Course Description: Science 325A Integrated Life Science (4). Fundamental principles of science (e.g. mechanics, thermodynamics) applied to biological systems, including ecology, evolution, and the human body. Laboratories focus on developing skills in the experimental method and processes of science with an integrated focus on biological topics. Two hours lecture and six hours laboratory. Prerequisites: Science 213 or Biology 100, and Science 214. Note: this is neither a methods of teaching nor curriculum development course; the focus is on science content and process for science literacy. Open only to majors in Liberal Studies or Child, Adolescent and Family Studies.

Lecture: ITV = studio C
AV campus - LUK 201 MW 10:30 AM - 12:55 PM
Labs: Science II - 355 Section 2: TR 9:30 AM - 1:25 PM
AV- LUK 213 Section 3: MW 1:00 PM - 5:00 PM

Course Website: www.csub.edu/~ddodenhoff/sci316/sci316.html
Summary text and slide notes for each lecture are available on WEBCT.

Instructors: Dr. Danielle Dodenhoff, Biology Department. Dr. Robert Stark
Office Hours: by appointment. Phone: 654-2225
Phone: 654-6296
Email: ddodenhoff@csub.edu rstark2@csub.edu

Required supplies for lab: Laboratory notebook, bound style and one of the following - 1.4MB 2SHD IBM formatted floppy disk or PC compatible ZIP disk.
An independent functional calculator [you may not use a cell phone as a calculator on exams]
There is no lab manual required for the course; the Laboratory activities and other materials will be distributed as needed during the quarter.

Text book:
Before purchasing the lower priced online version read the conditions and have the available software to download chapters. There are two versions of this E-book choose the version that is title Integrated Life Science and indicates the instructor as Carl Kloock [the Dr. Dodenhoff Sci 325A is a text from winter 2006]

Evaluation of Student performance and general information:

<table>
<thead>
<tr>
<th>Points possible</th>
<th>Grading Scale:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm Lecture and Lab Exam</td>
<td>A  = 92-100%  C+ = 76-79 %</td>
</tr>
<tr>
<td>Lecture &amp; Lab Final (cumulative)</td>
<td>A- = 90-91%  C  = 73-75%</td>
</tr>
<tr>
<td>Laboratory</td>
<td>B+ = 86-89%  C-  = 70-72%</td>
</tr>
<tr>
<td>Total</td>
<td>B  = 83-85%  D  = 60-69%</td>
</tr>
<tr>
<td></td>
<td>B- = 80-82%  F  &lt;  60%</td>
</tr>
</tbody>
</table>

Exams will NOT be curved. Instead, if the class average on an exam is below 65%, a "curve assignment" will be given targeting the area(s) of the exam with lowest class-wide performance. This extra work will be added to each individual's exam grade. Keep in mind that if you perform well on the exam (as a class), you will not receive extra work. This policy does not apply to the final.
Course Objectives:

The objective for this course is to complete your content knowledge in science as outlined by the California Commission on Teacher Credentialing Standards of Quality and effectiveness for the subject matter requirement for the multiple subject teaching credential: Content specifications in science (attached and those standards covered by Sci325A are in black bold print). We approach this objective from the position that to truly appreciate the sciences it is imperative that you have an opportunity to see how the integration of multiple disciplines provides for a more in-depth and comprehensive understanding of natural phenomena. This course covers material from each of the domains using biological examples as a focal point for addressing issues in each. The laboratory focuses less on content and more on the process of science – Part II of the standards.

Integrity of Scholarship and Grades/ Academic honesty

Please see the general catalog for a statement on Academic honesty. In the 2001-2003 Catalog it can be found on p 59. If you have any difficulty interpreting this section please come see me immediately.

Late assignments: Late assignments are allowed provided the instructor is informed before the due date. All late assignments will be subjected to a penalty on the following schedule: 1 day late -20%, 2 days late -40%, 3 days late -80%; assignments 4 or more days late will receive no credit. Note that “days” means real days, not lecture or lab meetings. In other words, if the assignment is due Thursday and you turn it in the following Monday, it is 4 days late and will receive no credit. If you have an assignment to turn in late it is your responsibility to ensure that the instructor receives the assignment in a timely fashion, so don’t just slip it under the door and hope it gets noticed: hand it to the instructor personally, Email it, or turn it into the biology secretary (and ask her to date and sign it). Quizzes and exams will not be accepted late, since keys are posted.

