Syllabus

Life Science (A) - Seventh Grade

Course Description; This class is intended to enhance the student's understanding and use of the Life Sciences. The instruction is primarily aimed at aiding the continued development of skills involved with the observing, measuring, sampling, researching, experimenting, documenting, and presenting known as scientific inquiry. It will also give students a broad understanding and an appreciation of various types of employment in the fields of science. The different topics of biochemistry, cell function, photosynthesis, respiration, cell division, and heredity will be explored. In addition, students will have a chance to learn about skills used in sketching and drawing samples from nature.

Textbook

Holt Science & Technology - *Life Science* copyright 1999

Scope & Sequence

- Measurements
- Biochemistry
  - Organic Polymers
    - Carbohydrates
    - Proteins
    - Lipids
    - Nucleic Acids
- Cells
  - Membrane derived organelles
  - Mitochondria and Chloroplasts
  - Contractile Fibers (Eukaryotic cytoskeleton)
  - Cell Walls
- Cell Processes
  - Photosynthesis

Midterm

- Cell Processes
  - Cellular Respiration

Nuclear Division and Cytokinesis
- Mitosis
- Meiosis
- Protein Synthesis

Genetics
- Mendelian Inheritance

Syllabus

Life Science (B) - Seventh Grade

Course Description

This class is intended to enhance the student's understanding and use of the Life Sciences. The instruction is primarily aimed at aiding the continued development of skills involved with the observing, measuring, sampling, researching, experimenting, documenting, and presenting known as scientific inquiry. It will also give students a broad understanding and an appreciation of various types of employment in the fields of science. The topics of taxonomy, viruses, microbes & decomposers, botany, and zoology will be explored. In addition, students will have a chance to learn about skills used in sketching and drawing samples from nature.

Textbook
Holt Science & Technology - *Life Science* copyright 1999

Scope & Sequence

- Virus
  - Characteristics of Life
- Taxonomy
  - Carolus Linnaeus
- Microbiology
  - Unicellular
    - Bacteria (Domain Eubacteria)
    - Protist Kingdoms
- Fungi & Decomposers

Midterm

- Plant Systematics
  - Plant Diversity (Moss, ferns, gymnosperms, angiosperms of Idaho?)
  - Anatomy (transport, growth, root, stem, leaf anatomy)
- Zoology
  - Diversity (Porifera, Cnidaria, 3 worm phyla, Mollusks, Arthropods, Just Chordates of Idaho?

Course Title; Life Science (A) - Seventh Grade Curriculum Map

Standard 1: Nature of Science
Standard 2: Physical Science
Standard 3: Biology
Standard 4: Earth and Space Systems
Standard 5: Personal and Social Perspectives

Syllabus Topics	Standard Goal	Objective	Instructional Objectives	Essential Vocabulary	Task Analysis	Sample Assessment	Resources
Scientific Inquiry; Using Math and Computational Thinking **Can the students use tools and properly measure?**							Emphasize scientific inquiry throughout the course.
Biochemistry Organic Polymers Carbohydrates Proteins Lipids Nucleic Acids **Scientific Inquiry; Asking Questions, and Defining Problems. Research**	Goal 1.8: Understand Technical Communication	7.S.1.8.1 Read and evaluate technical instructions. (643.02.a) **CCRST.6-8.3,10** **3-** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **10-** By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently	**Content Objective:** We will follow the written lab instructions. **Language Object:** SWBAT…. Evaluate how well they followed the lab instructions. **Language Objective (CC R3):** SWBAT….follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **Language Objective (CC R10):** SWBAT….develop strategies for reading and comprehending grade level science texts.		• Conduct experiments in accordance with written procedures.	• The students will create a biography/life story of a carbon molecule that has cycled through living and nonliving parts of the biosphere. • List the parts of a cycle. Cell cycle, carbon cycle, body system, ecosystem, succession, food web, trophic levels, etc. • Write a want ad for the job description or a lost and found poster for a missing part of a given system. Including job duties, co-workers, qualifications, etc. (The digestive system is hiring a gall bladeer. Any interested bladders please apply, or "found a kidney, what do I do with it now"?)	Emphasize scientific inquiry throughout the course.
Cells Membrane derived organelles Mitochondria and Chloroplasts Contractile Fibers (Eukaryotic cytoskeleton) Cell Walls	Goal 1.1: Understand Systems, Order, and Organization	7.S.1.1.2 Determine how small systems contribute to the function of the whole. (633.01.a)	**Content Objective:** We will investigate the cell cycle. **Language Objective:** Students will compare the different stages of the cell cycle in a medium of their choice.	**Prior:** cycle **Explicit:** **Introductory:** cell cycle • growth • development • reproduction • decomposition Additional vocabulary used depends on what system is being studied.	• List the parts of a system • Explain how the parts of the system are related • Given a system explain the consequences of removing any single component (e.g. food web missing primary consumer) • Determine how small systems contribute to the function of the whole (e.g., how the cell cycle results in growth, development and reproduction; how photosynthesis, cellular respiration and decomposition are part of the carbon cycle, nitrogen cycle)		Jason Project - Earth Systems - digital lab - **free registration** http://www.jason.org/gated/digital_labs/mars/earthsystems/carbon/carbon1.html •http://www.ehow.com/info_8362915_hierarchy-life-science-lab-activities.html

