

Fresno Pacific University
Center for Professional Development

Course Syllabus

SCI 903A Classroom Science, Animals (Methods and Activities, Grade 7+)

2 & 3 units

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Contact Information

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2 units

Course Description

This **online 2-unit** methods course is designed to explore how the study of Animals can be used to enrich the science programs. The participants are required to complete and evaluate a planned series of experiments and/or experiences with their students. This course is in alignment with the California State and National Science Standards. All of these experiments and/or experiences may be used with children in the classroom, home, and/or neighborhood.

The following National Science Standards are addressed in this class.

Cell Biology

1. All living organism are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. As a basis for understanding this concept:
 - a. Students know cells function similarly in all living organisms.
 - b. Students know the characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls.
 - c. Students know cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes.

Genetics

2. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept.
 - a. Students know the differences between the life cycles and reproduction methods of sexual and asexual organisms.
 - b. Students know sexual reproduction produces offspring that inherit half their genes from each parent.
 - c. Students know an inherited trait can be determined by one or more genes.
 - d. Students know DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.

Structure and Function in Living Systems

The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept.

- a. Students know plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.
- b. Students know organ systems functions because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system.

- c. Students know the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruit.

Investigation and Experimentation

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

Students will:

- a. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
- b. Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project.
- c. Communicate the logical connection among hypotheses, science concepts, test conducted, data collected, and conclusions drawn from the scientific evidence.
- d. Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).
- e. Communicate the steps and results from an investigation in written reports and oral presentations.

Grade 8

Chemistry of living Systems (Life Science)

6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept:

- a. Students know that carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.
- b. Students know that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.
- c. Students know that living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA.

Investigation and Experimentation

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

Students will:

- a. Plan and conduct a scientific investigation to test a hypothesis.
- b. Evaluate the accuracy and reproducibility of data.
- c. Construct appropriate graphs from data and develop qualitative statements about the relationships between variables.
- d. Distinguish between linear and nonlinear relationships on a graph of data.

Grades 9-12

Cell Biology

1. The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept:

- a. Students know cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.
- b. Students know the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm.

c. Students know usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.

Primary Learning Outcomes

1. Teachers who take this course will know how to make science learning relevant to daily life.
2. Teachers will know how to effectively present the study of plants in a variety of situations.
3. Teachers will be able to articulate how the State and/or National Science Standards were met using this material.
4. Teachers will be able to see a process on how to teach this material effectively.
5. Teachers will use science to understand and describe the local environment.
6. Teachers will understand that major scientific breakthroughs may link large amounts of knowledge, build upon the contributions of many scientists, and cross different lines of study.
7. Teachers will understand that scientific discovery is often a combination of an accidental happening and observation by knowledgeable persons with an open mind.

Course Materials

Animals Manual. Background materials are located in the rear of the Animals Manual to aid the teacher in teaching this material.

Course Requirements

1. The teacher is to do the 10 experiments and/or experiences with his/her class. The Forums are for the teacher to make an evaluation of the material presented in each experiment.
2. The teacher may write experiments of her/his own. Post the completed experiments in the Forum section at the bottom of the page.
3. The teacher is to list the State and/or National Science Standards that were met teaching each experiment, when requested.
4. Post a one page report describing how this class enhanced your curriculum. The assignment is found at the top.

Grades will be assigned based on points earned during the course. Grades will be given on the following basis: **A=90-100 points, B=80-89 points. For a credit grade you must have at least 80 points.**

Submitting the Material

First, Send the grade form to Marvin Harms 4114 E Farrin Fresno, CA 93726 when you have completed the requirements.

Post the one page report describing how this class enhanced your curriculum.

Assignments

Take a look at the curriculum required by your district. Perform the experiments and/or experiences included in this course that are appropriate to meet the needs of your district. By doing the experiments, you will be able to become more proficient in your ability to communicate with your students, parents, fellow teachers and administration.

Experiments and/or experiences are designed with the busy life of a teacher in mind. The experiments are designed to give you a basic format from which to develop the concepts. Teach the concept that meets the needs of your district and post the responses in the proper area.

Instructor/Student Contact

Built into the course requirements, are several contacts between the course instructor and the student.

Questions are addressed and assistance is offered through these contacts between the instructor and student.

1. On-track students – (with students) choose 10 Experiments and or experiences from the materials included with this course and present them to your class or a group of students. As you post your responses I will monitor your progress and let you know how you are doing on a daily basis.)

2. Off-track students - (without students) review 20 Experiments or complete as many Experiences as you wish. You do not need to actually present the Experiments to students. Check the complete assignment list on the Grading Rubric. You are to post your responses in the Forum section under the Experiment and/or Experience.

3. Upon receipt of your completed assignments and during the time that you are online, your instructor will contact you via phone or e-mail to discuss your work.

Policy on Plagiarism

All people participating in the educational process at Fresno Pacific University are expected to pursue honesty and integrity in all aspects of their academic work. Academic dishonesty, including plagiarism, will be handled according to the procedures set forth in the Fresno Pacific University Catalog.

Graduate level course work reflects Fresno Pacific University's Desired Student Learning Outcomes as it applies to professional development to demonstrate the following:

- Oral and written communication individual and group settings.
- Content knowledge, and application of such knowledge in the student's area of interest to affect change.
- Reflection for personal and professional growth.
- Critical thinking.
- Cultural and global perspectives to understand complex systems.
- Computational/methodological skills to understand and expand disciplines, including an understanding of technological systems"

3 units

Course Description

This **online 3 unit** methods course is designed to explore how the study of Animals can be used to enrich the science programs. The participants are required to complete and evaluate a planned series of experiments and/or experiences with their students. This course is in alignment with the California State and National Science Standards. All of these experiments and/or experiences may be used with children in the classroom, home, and/or neighborhood.

