affect gene expression in a mature cell. Students will use models of the *trp* and *lac* operons to explain the roles of regulatory proteins, operators, and structural genes; then predict and model the effect of an increase in gene product (tryptophan) on the *trp* operon and the introduction of substrate (lactose) on the *lac* operon.

IV. Learning Objectives: correlated to the Big Ideas (with related activities and labs)

Unit 1: Scientific Methods and Analysis (Big Ideas 1, 2, 3, and 4)		
Essential Questions: • How are scientific methods applied? • What constitutes good experimental design? • How is data used to draw conclusions?		
Objectives	**Activities**	**Laboratory experiences**
Science Practice 3: The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.	• Antibiotic resistance: can we ever win? (case study) • The process of science • Stomach Ulcers (case study) • Experimental Design Practice	• Why Don't Whales Have Legs? • Penny Lab- Properties of water with different independent variables
Science Practice 4: The student can plan and implement data collection strategies appropriate to a particular scientific question.	• Scientific Method Basics	• Pillbug lab: design your own • Reaction Time Lab • Skittles Lab
Science Practice 5: The student can perform data analysis and evaluation of evidence.	• Constructing line graphs • Graphs with variable populations and effect of environment from RESST	

	program • Interpreting Graphs • Graphing Activity-Critical Thinking	
Science Practice 2: The student can use mathematics appropriately.	• Chi squared data set practice • M&M Chi squared activity • Chi Square Coin Activity	
Science Practice 6: The student can work with scientific explanations and theories.	• Analysis of a scientific article	
Assessments:	Unit test	

Unit 2: Ecology and Animal Behavior
(Big Ideas 1, 2, 3, and 4)

Essential Questions:
- How and why do populations change?
- What limits production in ecosystems?
- How do nutrients and energy move in an ecosystem?
- How do humans impact ecosystems?
- How do organisms interact with their environment?
- How do organisms act on information and communicate it to others?

Objectives	Activities	Laboratory experiences
EK 2.D.1: All biological systems from cells and organisms to populations, communities and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy.	• 3D Ecological pyramid manipulative • Ecology presentation	
EK 2.D.3: Biological systems are affected by disruptions to their dynamic homeostasis.	• Human impact project • Wolf Population Article	
EK 4.A.5: Communities are composed of populations of organisms that interact in complex ways.	• Best Buddies – Symbiotic relations among populations	

EK 4.C.3: The level of variation in a population affects population dynamics.	• HHMI Rock pocket mouse activity	
EK 4.B.3: Interactions between and within populations influence patterns of species distribution and abundance.	• Travel guide to the Biomes of the world • Population Growth Essay • Ecology Graphing and Math Practice • Population Dynamics Web Activity	• Betta Behavior Lab • Slug Food Preference Lab • Pill bug lab: design your own • AP Fruit fly behavior lab
EK 2.A.1: All living systems require constant input of free energy.		• AP Energy Dynamics Lab
EK 4.A.6: Interactions among living systems and with their environment result in the movement of matter and energy.	• Model matter cycles-Ecology in a bottle	
EK 4.B.4: Distribution of local and global ecosystems changes over time.		
EK 4.C.4: The diversity of species within an ecosystem may influence the stability of the ecosystem.	• Research and write paper on ecological disruptions, successions which the students may have read about	
EK 3.E.1: Individuals can act on information and communicate it to others.		
EK 2.E.3: Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection.		
Assessments:	Unit Test	

Unit 3: Biochemistry **(Big Ideas 1, 2, 3, and 4)**

Essential Questions:

- Why is water essential to life?
- How are complex biomolecules assembled?
- What are the major properties of biomolecules that make them essential to life?
- How do the structure of biomolecules relate to their function?