							•http://www.teachersdomain.org Free registration •http://www.teachersdomain.org/resource/lsps07.sci.life.stru.bodysystems/
	Goal 1.1: Understand Systems, Order, and Organization	7.S.1.1.3 Identify the different structural levels of an organism (cells, tissues, organs, and organ systems). (633.01.b)	**Content Objective:** We will identify the difference between cells, tissues, organs, organ systems, and organisms. **Language Objective:** Students will create foldable using picture definitions for cells, tissues, organs, organ systems, and organisms.	**Prior:** cells • tissues • organs • organ systems • organisms **Explicit:** Vocabulary is system dependent **Introductory:**	• Identify the different structural levels of an organism (cells, tissues, organs, organ systems, and organisms).	• Given pictures of cells, tissues, and organs the students will put together the organ system. •	•http://www.teachersdomain.org/resource/lsps07.sci.life.stru.bodysystems/ http://powersof10.com/film http://micro.magnet.fsu.edu/primer/java/scienceoptics u/powersof10/
	Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things	7.S.3.3.2 Identify the parts of specialized plant and animal cells. (636.01.b)	**Content Objective:** We will identify the difference between a plant cell and an animal cell. **Language Objective:** SWBAT….. Compare and contrast a plant and animal cell.	**Prior:** nucleus • cell membrane • cell wall **Explicit:** mitochondria • chloroplast • cytoplasm • ribosome • endoplasmic reticulum • Golgi bodies • vacuole • organelle • neurons	• List structures found only in plant cells. • List structures found only in animal cells. • Compare and contrast a plant and animal cell.		http://learn.genetics.utah.edu/content/begin/cells/insideacell/
	Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things	7.S.3.3.3 Identify the functions of cell structures. (636.01.b)	**Content Objective:** We will investigate the function of each organelle. **Language Objective:** SWBAT…. Summarize the function of each organelle.	**Prior:** **Explicit:** osmosis • diffusion • active transport • passive transport **Introductory:** endocytosis • exocytosis • permeable • semi-permeable	• Describe the function of each organelle within a plant and animal cell. • Distinguish between osmosis and diffusion. • Distinguish between active and passive transport. • Design an experiment to demonstrate the process of osmosis.		
	Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things	7.S.3.3.4 Describe cell functions that involve chemical reactions. (630.01.c)	**Content Objective:** We will identify which cell process will convert sunlight to glucose vs. converting glucose to cell energy. **Language Objective:** SWBAT….. Compare cellular respiration and photosynthesis.	**Explicit:** cellular respiration • photosynthesis • carbohydrates • lipids • protein • nucleic acids • chemical reaction • organelles **Introductory:** aerobic respiration • anaerobic respiration • lactic acid fermentation • alcohol fermentation	• Define chemical reaction in a cell. • Identify chemical reactions that occur within a cell. • Identify what is necessary for cellular respiration to occur. • Distinguish between cellular respiration and photosynthesis.		Photosynthesis and cellular respiration http://www.nclark.net/PhotoRespiration
Cell Processes Photosynthesis	Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems	7.S.3.2.1 Describe how energy stored in food is primarily derived from the sun through photosynthesis. (638.01.a)	**Concept Objective:** We will investigate how the sun is the primary energy for life on earth. **Language Objective:** SWBAT… illustrate the process of photosynthesis.	**Prior:** photosynthesis • chloroplast **Explicit:** glucose • producer • chlorophyll • cellular respiration **Introductory:** ATP	• Explain how carbon dioxide, water, and sunlight are necessary for photosynthesis to occur in the chloroplast. • Show the process of photosynthesis.		
	Goal 3.2: Understand the	7.S.3.2.3 Illustrate how atoms and molecules cycle among the living and nonliving	**Concept Objective:** We will illustrate how atoms and molecules cycle	**Prior:** cycle • evaporation • precipitation •	• Create diagrams of water, nitrogen and carbon cycles showing various ways elements travel through the		ZuiTube - Video for kids http://video.kidzui.c