CLASS ASSIGNMENTS AND COMPUTER DOWNLOADS: There are course assignments and quizzes requiring the use of WebCT. The instructor will describe how to access these assignments during the first lecture [if you missed this lecture you have to learn how to login to WEBCT before the first quiz is due]. If you are unable to use WebCT; as the student, you are responsible for notifying the instructor of any difficulties prior to the due date of each assignment or quiz (“I did not know how to use WebCT” or “I did not try my login code until the day before the assignment was due” are not acceptable reasons for late assignments).

* Online lecture quizzes may not be turned in offline: you must take the quizzes online using WebCT by the due date on the syllabus. (You will be required to learn how to use WebCT)

LECTURE NOTE HANDOUTS – Science lectures can be difficult if students do not read the chapters before lecture and attempt to copy material during lecture that is already contained in the text book. In an effort to aid students with note taking during lecture, I try to provide lecture outlines of the powerpoint presentations. The presentation notes do not contain all of the material covered during lecture [and may not reflect last minute changes prior to the lecture], these notes are provided to limit the amount of needless copying of slide text [the slides contain text that is also explained in the textbook and many times would not require copying]. Notes will be posted as soon as they can be posted. However, this course is new and the lectures are still under revision, so notes may not be posted until the lecture is given. Please know that I post the notes as soon as possible, therefore please do not email me to notify that the notes were not posted.

You are not required to print out the note handouts for the course; All of this information is contained in the textbook. The lecture slide summaries maybe available on WEBCT in two different formats: 1. Adobe Acrobat files of the slides with note lines [3 slides per page] 2. A text file of the lecture slides, which does not contain any pictures but does not require Adobe Acrobat to open the files. Since both files contain the same text, students do not need to print out both formats. The second text format is available for students that do not want the small picture files and for students that do not have Adobe Acrobat Reader on their computer.

There is a WEBCT quiz due 01/18, so you will have to login into webct within the first week of class.

ACCESSING WEBCT: webct can be accessed from two websites- the main university page at http://www.csub.edu and use the webct icon or directly at http://www.csub.edu/webct/.
Read the directions about how to login. Your login is not necessarily the first letter of your first name and your last name, the correct login is your email address without the “@runner.csub.edu”…..therefore if your runner email is anderson2@runner.csub.edu then your login is anderson2. Your initial password before ever using webct is set by the university as either the last five digits of your social security number or the last five digits of your CSUB ID number. If neither of these is the correct passwords then either you have changed the password by a previous use of WEBCT or the password function is not set correctly. In both cases you must contact the WEBCT help desk at 654-2315. Due to privacy restrictions, students have to personally request to have their passwords reset. If the help desk is unable to solve access problems, you must notify the lecture instructor [include the name of the help desk personal that tried to help fix the problem].

Science 325A is a junior/senior level course; therefore, students are expected to demonstrate computer literacy. The use of WEBCT will not be formally taught during the course because its use requires computer skills taught in other college courses. If you have difficulties using WEBCT please schedule time during office hours or outside of class time to address the problems that prevent the completion of course quizzes and assignments. In addition, it is the student’s obligation to inform the instructor of difficulties accessing the information in a timely manner [I will not be able to solve access problems the day before an exam or quiz…most accessing problems require 1-2 days for Information and Technology Services to solve].

Attitudes and performance: I am committed to providing you with a deeper understanding of science and scientific processes in order to equip you with the knowledge needed for a career in teaching. In return, I expect you to behave as professionals in the classroom and laboratory. This includes: punctuality; a positive attitude toward the learning process; promotion of the learning process by actively participating in lecture, lab activities and your own education; proper respect towards your fellow students; and turning in assignments on time that demonstrate a commitment to quality and excellence.