Objectives	Activities	Laboratory experiences
EK 4.A.1 a. Structure and function of polymers are derived from the way their monomers are assembled.	• Classroom demonstration of protein folding • Sugar taste test	• Properties of biomolecules lab
EK 4.A.1 b. Directionality influences structure and function of the polymer.	• Modeling or diagrammatically representing the monomers of the macromolecules/ biomolecules	• Identifying the macromolecules using indicators and reagents
EK 4.B.1: Interactions between molecules affect their structure and function.	• Identifying functional groups	• Protein chemistry lab
EK 2.A.3 a. Molecules and atoms from the environment are necessary to build new molecules.		
EK 2.A.3 b. Living systems depend on properties of water that result from its polarity and hydrogen bonding.	• Amazing Water Demos	• Properties of water lab (Adhesion, Cohesion Lab) • Acid /Base identification
EK 4.B.1: Interactions between molecules affect their structure and function.	• Toothpickase • Enzyme Graphing • Enzyme Practice	• Enzyme catalysis • Design your own enzyme lab • Liver and hydrogen peroxide lab • Turnip peroxidase lab • Enzyme inquiry lab • Enzyme factor lab
Assessments:	Unit Test	

Unit 4: Cells and cell processes
(Big Ideas 1, 2, 3, and 4)

Essential Questions:

- How are cells and viruses different?
- What evidence supports the endosymbiotic theory?
- How do cells maintain homeostasis?
- How do organisms capture and use energy?

Objectives	Activities	Laboratory experiences
EK 3.C.3: Viral replication results in genetic variation and viral infection can introduce genetic variation into the hosts.	• HIV evolution reading and discussion • Using analogies to differentiate between lytic and lysogenic infection	
EK 2.B.3: Eukaryotic cells maintain internal membranes that partition the cell into specialized regions.	• Chapter 24 from *A Short History of Nearly Everything* • Model of the Cell Membrane • Transport strike skit • The Endosymbiotic Theory • Cell Structure and Function Practice (Microscope Activity)	
EK 4.A.2: The structure and function of subcellular components, and their interactions, provide essential cellular processes.	• Organelle Labeling and comparison • Organelles and disease reading • Tay Sachs Reading • Little Mito story	
EK 2.A.3 b. Surface area-to-volume ratios affect a biological system's ability to obtain necessary resources or eliminate waste products.	• Cell diffusion races	• Cell Size Lab • Diffusion w/ agar blocks lab
EK 2.B.1: Cell membranes are selectively permeable due to their structure.	• Compare and contrast the types of transport • Cell transport practice	• Observing plasmolysis in Elodea at different salt concentrations • Cell membrane practice

EK 2.B.2: Growth and dynamic homeostasis are maintained by the constant movement of molecules across membranes.	• Osmosis practice problems • Osmosis challenge • Nobel Prize reading (cell transport) • Water Potential Practice Questions • Diffusion and Osmosis Challenge • Cell Transport Essay	• Egg osmosis lab • AP Diffusion and Osmosis Labs • Potato Osmosis Lab
EK 2.A.1: All living systems require constant input of free energy.		
EK 2.A.2: Organisms capture and store free energy for use in biological processes.	• ATP Practice • Cell Energy Review • Energy Activity • Photosynthesis History • Photosynthesis In Class Essay • Light Dependent Open Response Practice	• Photosynthesis /Respiration lab • Plant Pigment Chromatography Lab • AP Photosynthesis Lab • AP Cellular Respiration Lab
EK 3.A.2: In eukaryotes, heritable information is passed to the next generation via processes that include the cell cycle and mitosis or meiosis plus fertilization.	• Cancer Research Project • Cell Cycle Regulation Graphing • Mitosis Practice	• Mitosis and Cancer Lab
Assessments:	• Unit Test • Cell and Cell Processes Review	

Unit 5: Molecular Genetics (Big Ideas 1, 2, 3, and 4)		
Essential Questions: • How is genetic information stored? • How do genetic processes allow for variation? • How is genetic information passed from one generation to the next?		
Objectives	**Activities**	**Laboratory experiences**