	Relationship between Matter and Energy in Living Systems	components of the biosphere. (638.01.c)	among the living and nonliving components of the biosphere. **Language Objective:** SWBAT…… Create diagrams of water, nitrogen and carbon cycles showing various ways elements travel through the ecosystem.	condensation • water cycle • atoms • molecules • element • states of matter **Explicit:** biosphere • carbon cycle • nitrogen cycle • respiration • decomposition • fossil fuels • transpiration **Introductory:** nitrogen fixation	ecosystem. • Explain the relationship between evaporation, condensation and precipitation in the water cycle. • Describe the relationship between photosynthesis, respiration, decomposition and the burning of fossil fuels in the carbon cycle. • Explain nitrogen fixation and the nitrogen cycle.		om/channels/Nitrogen+Cycle
Scientific Inquiry; Planning and Carrying out Investigations	Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills	7.S.1.6.1 Identify controls and variables used in scientific investigations. (634.01.b)	**Content Objective:** We will determine the controls and variables in a scientific investigation. **Language Objective:** SWBAT…. Design an experiment and define the variable and control.	**Prior:** variable • control group **Explicit:** controlled variable • experimental variable • dependent variable • independent variable **Introductory:** manipulated • responding	• Ask questions that can be answered by scientific investigations. • Review scientific method. • Design an experiment demonstrating knowledge of the use of controls and variables (e.g., How does the concentration of salt water effect the slices of celery? Celery in water being the control.)		Emphasize scientific inquiry throughout the course.
Scientific Inquiry; Planning and Carrying out Investigations	Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills	7.S.1.6.2 Use appropriate tools and techniques to gather and display data. (634.01c)	**Content Objective:** We will investigate the different ways of gathering and displaying data. **Language Objective:** SWBAT…. Create a pie chart that exhibits the percentages of the elements found in their body. **Language Objective (CC R4):** SWBAT…. determine and express the meaning of symbols and terms in the textbook.	**Prior:** graph • chart • pie chart • table • line graph • bar graph **Explicit:** • triple beam balance • digital balance • beaker • flask **Introductory:**	• Use appropriate tools and techniques to gather and display data. • Understand which type of display best portrays certain kinds of data (e.g., pie charts best show numbers that add up to 100%, line graphs show change over time).		Emphasize scientific inquiry throughout the course.
Cell Processes Cellular Respiration	Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems	7.S.3.2.4 Identify how energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores, carnivore, and decomposers. (638.01.d)	**Concept Objective:** We will identify how energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores, carnivore, and decomposers. **Language Objective:** SWBAT…..Distinguish between a food chain and a food web.	**Prior:** food chain • food web **Explicit:** • energy pyramid • decomposer • herbivore • carnivore • omnivore • biomass • symbiosis • mutualism • commensalism • parasitism **Introductory:** primary consumer • secondary consumer • tertiary consumer	• Define: herbivore, carnivore, omnivore, decomposer. • Design a simple food chain including producer, primary consumer, secondary consumer, tertiary consumer, and decomposer. • Define symbiosis, and identify examples of each relationship. • Distinguish between a food chain and a food web. • Explain how available energy changes as energy moves up the food chain.		You Tube - The Food Chain http://www.youtube.com/watch?v=3Bn7wdCP2v4
Scientific Inquiry; Analyzing and Interpreting Data	Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills	7.S.1.6.3 Evaluate data in order to form conclusions. (634.01.d)	**Content Objective:** We will form conclusions given data. **Language Objective:** SWBAT…. Summarize a conclusion after collecting data. **Language Objective(CC R6):** SWBAT….write a conclusion based on their research and data.		• Organize data in a visual product (chart/graph) • Identify trends within the data. • Draw a conclusion based on linear data tied to a focused topic (e.g., How do invasive species affect native species?)		Emphasize scientific inquiry throughout the course.
Scientific	Goal 1.6: Understand	7.S.1.6.6 Communicate and defend scientific procedures and	**Content Objective:** We	**Prior:**	• Follow a written lab procedure		Emphasize scientific inquiry throughout