ATTENDANCE: Students are expected to attend all lectures and laboratories in this class [As is stated on the laboratory syllabus, there is a point deduction for unexcused absences from lab]. Although there are other priorities in a student’s busy schedule Sci325A is an information rich course, so absences from lectures will require more than just reading the textbook to make up the missed material. Students are not allowed to leave lecture early, except for emergencies [please do not consider lecture as a seminar that you can freely walk in and out of, the disruptions are inconsiderate to the students remaining in lecture]. There are no points given for attending class, however there is a lot of information contained in the text and laboratory assignments, so a lack of attendance will increase your workload. Students are responsible for knowing the material for each exam, therefore no information missed during lectures and labs that clarify the course will not be repeated or made available electronically. Laboratory is your chance for a "hands on" experience, which cannot be duplicated by reading the text or a laboratory manual. You may not bring food, beverages, or children to lectures or the laboratory. If you converse during lecture, you will be asked to leave the lecture. Turn off all cell phones during lab and lecture; if your use your cell phone during a lecture or lab the instructor will ask you to leave the class [if you have a job or a circumstance that requires your cell phone to be on during class you must provide the instructor with proof of this requirement]. Cell phones in place of a calculator is not allowed for any exam; some exams will require each student to have calculator. Any conversation between students or use of non-approved electronic devices during an exam will be considered academic misconduct and handled according the rules outlined in the university catalog. Students with disabilities, who need special accommodations to participate fully in the class, please see me to discuss your needs.

Points to remember:
1. Although the Lecture and Lab sessions are separate much of the material overlaps between both. Therefore, some material covered during lecture will supplement material covered in the Laboratory and would be useful to know when answering lab exam questions [the same is true for Lecture exams].
2. There are no "Make-ups" of examinations or Laboratory assignments.
3. NO Extra Credit is offered in this course
4. Lab attendance is critical. Minus 5 points for each absence
5. Science 325A is a liberal studies course with a portfolio assignment necessary for credentialing. The portfolio assignment can be picked up outside the Liberal Studies office.
The printed schedule is tentative and subject to change during the quarter. Refer to the WEBCT calendar for any changes in the schedule. Exam dates are not subject to change, check WEBCT Exam topics for the material that will be covered for each exam. There are no make-up exams without prior arrangements.

**Course workload expectations:** Science 325A assessment consist of written [scantron- multiple choice] and practical [short answer and fill-in-the blank] examination of the student’s understanding of the course material. In addition to examinations, the laboratory analyses, notebook, experimental topic, and science lessons will require hours of work outside of laboratory time and serve as an additional assessment of the course scientific inquiry objective.

In addition to the assigned coursework students are expected to spend the recommended amount of time for all university classes [catalog p. 80] reviewing course material. Additional time outside of lecture is required to learn science concepts. Science 325A is a 4 credit hour course; the credit hours are divided into 2 credit hours for lecture and 2 credit hours for lab. According to reasonable expectations from a university course, 1 credit hour represents 1 hour in class and no less than 2-3 hours of outside study per week for one quarter (11 weeks) [see p. 80 of the college catalog]. Following this rule of course credit a student **should expect to devote approximately 8-12 hours per week to studying and working on Science 325A assignments outside of class.** Lectures are only intended to present information; students are expected to spend 2-3 hours for each hour spent in lecture outside of class working on exercises that review and increase understanding of the lecture topics [laboratory exercises will not cover all lecture topics nor are laboratory exercises intended to replace additional review of lecture material by students.

The WEBCT site is still under construction, so the extend of extra material maybe limited, but whenever possible lectures will have self-tests and quizzes to serve as a guide for outside study of the course content.

**Missing a lecture or lab. DON’T!** There is simply too much material covered too rapidly to catch up if you get behind. Skipping class and relying on the web-posted notes is a guaranteed recipe for failure. If you miss a lab, get in there and cover the material before the next scheduled session.

**Keep up by studying regularly.** This is not the kind of course that you can survive by waiting until the week before an exam to study. You must drill on the material as it is presented. Your nervous system will simply overheat and shut down (perhaps not an anatomically nor physiologically correct explanation) if you try to learn it all the day or two before an exam.

Standards of Quality and Effectiveness for the Subject Matter Requirement for the Multiple Subject Teaching Credential