EK 3.A.1: DNA, and in some cases RNA, is the primary source of heritable information.	• DNA History Posters Timeline • DNA History Guide Online • Classic experiment presentation • Case study: molecular biology classics	• Extraction of DNA
EK 3.B.2: A variety of intercellular and intracellular signal transmissions mediate gene expression.	• Transcription and translation exercises, with mutations situations • Gene Expression Activity • Which Drug Does the Job • Gene Expression Challenge • Protein synthesis diagram interpretation • Protein Synthesis Review • Transcription Challenge Problem • DNA: know your molecules matching	
EK 3.C.1: Changes in genotype can result in changes in phenotype.	• DNA to Disease BLAST Lab	
EK 3.C.2: Biological systems have multiple processes that increase genetic variation.	• Case study of Sickle cell anemia	
EK 4.A.3: Interactions between external stimuli and regulated gene expression result in specialization of cells, tissues and organs.		
EK 4.C.1: Variation in molecular units provides cells with a wider range of functions.	• Karyotyping	
Need EK? Genetic engineering techniques can manipulate the heritable information of DNA and, in special cases, RNA.	• Cloning simulation (paper plasmid lab) • Restriction enzyme paper lab • Electrophoresis simulation • Gel electrophoresis paper lab • Gel electrophoresis virtual lab • PCR virtual lab • Restriction mapping practice	• AP Restriction Enzyme Analysis of DNA Lab • AP Transformation Lab

Assessments:	Unit Test	

Unit 6: Mendelian genetics (Big Ideas 1, 2, 3, and 4)		
Essential Questions: • What are the processes that increase genetic variation? • How does heritable information provide for continuity of life? • How can probability be used to predict outcomes of Mendelian and non-Mendelian crosses? • How is the transmission of genetic information regulated?		
Objectives	**Activities**	**Laboratory experiences**
EK 3.A.2: In eukaryotes, heritable information is passed to the next generation via processes that include the cell cycle and mitosis or meiosis plus fertilization.		
EK 3.C.2: Biological systems have multiple processes that increase genetic variation.		• Meiosis Lab • Crossing over lab
EK 3.C.1: Changes in genotype can result in changes in phenotype.	• Monohybrid and dihybrid cross exercises	• Corn genetics lab
EK 3.A.3: The chromosomal basis of inheritance provides an understanding of the pattern of passage (transmission) of genes from parent to offspring.	• Genetics Homework • Genetics Problem Set • Gene Mapping Lesson • Gene mapping problems	• Virtual Fly lab
EK 3.A.4: The inheritance pattern of many traits cannot be explained by simple Mendelian genetics.	• Chi Square Practice Essay • Sex-linked problems	
EK 4.C.1: Variation in molecular units provides cells with a wider range of functions.		
EK 4.C.2: Environmental factors influence the expression of the genotype in an organism.	• Moth/mice case study	

Assessments:	Unit Test	

Unit 7: Evolutionary Biology (Big Ideas 1, 2, 3, and 4)		
Essential Questions: • Identify the major mechanisms of evolution. • How can evolution be measured? • What is the evidence of evolution? • How does life continue to evolve?		
Objectives	**Activities**	**Laboratory experiences**
EK 1.A.1: Natural selection is a major mechanism of evolution.	• Chapter 25 from *A Short History of Nearly Everything* • Adaptations lab-funlab different animals given different tools to pick seeds • "Avida" reading and discussion • Conceptual inventory of natural selection	• AP Artificial Selection Lab
EK 1.A.2: Natural selection acts on phenotypic variations in populations.	• Moth on bark/mice on background case study • Hardy-Weinberg Teddy Graham • Hardy-Weinberg Problem Set • Hardy-Weinberg Gizmo • Selection Scenarios • Natural Selection "lab" • Strawfish "lab" • *The Flower and the Fly* reading, questions, and discussion	
EK 1.A.3: Evolutionary change is also driven by random processes.	• Genetic Drift Fruit Loops • Genetic drift "lab"	
EK 1.A.4: Biological evolution is supported by scientific evidence from many disciplines, including mathematics.	• AA Evolutionary Relationships • Hardy-Weinberg problems • Population genetics "lab"	

EK 1.B.1: Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today.	• DNA regulation reading and discussion • Three Lice case study	• Computational Analysis (BLAST Lab) for penguins • Blast lab for mystery fossil
EK 1.B.2: Phylogenetic trees and cladograms are graphical representations (models) of evolutionary history that can be tested.	• Cytochrome C lab activity • Cladogram Practice • TRex Webquest • How to make a cladogram • Great Clade Race • Tree Thinking Quizzes (practice) • Penguin cladogram Lab	
EK 1.C.1: Speciation and extinction have occurred throughout the Earth's history.		
EK 1.C.2: Speciation may occur when two populations become reproductively isolated from each other.		
EK 1.C.3: Populations of organisms continue to evolve.		
EK 1.D.1: There are several hypotheses about the natural origin of life on Earth, each with supporting scientific evidence.	• Chapter 19 from *A Short History of Nearly Everything*	
EK 1.D.2: Scientific evidence from many different disciplines supports models of the origin of life.		
Assessments:	Unit Test	