Inquiry; Constructing Explanations or Designing Solutions. Obtaining, Evaluating, and Communicating Information Engaging in Argument from Evidence	Scientific Inquiry and Develop Critical Thinking Skills	explanations. (634.01.g)	will communicate and defend scientific procedures and explanations. **Language Objectives:** SWBAT…. Act out osmosis (students are molecules and membranes) **Language Objective(CC W):** Students will write newspaper articles.	**Explicit:** procedure **Introductory:**	• Explain the possible cause and effect of improper sequencing of lab procedures • Analyze, draw, model, dramatize and/or compare and contrast life science concepts.		the course.
Cell Processes Cellular Respiration	Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems	7.S.3.2.2 Describe how the availability of resources (matter and energy) limits the distribution and abundance of organisms. (638.01.b)	**Concept Objective:** We will draw a conclusion about why different biomes have certain characteristics. **Language Objective:** SWBAT….. Present a "Day In the Life" of an animal from their assigned biome.	**Prior:** predator • prey **Explicit:** carrying capacity • limiting factor • producer (autotroph) • consumer (heterotroph) • competition • population • organism • ecosystem • community • biome • habitat • biotic factor (living) • abiotic factors (nonliving) **Introductory:**	• List several limiting factors • Understand and describe the trophic level • Label abiotic and biotic factors in a given ecosystem. • Compare and contrast limiting factors and carrying capacity in an ecosystem.	• The students will demonstrate mastery of these standards with a long term project. http://coe.nevada.edu/sstewart/evaluation.html (a great rubric)	Virtual Ecosystems http://coe.nevada.edu/sstewart/index.html
Additional Topic?	Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them	7.S.5.3.1 Identify alternative sources of energy. (641.03.a)	**Content Objective:** We will identify alternative sources of energy. **Language Objective:** SWBAT…Identify renewable resources and sustainable practice.	**Prior:** natural resource • renewable resource • nonrenewable resource **Explicit:** • fossil fuel • alternative resource (fossil fuel, solar energy, wind power, geothermal, biofuel, hydroelectric, nuclear energy) • sustainable practice	• Define renewable and nonrenewable resources. • Identify renewable resources and sustainable practice. • Identify nonrenewable resources. • Identify alternative sources of energy. • Examine the pros and cons of alternative sources of energy.		
Nuclear Division and Cytokinesis Mitosis Meiosis Protein Synthesis	Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanations	7.S.1.2.1 Describe how observations and data are evidence on which to base scientific explanations and predictions. (633.02.a)	**Content Objective:** We will make observations, collect data and create reasonable predictions. **Language Objective:** SWBAT…. Create a Venn diagram for qualitative and quantitative observations.	**Prior:** observation • data • prediction • hypothesis • chart • table • graph • interpret • conclusion • analyze **Explicit:** • theory • qualitative observation • quantitative observation **Introductory:**	• Apply methods of observation, which may include: the five senses, meter-stick, balances, microscopes, thermometers, and graduated cylinders to gather data. • Distinguish between qualitative and quantitative observations. • List examples of qualitative and quantitative observations.		
	Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills	7.S.1.6.4 Use evidence and critical thinking to accept or reject a hypothesis. (634.01.e)	**Content Objective:** We will accept or reject a hypothesis after analyzing evidence. **Language Objective:** SWBAT….. Summarize the reasons to accept or reject a hypothesis. **Language Objective (CC R9):** SWBAT….. Compare and contrast the information gained from experiments, simulations,	**Prior:** hypothesis • evidence **Explicit:** • prediction **Introductory:** validity • reliability	• Demonstrate patterns of scientific thinking using examples of past scientists (Redi, Darwin, Mendel) to illustrate how critical thinking and evidence are used to accept or reject hypothesis. • Given examples of evidence, students will accept or reject a hypothesis.		