**Content Domains for Subject Matter Understanding and Skill in Science**

Domain 1: Physical Science

1.1 **Structure and Properties of Matter.** Candidates for Multiple Subject Teaching Credentials understand the physical properties of solids, liquids, and gases, such as color, mass, density, hardness, and electrical and thermal conductivity. They know that matter can undergo physical changes (e.g., changes in state such as the evaporation and freezing of water) and chemical changes (i.e., atoms in reactants rearrange to form products with new physical and chemical properties). They know that matter consists of atoms and molecules in various arrangements, and can give the location and motions of the parts of an atom (protons, neutrons, and electrons). They can describe the constituents of molecules and compounds, naming common elements (e.g., hydrogen, oxygen, and iron), and explain how elements are organized on the Periodic Table on the basis of their atomic and chemical properties. They can describe characteristics of solutions (such as acidic, basic, and neutral solutions) and they know examples with different pH levels such as soft drinks, liquid detergents, and water. They know that mixtures may often be separated based on physical or chemical properties.
1.2 **Principles of Motion and Energy.** Candidates for Multiple Subject Teaching Credentials describe an object's motion based on position, displacement, speed, velocity, and acceleration. They know that forces (pushes and pulls), such as gravity, magnetism, and friction act on objects and may change their motion if these forces are not in balance. They know that "like" electrical charges or magnetic poles produce repulsive forces and "unlike" charges or poles produce attractive forces. They describe simple machines in which small forces are exerted over long distances to accomplish difficult tasks (e.g., using levers or pulleys to move or lift heavy objects). Candidates identify forms of energy including solar, chemical, electrical, magnetic, nuclear, sound, light, and electromagnetic. They know that total energy in a system is conserved but may be changed from one form to another, as in an electrical motor or generator. They understand the difference between heat, (thermal energy) and temperature, and understand temperature measurement systems. Candidates know how heat may be transferred by conduction, convection, and radiation (e.g., involving a stove, the Earth's mantle, or the sun). They describe sources of light including the sun, light bulbs, or excited atoms (e.g., neon in neon lights) and interactions of light with matter (e.g., vision and photosynthesis). They know and can apply the optical properties of waves, especially light and sound, including reflection (e.g., by a mirror) or refraction (e.g., bending light through a prism). They explain conservation of energy resources in terms of renewable and non-renewable natural resources and their use in society.

**Domain 2: Life Science**

2.1 **Structure of Living Organisms and Their Function (Physiology and Cell Biology).** Candidates for Multiple Subject Teaching Credentials describe levels of organization and related functions in plants and animals, including, organ systems (e.g., the digestive system), organs, tissues (e.g., ovules in plants, heart chambers in humans), cells, and subcellular organelles (e.g., nucleus, chloroplast, mitochondrion). They know structures and related functions of systems in plants and animals, such as reproductive, respiratory, circulatory, and digestive. They understand principles of chemistry underlying the functioning of biological systems (e.g., carbon's central role in living organisms, water and salt, DNA, and the energetics of photosynthesis).

2.2 **Living and Nonliving Components in Environments (Ecology).** Candidates for Multiple Subject Teaching Credentials know the characteristics of many living organisms (e.g., growth, reproduction, and stimulus response). They understand the basic needs of all living organisms (e.g., food, water, and space), and can distinguish between environmental adaptations and accommodations. They describe the relationship between the number and types of organisms an ecosystem can support and relationships among members of a species and across species. They illustrate the flow of energy and matter through an ecosystem from sunlight to food chains and food webs (including primary producers, consumers, and decomposers). They identify the resources available in an ecosystem, and describe the environmental factors that support the ecosystem, such as temperature, water, and soil composition.

2.3 **Life Cycle, Reproduction, and Evolution (Genetics and Evolution).** Candidates for Multiple Subject Teaching Credentials diagram life cycles of familiar organisms (e.g., butterfly, frog, mouse). They explain the factors that affect the growth and development of plants, such as light, gravity, and stress. They distinguish between sexual and asexual reproduction, and understand the process of cell division (mitosis), the types of cells and their functions, and the replication of plants and animals. They distinguish between environmental and genetic sources of variation, and understand the principles of natural and artificial selection. They know how evidence from the fossil record, comparative anatomy, and DNA sequences can be used to support the theory that life gradually evolved on earth over billions of years. They understand the basis of Darwin's theory, that species evolved by a process of natural selection.
Domain 3: Earth and Space Science

3.1 **The Solar System and the Universe (Astronomy).** Candidates for Multiple Subject Teaching Credentials identify and describe the planets, their motion, and that of other planetary bodies (e.g., comets and asteroids) around the sun. They explain time zones in terms of longitude and the rotation of the earth, and understand the reasons for changes in the observed position of the sun and moon in the sky during the course of the day and from season to season. They name and describe bodies in the universe including the sun, stars, and galaxies.