Unit 8: Plants **(Big Ideas 1, 2, 3, and 4)**

Essential Questions:
- How do plants maintain dynamic homeostasis?
- How do plants respond to their environment?
- What is the role of plants in an ecosystem?
- What adaptations of plants allow them to live in various ecosystems?

Objectives	Activities	Laboratory experiences
EK 2.D.4: Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis.	• Tougher plants case study	
EK 2.E.2: Timing and coordination of physiological events are regulated by multiple mechanisms.	• Plant adaptations reading and discussion • Plant physiology challenge	• Comparison of stomata
EK 2.E.3: Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection.		
EK 4.A.4: Organisms exhibit complex properties due to interactions between their constituent parts.	• *How Trees Get High* reading and discussion	• AP Transpiration Lab
Assessments:	Unit Test	

Unit 9: Body Systems
(Big Ideas 1, 2, 3, and 4)

Essential Questions:
- How do animals maintain dynamic homeostasis?
- What are the various mechanisms that cells use to communicate with one another?
- What evolutionary trends are seen across animal phylogeny?

Objectives	Activities	Laboratory experiences
EK 3.D.2: Cells communicate with each other through direct contact with other cells or from a distance via chemical signaling.	• Videos for cell communication • Pathways with Friends skit • Adrenaline signaling pathway animation	

	• Cell communication project • Cell communication essay	
EK 3.D.3: Signal transduction pathways link signal reception with cellular response.	• Cell communication reading and questions	
EK 3.D.4: Changes in signal transduction pathways can alter cellular response.	• Cell signaling case study	
EK 3.D.1: Cell communication processes share common features that reflect a shared evolutionary history.		
EK 2.D.4: Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis.	• Immune Essay • HIV resistance case study	
EK 4.A.4: Organisms exhibit complex properties due to interactions between their constituent parts.		
EK 2.E.3: Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection.		
EK 2.C.1: Organisms use feedback mechanisms to maintain their internal environments and respond to external environmental changes.		• AP 2001 Human physiology lab
EK 2.C.2: Organisms respond to changes in their external environments.		• Q10 with goldfish lab
EK 2.D.2: Homeostatic mechanisms reflect both common ancestry and divergence due to adaptation in different environments.		
EK 2.D.3: Biological systems are affected by disruptions to their	• Chemical Eric Case Study	

dynamic homeostasis.		
EK 3.E.2: Animals have nervous systems that detect external and internal signals, transmit and integrate information, and produce responses.	• Mouse Party • Nerve Cell Communication activity • Neuron activity	• Cockroach Lab
EK 4.B.2: Cooperative interactions within organisms promote efficiency in the use of energy and matter.		
EK 2.E.1: Timing and coordination of specific events are necessary for the normal development of an organism, and these events are regulated by a variety of mechanisms.		
Assessments:	Unit Test	

V. Social and Ethical Concerns:

This course will provide many opportunities to explore and discuss many social and ethical issues in a variety of formats. Students will engage in class discussions, activities and research and report on a current topic. The following list can be used as examples of topics, but additional topics may be added as new issues continually appear.

- DNA technology: students will have opportunities to conduct experiments in gel electrophoresis and PCR followed by discussions of applications and concerns. [Big Ideas 1 and 3]
- Discussions on stem cell research, cloning, and the use of HeLa cells. [Big Idea 3]
- Sam Rhine Genetic Update Conference: Students will have a field trip to this annual conference where they will be exposed to current topics, research and discoveries in genetics. They will then write a short paper on one topic and participate in a class discussion of the experience. [Big Idea 3]
- Human Genetics Project: Students will attend at least 3 of 4 guest speaker lectures on PKU (parent of a patient, medical geneticist, genetic counselor, dietitian and metabolic nurse.) Students will be assigned a human genetic disorder that they will research and present.