			video or multimedia sources with that gained from reading a text on the same topic.				
	Goal 1.3: Understand Constancy, Change, and Measurement	7.S.1.3.3 Make metric measurements using appropriate tools.	**Content Objective:** We will make measurements using triple beam balance, graduated cylinder, beakers, meter stick, thermometer. **Language Objective:** SWBAT…. Record measurements on a chart. **Language Objective (CC R4):** SWBAT….use appropriate unit labels to display data.	**Prior:** SI units {kilo • hecto • deka• deci • centi • milli • micro • macro • base unit(meter/liter/gram)} • measurement • conversion	• Identify measurement equipment. • Name the metric base units for mass, length, volume, temperature • Convert metric units (e.g., 1 m=1000mm) • Use appropriate measurement tool and units for given substance.		Metrics PowerPoint http://daphne.meccahosting.com/~a0000e89/metricsystem.htm
Genetics Mendelian Inheritance	Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things	7.S.3.3.5 Describe how dominant and recessive traits are inherited. (636.01.e)	**Content Objective:** We will solve Punnett squares using the proper terminology. **Language Objective:** SWBAT……summarize the information gained from a Punnett square.	**Prior:** ratio • probability • **dominant • recessive traits** **Explicit:** • alleles • gene • genotype • phenotype • Punnett square • homozygous (purebred) • heredity • heterozygous (hybrid) • chromosome • DNA **Introductory:** pedigree chart	• Summarize Gregor Mendel's contribution to genetics. • Distinguish between dominant and recessive traits. • Distinguish between genotypes and phenotypes. • Distinguish between heterozygous and homozygous. • Define Probability. • Describe the purpose of a Punnett square. • Create Punnett squares. • Express results of Punnett squares in ratios and percentages.		http://ethemes.missouri.edu/themes/1015 http://learn.genetics.utah.edu/content/begin/traits/
	Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills	7.S.1.6.5 Evaluate alternative explanations or predictions. (634.01.f)	**Content Objective:** We will evaluate alternative predictions. **Language Objective:** SWBAT…… compare the different theories of Lamarck and Darwin. **Language Objective (CC R8):** SWBAT….distinguish among facts, reasoned judgment based on research findings, and speculation in a text.		• Compare and Contrast alternate theories (Lamarck's ideas to Darwin's). • Compare and contrast fact and opinion. • Compare and contrast a narrative passage with a technical passage.		

Course Title; Life Science (B) - Seventh Grade Curriculum Map

Standard 1: Nature of Science
Standard 2: Physical Science
Standard 3: Biology
Standard 4: Earth and Space Systems
Standard 5: Personal and Social Perspectives

Syllabus Topics	Standard Goal	Objective	Instructional Objectives	Essential Vocabulary	Task Analysis	Sample Assessment	Resources
Virus Characteristics of Life	Goal 5.2: Understand the Relationship between Science and Technology	**7.S.5.2.1** Explain how science and technology are interrelated. (640.01.a)	**Content Objective:** We will explain how science and technology are interrelated. **Language Objective:** SWBAT…Describe how the development of the microscope led to the cell theory. **Language Objective:** SWBAT... research, identify and apply the writing process explaining how scientific inquiry advances technology and vise versa. (Choose a C.C. reading and writing objective)	**Prior:** tool **Explicit:** technology **Introductory:**	• Relate history of the microscopes. • Describe how the development of the microscope is related to the increased understanding of life. • Identify examples of technology (e.g. from pencils to digital technology)		Suggestion; viruses are used for genetic recombination !
Taxonomy Carolus Linnaeus	Goal 1.1: Understand Systems, Order, and Organization	7.S.1.1.1 Define small systems as a part of a whole system. (633.01.a) **CCRST.6-8.1,2,5** These comprehensive science and reading standards are inclusive and should be used liberally and at any point in the curriculum. **1-** Cite specific textual evidence to support analysis of science and technical texts. **2-** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. **5-** Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the	**Content Objective:** Our job today is to identify an organism using a dichotomous key. **Language Objective:** You will create a dichotomous key to classify ten objects into groups and give oral directions to your lab partner. **Language Objective (CC R1,2,5):** SWBAT…. Cite evidence from text to support conclusions. SWBAT…. summarize the main idea. SWBAT…. familiarize yourself with the format of your textbook.	**Prior:** classify •system • part to whole • characteristic **Explicit:** **Introductory:** domain • taxonomy • dichotomous key • levels of classification (kingdom, phylum, class, order (in the taxonomy sense), family, genus, species) • binomial nomenclature • scientific name	• List the levels of classification. • Define small systems as a part of a whole system (e.g. ,cell, levels of ecosystem, organ systems). • Identify systems of classification (e.g., taxonomy). • Describe the system of assigning scientific names to organisms (e.g., binomial nomenclature). • Describe similar traits that would place an organism in its proper kingdom. • Use a dichotomous key to identify unknown objects.	• Given a list of organisms and their characteristics the students will place them in the correct kingdoms. • Use a dichotomous key to identify unknown objects. • Write a letter to an imaginary scientist explain how to classify a newly discovered organism. • List the levels of classification.	Taxonomy presentation http://staffweb.psdschools.org/shunter/zoologyweb/Intro/Intro%20&%20Taxonomy.pdf