3.2 **The Structure and Composition of the Earth (Geology).** Candidates for Multiple Subject Teaching Credentials describe the formation and observable physical characteristics of minerals (e.g., quartz, calcite, hornblende, mica, and common ore minerals) and different types of rocks (e.g., sedimentary, igneous, and metamorphic). They identify characteristics of landforms, such as mountains, rivers, deserts, and oceans. They explain chemical and physical weathering, erosion, deposition, and other rock forming and soil changing processes and the formation and properties of different types of soils and rocks. They describe layers of the earth (crust, lithosphere, mantle, and core) and plate tectonics, including its convective source. They explain how mountains are created and why volcanoes and earthquakes occur, and describe their mechanisms and effects. They know the commonly cited evidence supporting the theory of plate tectonics. They identify factors influencing the location and intensity of earthquakes. They describe the effects of plate tectonic motion over time on climate, geography, and distribution of organisms, as well as more general changes on the earth over geologic time as evidenced in landforms and the rock and fossil records, including plant and animal extinction.

3.3 **The Earth’s Atmosphere (Meteorology).** Candidates for Multiple Subject Teaching Credentials explain the influence and role of the sun and oceans in weather and climate and the role of the water cycle. They describe causes and effects of air movements and ocean currents (based on convection of air and water) on daily and seasonal weather and on climate.

3.4 **The Earth's Water (Oceanography).** Candidates for Multiple Subject Teaching Credentials compare the characteristics of bodies of water, such as rivers, lakes, oceans, and estuaries. They describe tides and explain the mechanisms causing and modifying them, such as the gravitational attraction of the moon, sun, and coastal topography.

Part II: Subject Matter Skills and Abilities

Applicable to the Content Domains in Science

 Candidates for Multiple Subject Teaching Credentials know how to plan and conduct a scientific investigation to test a hypothesis. They apply principles of experimental design, including formulation of testable questions and hypotheses, and evaluation of the accuracy and reproducibility of data. They distinguish between dependent and independent variables and controlled parameters, and between linear and nonlinear relationships on a graph of data. They use scientific vocabulary appropriately (e.g., observation, organization, experimentation, inference, prediction, evidence, opinion, hypothesis, theory, and law). They can select and use a variety of scientific tools (e.g., microscopes) and know how to record length, mass, and volume measurements using the metric system. They interpret results of experiments and interpret events by sequence and time (e.g., relative age of rocks, phases of the moon) from evidence of natural phenomena. They can communicate the steps in an investigation, record data, and interpret and analyze numerical and non-numerical results using charts, maps, tables, models, graphs, and labeled diagrams. They make appropriate use of print and electronic resources, including the World Wide Web, in preparing for an investigative activity. Candidates communicate the steps and results of a scientific investigation in both verbal and written formats.
Science 325A: Laboratory Schedule
Winter Quarter 2006

The laboratory in science 325A is designed to give you experience in the process of inquiry: asking and attempting to answer questions about the world around you. The only way you can learn inquiry is to do it. Therefore, we will engage in a variety of question asking and answering activities. Not only will this practice make you more adept at these fundamental processes of science, but they should also prepare you for teaching with an inquiry perspective, which is the goal of most of the major science education reforms: to move science teaching from the transmission of facts to doing science.

Your grade in this section of the class will be based on the following activities (see schedule for due dates; due dates can also be checked on the WEBCT calendar: please refer to only your laboratory section)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Notebook:</td>
<td></td>
</tr>
<tr>
<td>Lab Activity notes/questions/graphs</td>
<td>35</td>
</tr>
<tr>
<td>Laboratory Analysis Quizzes [available only through WEBCT] check the schedule for dates due [there are 4 quizzes during the course]</td>
<td>35</td>
</tr>
<tr>
<td>Experimental Design group write-up</td>
<td>20</td>
</tr>
<tr>
<td>Individual Experimental topic write up</td>
<td>35</td>
</tr>
<tr>
<td>*Science lesson- Write up [paper submitted by paired groups]</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total points in lab</strong></td>
<td>160</td>
</tr>
</tbody>
</table>

* The exam questions based upon laboratory activities and science lesson are graded to assess student understanding of the California Science Standards of Quality and Effectiveness for the Subject Matter Requirement for the Multiple Subject Teaching Credential; Part II: Subject Matter Skills and Abilities Applicable to the Content Domains in Science

Attendance is critical for laboratory. Therefore:
1. Unexcused absence will result in **automatic loss of 5 points**. Excused absences require the lab instructor knows the circumstances and approves the absence before the absence occurs.
2. Being late two times will count as one absence.
3. Students will lose 10 points for non-attendance at each Science lesson day.