VI. Laboratory Component

The students will be engaged in investigative lab work for at least 25% of the instructional time. These labs will be inquiry based, student directed investigations. There will be at least two laboratory experiences per big idea selected from the *AP Biology Investigative Lab Manual: An Inquiry-Based Approach (2012).* The labs will be spread throughout the school year and will be conducted at least one out of every four class meetings during the year. Students will be able to apply the seven science practices throughout their lab work. The following list provides an overview of the lab and depicts which

science practices are *emphasized* in each of the listed labs. However, some of the science practices may be used in all the student directed labs.

Big Idea 1: Evolution

- Mathematical Modeling: Hardy-Weinberg – students will develop and use a spreadsheet to investigate factors affecting Hardy-Weinberg Equilibrium. Scientific Practices: modeling, mathematics, and data analysis. [SP 1,2,5]
- Comparing DNA Sequences to Understand Evolutionary Relationships with BLAST – students use NCBI to compare DNA sequences for organisms to test student generated hypotheses on relatedness. Scientific Practices: Analysis, modeling and computer science. [SP 1,5]

Big Idea 2: Cellular Processes: Energy and Communication

- Diffusion and Osmosis – students investigate diffusion and osmosis in model systems and plant tissues using student selected variables. Scientific Practices: modeling, mathematics, scientific questioning, data collection and analysis. [SP 1,2,3,4,5]
- Photosynthesis – students investigate the rate of photosynthesis under student selected conditions. Scientific Practices: modeling, mathematics, questioning, data collection, analysis, scientific explanation, and making connections. [SP 1,2,3,4,5,6,7]
- Cellular Respiration – students investigate the rate of cellular respiration using student selected conditions and /or organisms. Scientific Practices: modeling, mathematics, questioning, data collection, analysis, and scientific explanation. [SP 1,2,3,4,5,6]

Big Idea 3: Genetics and Information Transfer

- Cell Division: Mitosis & Meiosis – students investigate and analyze mitotic rate, model meiosis and examine crossing over in *Sordaria.* Scientific Practices: modeling, analysis, scientific explanation, and making connections. [SP 1,5,6,7]
- Biotechnology: Bacterial Transformation – students investigate bacterial transformation. Scientific Practices: modeling, mathematics, questioning, analysis, scientific explanation, and making connections. [SP 1,2,3,5,6,7]
- Biotechnology: Restriction Enzyme Analysis of DNA – students investigate restriction enzyme analysis using gel electrophoresis. Scientific Practices: scientific questioning and scientific explanation. [SP 3,6]

Big Idea 4: Interactions

- Energy Dynamics – students develop and analyze models that demonstrate energy flow. Scientific Practices: modeling, mathematics, questioning, data collection, analysis, scientific explanation, and making connections. [SP 1,2,3,4,5,6,7]
- Transpiration – students use whole plants to investigate the movement of water through plants. Scientific Practices: modeling, mathematics, questioning, data collection, analysis, and scientific explanation. [SP 1,2,3,4,5,6]
- Behavior – in an open inquiry lab, students investigate factors that affect animal behavior. Scientific Practices: modeling, questioning, data collection, analysis, scientific explanation, and making connections. [SP 1,3,4,5,6,7]
- Enzyme Activity – in an open inquiry lab, students investigate factors that affect enzyme action. Scientific Practices: questioning, data collection, analysis, scientific explanation, and making

connections. [SP 3,4,5,6,7]

Additional Labs:
I will supplement the course with additional lab activities including, but not limited to: safety, introduction to inquiry with skittles or termites, cells, and plant and animal histology.

VII. Communication

Students will maintain a laboratory notebook throughout the course. Students will also be responsible for communicating results and/or knowledge in other formats such as group presentations, power point presentations, mini posters, gallery walks, and written reports. Communication tools are also essential in non-laboratory experiences and students will be expected to collaborate, reflect, and communicate findings and write, discuss and present content on a regular basis. A major goal of this course is to develop students who have a clear understanding of the four big ideas and the connections between them and have the science skills necessary to be successful in undergraduate science courses.