		topic.					
Microbiology Unicellular Bacteria (Domain Eubacteria) Protist Kingdoms	Goals;1.6 and 1.8	1.6.1, 1.6.2, 1.6.3, 1.6.6, 1.8.1					Highly suggesting bacteria lab based on scientific inquiry.
Fungi & decomposers	Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things	7.S.3.3.1 Explain the relationships among specialized cells, tissues, organs, organ systems, and organisms. (636.01.a)	**Content Objective:** We will explain each level of organization as it relates to the next level. **Language Objective:** SWBAT….. Distinguish between each level of organization as it relates to the next level.	**Prior:** **Explicit:** specialized cells • tissues • organ systems • organisms • unicellular • multicellular• prokaryotic • eukaryotic **Introductory:**	• Explain what specialization in cells means. • Define and give examples of specialized cells, tissues, organs, organ systems. • Distinguish between each level of organization as it relates to the next level (e.g., cells to tissue, tissue to organs, organs to organ systems).		
Plant Systematics Plant Diversity Gymnosperms, Angiosperms of Idaho Anatomy transport, growth, root, stem, leaf anatomy Plant reproduction	Goal 3.1: Understand the Theory of Biological Evolution	7.S.3.1.1 Describe how natural selection explains Prior: species change over time. (637.01.a)	**Concept Objective:** We will describe how species change over time through natural selection. **Language Objective:** SWBAT… find the main ideas in the information given about natural selection.	**Prior: Explicit:** adaptation • natural selection • evolution• species • variation • overproduction • fossil **Introductory:** vestigial organ • homologous structures	• Describe how species change over time. • Explain how genetic variation, adaptation, over production and selection lead to natural selection. • Identify evidence that support species change over time (e.g., biological, fossil, genetic). • Examine how environmental pressures contribute to natural selection.		
Plant Systematics	Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanations	7.S.1.2.2 Use observations to make defendable inferences. (633.02.b)	**Content Objective:** We will investigate defendable inferences. **Language Objective:** Students will be able to (SWBAT)…. Orally defend an inference.	**Prior:** inference **Explicit:** defendable inference **Introductory:**	• Use observations to make defendable inferences (e.g., plants given sunlight, water, and fertilizer had a greater growth rate than the control plants without fertilizer therefore fertilizer improves plant growth).	• Given observations about the dead grass in the teacher's lawn, the students will make defendable inferences regarding the dead grass.	
Plant Systematics Scientific Inquiry; Asking questions and defining problems, using models.	Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanations	7.S.1.2.3 Use models to explain or demonstrate a concept.	**Content Objective:** We will read, use, and create models to explain or demonstrate concepts. **Language Objective:** SWBAT….. Look at a model of a food chain and answer true and false questions about energy flow.	**Prior:** model • concept • demonstrate	• Construct models to explain or demonstrate a concept: models may include diagrams (mathematical), illustrations (conceptual), and 3-D representations (physical).	• Given a list of producers, consumers and bacterial decomposers students will create a food web.	
Zoology Diversity Arthropods, Chordates ; Idaho Wildlife	Goal 1.3: Understand Constancy, Change, and Measurement	7.S.1.3.1 Identify concepts of science that have been stable over time.	**Content Objective:** We will identify science concepts that have been well tested and widely accepted, such as the characteristics of life. **Language Objective:** SWBAT...identify the characteristics of a living thing; answer the question, "What constitutes life?" **Language Objective:** SWBAT...Tell their lab partner the difference between a hypothesis and theory.	**Prior:** theory • hypothesis **Explicit:** Testable hypothesis • scientific law • **Introductory:**	• Identify concepts of science that have been stable over time (e.g., nature cycles, energy flows). • Distinguish between hypothesis and theory.	• Given the characteristics of life and a visual representation of an inanimate object brought to life (e.g. Cars, The Little Toaster etc…) SWBAT...write a narrative story bringing a faceless inanimate object to life. The story must contain evidence of all the characteristics of life. Students will evaluate each others	http://www.toadhaven.com/genetics.html