**4.** Necessary notes and figures for each lab are given during the lab exercise; the required material for each lab will not be posted electronically. Please keep up with your notes, questions and figures for each lab.

How to write the experimental question and information on the Science lesson will be explained in separate hand-outs and verbally.

There is no laboratory manual for this course; in each lab you will receive any materials you need to do the activity.

There is, however, a required laboratory notebook. It needs to have bound pages. The bookstore sells composition books that work well.

There is a computer disk requirement; bring to each lab meeting one of the following - 1.4MB 2SHD IBM formatted floppy disk or PC compatible ZIP disk.(one disk can be used to save files during the entire quarter)

**Format and Notes for Results Section, Science lesson and Experimental Questions**

1. All assignments except the notebook are to be typed. Assignments should be stapled; **do not use report covers**.

2. Graphs, tables, etc. should be professional in appearance. Learning how to make these on the computer will simplify your task.
3. Unless instructed differently, assignments are to be completed individually. They are not a group effort. No assignment unless specified can contain material turned in by another student in the class.

4. Assignments are to follow rules of proper English writing, i.e., complete sentences, proper grammatical structure, etc. You will be graded down if your assignment is not well written.

5. You may need to do outside reading about the concepts to enhance your understanding. It would be appropriate to consult your text, high-school level texts, or even middle-school-level texts. Even an encyclopedia or science dictionary might help. You do not necessarily need to present such information in your papers, but you should cite such information whenever it is used – do not quote large sections from sources, however. Reports that are largely quotes indicate a lack of thinking on the part of the author. Quotes not acknowledged, however, indicate academic dishonesty – see p 59 of the 2001-2003 catalog.

LABORATORY NOTEBOOK

You are to keep a notebook for the laboratory portion of this course. The notebook must have permanently bound pages; loose-leaf style is unacceptable. (Composition books are available in the bookstore.) The notebook is not unlike what scientists keep as they work on research projects and reflect on their work, and is akin to a scientific diary or journal. Additionally, and not insignificantly for future teachers and their students, a laboratory notebook is a powerful tool for developing questioning, analysis, critical-thinking and writing skills. It also aids in vocabulary acquisition and language growth.

Your notebook has to contain the following:

**Table of Contents.** Use titles as given on the syllabus, plus meaningful labels for other items. Provide page numbers for the Daily journal and the Analysis for each lab. Be sure to leave a few pages blank at the front of your notebook for the table of contents.

**Daily Journal and Analyses.** The notebook should contain in chronological order your daily journals followed by an analysis of each laboratory activity, as specified in the syllabus.

**Daily journal:** These are the notes collected during the course of the lab day and should not be recopied even though they may be rough. After each lab, however, you are expected to add to your notes as needed to make them useful to you later. Your instructor will look for contemporaneous reporting of what you did, and the presence of tables, graphs and other demonstrations that you were an active participant in each lab. If you receive a handout with the method, it is not necessary to rewrite those methods in your notebook. Whenever methods are student-developed, you must include the methods used. The notes for every lab day should be complete enough to jog your memory - even years from now - about what went on each day and why. In order to accomplish this, be sure to: label tables, graphs and sketches completely; identify any abbreviations you create; write in complete sentences wherever appropriate, and explain your thinking. All content must be in the notebook, do not staple handouts or sheets of paper into your notebook in place of taking notes.

The notebooks will be graded based upon amount of required graphs and answers to laboratory questions. In addition, a portion of the grade will reflect the degree of organization and completeness of the answers to laboratory questions [not all answers must be correct, but all lab notes should indicate an attempt to learn the laboratory material].
There will be 3 – Laboratory analysis quizzes during the term. The quiz questions are based upon an analysis of laboratory exercises. The laboratory analysis described below is not required to be submitted, however when doing the laboratory exercises you should note which CA science standards are covered, science process skills, and relevant concepts and possible experimental questions. The laboratory quizzes will replace a formal written analysis of each laboratory exercise. The questions will also include relevant topics covered during the covered lab….for example if we cover evolution the questions would include which CA science standard applies and they could also include how to recognize a generational pattern of genetic drift as an evolutionary mechanism.