The following standards are addressed in this course:

7th Grade

Cell Biology

1. All living organism are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. As a basis for understanding this concept:
 - a. Students know cells function similarly in all living organisms.
 - b. Students know the characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls.
 - c. Students know the nucleus is the repository for genetic information in plant and animal cells.
 - d. Students know that mitochondria liberate energy for the work that cells do and that chloroplasts

capture sunlight energy for photosynthesis.

e. Students know cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes.

f. Students know that as multicellular organisms develop, their cells differentiate.

Genetics

2. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept:

a. Students know the differences between the life cycles and reproduction methods of sexual and asexual organisms.

b. Students know sexual reproduction produces offspring that inherit half their genes from each parent.

c. Students know an inherited trait can be determined by one or more genes.

Structure and Function in Living Systems

5. The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept:

a. Students know plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems and the whole organism.

b. Students know organ systems functions because of the contributions of individual organs, tissues and cells. The failure of any part can affect the entire system.

c. Students know how bones and muscles work together to provide a structural framework for movement.

d. Students know how the reproductive organs of the human female and male generate eggs and sperm and how sexual activity may lead to fertilization and pregnancy.

f. Students know the structures and processes by which flowering plants generate pollen, ovules, seeds and fruit.

Investigation and Experimentation

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

Students will:

a. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data and display data.

b. Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project.

c. Communicate the logical connection among hypotheses, science concepts, test conducted, data collected and conclusions drawn from the scientific evidence.

d. Construct scale models, maps and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).

e. Communicate the steps and results from an investigation in written reports and oral presentations.

Grade 8

Chemistry of living Systems (Life Science)

6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept:

a. Students know that carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.

b. Students know that living organisms are made of molecules consisting largely of carbon, hydrogen,

nitrogen, oxygen, phosphorus and sulfur.

c. Students know that living organisms have many different kinds of molecules, including small ones, such as water and salt and very large ones, such as carbohydrates, fats, proteins, and DNA.

Investigation and Experimentation

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

Students will:

- a. Plan and conduct a scientific investigation to test a hypothesis.
- b. Evaluate the accuracy and reproducibility of data.
- c. Distinguish between variable and controlled parameters in a test.
- d. Recognize the slope of the linear graph as the constant in the relationship $y=kx$ and apply this principle in interpreting graphs constructed from data.
- e. Construct appropriate graphs from data and develop qualitative statements about the relationships between variables.

Grades 9-12

Cell Biology

1. The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept:

- a. Students know cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.
- b. Students know usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.
- c. Students know the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.

Investigation and Experimentation

1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will:

- a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships and display data.
- b. Identify and communicate sources of unavoidable experimental error.
- c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.
- d. Formulate explanations by using logic and evidence.
- e. Distinguish between hypothesis and theory as scientific terms.
- f. Recognize the usefulness and limitations of models and theories as scientific representations of reality.
- g. Recognize the issues of statistical variability and the need for controlled tests.
- h. Recognize the cumulative nature of scientific evidence.
- i. Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

Primary Learning Outcomes

1. Teachers who take this course will know how to make science learning relevant to daily life.

2. Teachers will know how to effectively present the study of animals in a variety of situations.
3. Teachers will be able to articulate how the State and/or National Science Standards were met using this material.
4. Teachers will be able to see a process on how to teach this material effectively.
5. Teachers will use science to understand and describe the local environment.
6. Teachers will understand that major scientific breakthroughs may link large amounts of knowledge, build upon the contributions of many scientists and cross different lines of study.
7. Teachers will understand that scientific discovery is often a combination of an accidental happening and observation by knowledgeable persons with an open mind.

Course Materials

Animals Manual. Background materials are located in the rear of the Animals Manual to aid the teacher in teaching this material.

Course Requirements

1. The teacher is to do the 15 experiments and/or experiences with his/her class.
2. The teacher may write experiments of her/his own. Post the completed experiments.
3. The teacher is to list the State and/or National Science Standards that were met teaching each experiment, where requested.
4. Post a one page report describing how this class enhanced your curriculum.

Grades will be assigned based on points earned during the course. Grades will be given on the following basis: **A=90-100 points, B=80-89 points. For a credit grade you must have at least 80 points.**

Submitting the Material

The signed three part grade form should be sent via mail to Marvin Harms, 4114 E Farrin, Fresno, CA 93726 when you have completed all of the requirements. Post the one page report describing how this class enhanced your curriculum.

Assignments

Take a look at the curriculum required by your district. Perform the experiments and/or experiences included in this course that are appropriate to meet the needs of your district. By doing the experiments, you will be able to become more proficient in your ability to communicate with your students, parents, fellow teachers and administration.

Experiments and/or experiences are designed with the busy life of a teacher in mind. The experiments are designed to give you a basic format from which to develop the concepts. Teach the concept that meets the needs of your district and post the responses in the proper area.

Instructor/Student Contact

Built into the course requirements, are several contacts between the course instructor and the student. Questions are addressed and assistance is offered through these contacts between the instructor and student.

1. On-track students – (with students) choose 15 Experiments and or experiences from the materials included with this course and present them to your class or a group of students. As you post your responses I will monitor your progress and let you know how you are doing on a regular basis.)
2. Off-track students - (without students) review 30 Experiments or complete as many Experiences as you wish. You do not need to actually present the Experiments to students. Check the complete assignment list on the Grading Rubric. You are to post your responses in the Forums as you revise each of the 30.

3. Upon receipt of your completed assignments and during the time that you are online, your instructor will contact you via phone or e-mail to discuss your work.

Policy on Plagiarism

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