						papers given a rubric.	
Zoology	Goal 1.3: Understand Constancy, Change, and Measurement	7.S.1.3.2 Recognize changes that occur within systems.	**Content Objective:** We will observe changes in a system. **Language Objective:** SWBAT…. Write the changes that occur in their backyard throughout the year.		• Recognize changes that occur within systems (e.g., natural selection, succession).		
Zoology	Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State	Reference to objective 7.S.3.1.1 Describe how natural selection explains species change over time	**Concept Objective:** We will describe how species change over time through natural selection. **Language Objective:** SWBAT… find the main ideas in the information given about natural selection.	**Prior:** species change over time. (637.01.a) species • variation • overproduction • fossil **CL: D** in flux (new volcanic islands, lakes being impacted	• Describe how species change over time. • Explain how genetic variation, adaptation, over production and selection lead to natural selection. • Identify evidence that support species change over time (e.g., biological, fossil, genetic). • Examine how environmental pressures contribute to natural selection.		http://www.toadhaven.com/genetics.html

Scientific Inquiry (NGSS in bold)

Prepared by Elaine Asmus

There are activities and labs. Every science course should include labs based on scientific inquiry. It is part of scientific inquiry to experience odd results at times or find that there is an error in the way an experiment was carried out. Scientists collaborate at these times and start again. The process is fun; a possible discovery is the treat! Emphasize scientific inquiry throughout coursework.

1. **Using Math and Computational Thinking**
   Emphasis on proper measuring techniques during the investigation
   Can the students use tools and properly measure?

2. **Asking Questions, and Defining Problems.**
   Research
   Develop and Use Models
   Form a Hypothesis Statement
   Supported hypothesis become Laws

3. **Planning and Carrying out Investigations**
   Measuring
   Gather data into charts
   Single Variable; should be identified
   All other factors remain the same
   Control Group/Experiment Group
   (High school) multiple experimental groups
   Include a high number of subjects

4. **Analyzing and Interpreting Data**
   Results are entered onto a Data Chart
   Dependent & Independent variable (begin in Junior High)
   Charts generate Graphs
   Using Math and Computational Thinking;
   (High School?) Graphs produce Mathematical Formulas
   (High School) Chi Square Value; differences are significant

5. **Constructing Explanations or Designing Solutions**
   Obtaining, Evaluating, and Communicating Information
   Engaging in Argument from Evidence

Producing a Graph from a Data Chart; Instructions and Rubric; Names _____
Long Form

Scientists qualify information by carrying out scientific experimentation through a process known as the scientific method. In an experiment, the variables which will not be studied are controlled. The scientist selects a single variable to change (independent variable) and watches the effect of that change on another variable (dependent variable). Data is collected and placed in a chart.

Scientists quantify the results of an experiment when he/she graphs the collected data. The data collected is represented by dots on the graph. The best-fit line of a graph represents the result or lesson proved from the experiment. Scientists and mathematicians create formulas from line graphs. All formulas arise from graphs.

What are the 2 variables being watched? Factor 1 _____Factor 2 _____

Which is the Independent Variable? _____ Range of values (units)? _____to _____

Which is the dependent Variable? _____ Range of values (units)? _____to _____

On the graph (use the ۞to check off the items as you place them on the graph);

۞Title both axes (Independent variable is placed on the x-axis, dependent variable on the y-axis).

۞Label both axes' units.

۞Using the range for each variable, place the units on each axis **utilizing the entire axis**. It is important to have the same amount of unit variation between each line on the graph, for example, each line represents an increase of 5 numerals.

۞Place data dots onto the graph in the appropriate places.