Connections to California Science Standards: Write out (don't simply list grade levels and numbers, but do include them) the 3 most relevant standards specifically covered by the lab activities. After each standard, give a brief explanation of the specific sections of the lab taught the concept described by the standard. Check grades 4-8. Many of the standards are somewhat redundant across grade levels. Avoid picking redundant standards; instead, choose 2 independent standards that best fit the day’s activity. Note: Do NOT use the notebook assignment itself to justify any standards.

Process Skills: Identify which scientific process skills were used in the day's activity. For each process you identify, provide a brief explanation of how it was used during the lab. See separate sheet (attached) for a list and descriptions of the science process skills we will use. Processes identified here should include the informal hypotheses and predictions that form part of the thinking process. In your experimental questions (see separate handout) your hypotheses will be more formal. Not every process will be used in any given lab: if a process is not used, either omit it or state explicitly that it is not used.

Previous learning concepts or experience: As your text book explains in chapters 3 and 4, lab activities requires prior skills to complete new introduced tasks. If students do not remember required prior skills then the new introduced task is more difficult. For this section of the analysis identify a skill or topic that the lab activity required you to be familiar with but you know you need to review before fully understanding the lab activity. Include in your description why you feel you need to review the required concept or skill. This section is meant to have you critically evaluate whether you are retaining necessary skills, responses that do not explain your reasoning or simply state "I need to review everything about cell chemistry" will not receive credit.

Question for future experimentation: Identify and discuss a question that was generated by the lab activity that could be answered by a simple experiment. For these questions, specific, easy to address questions should be the goal, not broad or complex ones. Don’t use questions to which you already know the answer or which were answered by the lab. Be sure to explicitly identify the independent and dependent variables you would need to measure to conduct an experiment, as well as provide a brief description of your method.

General Recommendations
Reserve several pages at the beginning of the notebook for the Table of Contents. Consecutively number all pages of the notebook, even those pages with no entries. Reserve pages following each activity for the analysis.

Notes:
1) Keep up with the notebook assignments. You will benefit at exam time, and you will not have much to do to get your notebook ready to submit for grading. If you do not keep up, you will find yourself with an overwhelming amount of work the night before notebooks are due.
2) The sooner after lab you do the analyses, the less time it will take you. Finish your analyses quickly, while the information and experience is still fresh, and you will save yourself time in the long run.
3) Always follow directions. Your work will receive a lower grade if directions are not followed. If in doubt, explore the models, reread the instructions, and ask questions.
4) You will lose points if it is not easy to navigate through the notebook.
5) Many people prefer to type their analyses and staple them into the notebook. This is perfectly acceptable; just make sure that your table of contents directs the grader appropriately.
Science Process Skills

Following are the science process skills used to develop science inquiry skills. Inquiry-based exercises should require students to use these skills to complete the activity or experiment. For more explanation of each skill refer to chapter 4 in the Science in elementary education text. All laboratory analyses should address these skills only for the process skills section.

**Observing** - using the senses to gather information about an object or event. Example: Noting that plants growing in soil with dead leaves grow larger than plants in soil without dead leaves.

**Measuring** - using both standard and nonstandard measures or estimates to describe the dimensions of an object or event. Measuring is primarily a way of making observations more precise. Example: Using a balance to measure the mass of a plant, or using a chemical indicator to measure the concentration of nitrogen in soil.

**Communicating** - using words or graphic symbols to convey an action, object or event to other people. Examples: Describing the change in mass of a plant over time in writing or through a graph; writing the procedures and/or results of an experiment for others to read.

**Classifying** - grouping or ordering objects or events into categories based on properties or criteria. Example: grouping plants into various families based on similarities in structure and/or physiology.

**Formulating hypotheses** – A hypothesis is a potential explanation for an observation or series of observations. Example: If you observe that plants growing in soil with dead leaves grow larger than plants growing in soil without dead leaves, you might hypothesize that the reason for this difference is that the dead leaves supply Nitrogen to the plant.

**Predicting** - stating the outcome of a future event based on either a pattern of evidence or a hypothesis. Example from a pattern of evidence: predicting the mass of a plant in two weeks time based on a graph of its growth during the previous four weeks. Example from a hypothesis: predicting that Nitrogen levels in soil with dead leaves will be higher than Nitrogen levels in soil without dead leaves.

**Identifying variables** – being able to identify variables that can affect an experimental outcome, including the independent and dependent variables in an experiment. Example: identifying variables, such as the amount of water and light, that may affect the growth of plants in different environments.

**Controlling variables** - Keeping variables other than the independent and dependent variables constant (or randomized) during experiments. Example: Keeping the amount of light and water constant in all pots when testing to see how the addition of dead leaves affects the Nitrogen levels of soil. Note: This is NOT the same as a control group.

**Experimenting (i.e. Testing hypotheses)** - conducting an experiment, including asking an appropriate question, stating a hypothesis, making predictions, identifying and controlling variables, conducting the experiment, and interpreting the results of the experiment. Example: The entire process of conducting an experiment on the affect of dead leaves on the Nitrogen levels in the soil.

**Interpreting data** - drawing conclusions from data. This can be by making predictions based on trends or evaluating a hypothesis – this will usually require organizing your data in tables or graphs and/or conducting statistical tests. Example: using statistics and/or graphing the data on nitrogen levels in soils with dead leaves and without dead leaves, and deciding whether the results support or falsify your hypothesis.
<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture topic</th>
<th>Lab Topic- Date: Note all MW labs will be the same date as the lecture topic</th>
<th>Assignment Due [during lab session]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun 19</td>
<td>Learning Theory and Science education</td>
<td>No Lab Monday 6/19 or 6/20- the first day of lab is 6/21 or 6/22</td>
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<tr>
<td></td>
<td>Methods of scientific investigation</td>
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<tr>
<td>Jun 21</td>
<td>Experimental Method</td>
<td>The scientific method</td>
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<td></td>
<td>Evolution [ What laws govern organic change]</td>
<td>Observation and hypothesis formulation</td>
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<tr>
<td>Jun 26</td>
<td>Adaptation and Selection</td>
<td>Digestion experiment</td>
<td>WEBCT pretest due 6/27 for all classes</td>
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<td></td>
<td></td>
<td>How to analyze and report data [Digestion exp. Write-up in notebook]</td>
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<tr>
<td>Jun 28</td>
<td>Digestion</td>
<td>Evolution lab</td>
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<td></td>
<td>And material acquisition</td>
<td>Phylology and classification</td>
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<td></td>
<td>Photosynthesis</td>
<td>Chap 23 (pp. 290-309)</td>
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<tr>
<td>July 3</td>
<td>Mid-term Exam [Lab and Lecture material]</td>
<td>Holiday No Class</td>
<td>WEBCT Quiz 1 available 6/28 and due 7/3</td>
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<tr>
<td></td>
<td><strong>The exam will be given during lecture</strong></td>
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<tr>
<td>July 5</td>
<td>Maintain internal environment</td>
<td>Diffusion and Osmosis / Science lessons assigned</td>
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<td></td>
<td>Adapations to salinity</td>
<td>Environmental conditions investigation</td>
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<td></td>
<td>Acquire information about the external environment/ Sensory systems</td>
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<tr>
<td>July 10</td>
<td>Exploit new resources….what is required?</td>
<td>Environmental conditions</td>
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<td>The move to land</td>
<td>Experiments</td>
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<tr>
<td>July 12</td>
<td>The move to land</td>
<td>Science lesson discussions</td>
<td>Environmental Design Group write-up Due</td>
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<td></td>
<td>Animal movement and Simple machines</td>
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<td>WEBCT Quiz 2 due 7/13</td>
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<tr>
<td>July 17</td>
<td>Lecture Scheduled- Complete Animal movement and Intro to ecology</td>
<td>Holiday – No Lab scheduled</td>
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<td>No lab for MW or TR scheduled 17th or 18th</td>
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<tr>
<td>July 19</td>
<td>Ecology</td>
<td>Stride length Regression Analysis</td>
<td>Science lesson assignment due MW lab 7/19  TTR lab 7/20</td>
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<td>Energy flow in the environment &amp;</td>
<td>Skull and Bones</td>
<td>Turn in Notebooks due in lab MW 7/19 or TR lab 7/20</td>
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<td>July 24</td>
<td>Material Flow in the environment----</td>
<td>Improving simple machines</td>
<td>Individual Exp. Topic write-up due MW lab 7/24 TR lab 7/25</td>
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<tr>
<td>July 26</td>
<td>Ecology lecture cont.</td>
<td>Final Exam [cumulative lab and lecture]</td>
<td>WEBCT Quiz 3 due 7/26</td>
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<td><strong>Final Exam for MW class is 7/26 in Lab</strong></td>
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