Best Fit Line; represents **the trend** of the data points. Best-fit lines are often either straight **or** curving lines. Discuss the following with the teacher if necessary before drawing a best-fit line;

۞Does the graph's best fit line pass through the origin? _____Why or why not? _____

_____

۞Does a best fit line connect the dots? _____Why or why not? _____

_____

۞Within the lab group, discuss if any data points might be random mistakes and why these data points might be excluded from the best fit line. Label these points and the reason for excluding any data point from the best fit line.

۞Is the best fit line straight or curved? _____

۞The best fit line should be solid as the line passes between data points, but dashed if the line is extended past or before data points. A dashed line represents predicted behavior not supported by the current experiment.

۞Draw a best-fit line

Abstract and results; each graph should include an abstract sentence or paragraph. The abstract should sound like,
"The lab group found that as the independent variable increases, the dependent variable decreases",

where the student substitutes the specific experimental data for the underlined items. Also include any explanations or notable events of the experiment.

۞ Write the abstract statement or paragraph on the bottom of the graph.

۞ Write a complete sentence for the graph title. Titles should be clear and concise.

Advanced; determination of a graph's formula.
Straight line graphs produce the following formula format;

$$y = m x + b$$

Where m = slope of the line and b = the y intercept of the line.

The formula should read;

Dependent variable = m times the independent variable + b
where the student substitutes actual experimental data for the underlined items.

- Calculate the formula showing all work.

- Write the formula in sentence form.

- Calculate a "y" value that was not experimented by randomly selecting an x axis value and using the formula. Please show all work.

Producing a Graph from a Data Chart; Instructions and Rubric; Names _____
Short Form (more experienced science students)

Scientists qualify information by carrying out scientific experimentation through a process known as the scientific method. In an experiment, the variables which will not be studied are controlled. The scientist selects a single variable to change (independent variable) and watches the effect of that change on another variable (dependent variable). Data is collected and placed in a chart.

Scientists quantify the results of an experiment when he/she graphs the collected data. The data collected is represented by dots on the graph. The best-fit line of a graph represents the result or lesson proved from the experiment. Scientists and mathematicians create formulas from line graphs. All formulas arise from graphs.

What are the 2 variables being watched? Factor 1 _____Factor 2 _____

Which is the Independent Variable? _____ Range of values (units)? _____to _____

Which is the dependent Variable? _____ Range of values (units)? _____to _____

On the graph (use the ۞to check off the items as you place them on the graph);
۞Title both axes (Independent variable is placed on the x-axis, dependent variable on the y-axis).
۞Label both axes' units.
۞Using the range for each variable, place the units on each axis **utilizing the entire axis**. It is important to have the same amount of unit variation between each line on the graph, for example, each line represents an increase of 5 numerals.
۞Place data dots onto the graph in the appropriate places.

Best Fit Line; represents **the trend** of the data points. Best-fit lines are often either straight **or** curving lines. Discuss the following with the teacher if necessary before drawing a best-fit line;
۞Does the graph's best fit line pass through the origin? Why or why not?
۞Does a best fit line connect the dots? Why or why not?
۞Within the lab group, discuss if any data points might be random mistakes and why these data points might be excluded from the best fit line. Label these points and the reason for excluding any data point.
۞Is the best fit line straight or curved?
۞The best fit line is solid as the line passes between data points, but dashed if the line is extended past or before data points. A dashed line represents predicted behavior not supported by experimentation.
۞Draw a best-fit line

Abstract and results; each graph should include an abstract sentence or paragraph. The abstract should sound like, "The lab group found that as the <u>independent variable</u> <u>increases</u>, the <u>dependent variable</u> <u>decreases</u>", where the student substitutes the specific experimental data for the underlined items. Also include any explanations or notable events of the experiment.
۞ Write the abstract statement or paragraph on the bottom of the graph.

۞ Write a complete sentence for the graph title. Titles should be clear and concise.

Advanced; determination of a graph's formula.

Straight line graphs produce the following formula format; y = m x + b, Where m = slope of the line and b = the y intercept of the line. The formula should read; Dependent variable = m times the independent variable + b, where the student substitutes actual experimental data for the underlined items.

۞Calculate the formula showing all work.

۞Write the formula in sentence form.

۞Calculate a "y" value that was not experimented by randomly selecting an x axis value and using the formula. Please show all work.