Lane College Division of Science and Mathematics

Biology 331 Methods of Teaching Natural Science

Syllabus

This course is designed to prepare students who intend to certify in science for secondary education. Offered Spring semester in odd numbered years only.

3 hours per week classroom meetings.

Instructor contact:

All assignments must be done to pass the course. The grade depends on the degree to which the assignment meets the course learning objectives.

If you have a diagnosed learning disability that requires accommodations, please notify the Vice President of Academic Affairs, who will make arrangements for those accommodations.

Textbook: Required. Derry, G (2002). What science is and how it works. Princeton, NJ; Princeton University Press.
Other readings: *Why we can't rule out bigfoot.* Zimmer 2017

Grading for the course: Two exams worth 50 points each
Demonstration project: 100 pts
Assignment portfolio: 4 assignments worth 50 points each
Alignment Exercises: 50 pts each
Discussion/ Participation: 50 pts

Total 500 pts

The course is aligned with the National Science Teachers Association Standards for Science Teaching..

The two areas of those standards pertaining to this course are: Conceptual Content of the Natural Sciences: ability to articulate and interpret the important unifying concepts, ideals and relationships in physics, chemistry, biology and or earth science; History, Nature and Philosophy of Science leads to understanding of the ways scientific discovery comes about and scientific knowledge becomes accepted; and Science Education: using the nature and history of science to bring forth learning.

The students must develop an enduring understanding of the nature of science: how science is done and the influence of science and society on one another.

The units within the course include the History of Science, Science Today and Science Education. Each student should develop a portfolio of assignments to convey these concepts in a thorough and engaging manner.

Students should be able to distinguish between science and non-science and critically analyze claims made from either point of view. Students should also be able to delineate the difference between science and technology and what kinds of questions each can answer.

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Lane College complies with the Americans with Disabilities Act. Students requesting academic accommodations should contact Ms. Kimberly Morris, Director of Counseling and Disability Support Services. In order to provide appropriate accommodations in a timely manner, students are encouraged to contact Ms. Morris as early in the term as possible.
Contact Information: Ms. Kimberly Morris,
Saunders Hall, Room 109
kmorris@lanecollege.edu
731-426-7619

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Students should be able to understand scientific research and design, conduct and report scientific investigations, to facilitate the learning of science.

Students will be required to develop and present a mock lesson on a modern scientific controversy (e.g. cloning; CRISPR; etc.) addressing both the substance of the science and the societal or ethical questions. The presentation should use technology, including computer resources, to process and present the information. Alternatively, a student may develop a lab activity to share with the class that would convey a principle that learners in their chosen discipline need to master.

Because we have limited time and secondary school teachers also have time limits, you will need to select your topic by the beginning of Week 3 and sign up for a particular day for your presentation of the lesson/lab. You do not need to develop an assignment on the topic of your presentation.
Science education: How can the history and nature of science be used to improve teaching and learning? Students should choose an episode/ topic from the history of science and describe how it both illustrates the scientific method and advanced an understanding of scientific principles in the field.

Current research in the scientific field should be examined to see how it provides an opportunity to discern general principles that are accessible to students and evaluate the grade level at which they should be presented.

Assignment portfolio: Students are required to develop assignments addressing essential topics in science education. Choose from among the following (each assignment must deal with a different topic – you may only do one history and one biography) Please design at least two assignments each for middle and high school audiences:

The History of Science	Research Rules
The Nature of Science	Ethics in Science
Hypothesis and Theory	Reading Scientific Literature
The Role of Evidence in Science	Using Sources Wisely
Scientific Reasoning	Biography of a Scientist
Experimental Design	History of sDiscovery

Assignment criteria for your portfolio and presentation will be relate to:
Accuracy of information shared: is everything presented factually accurate according to the best information available?
Accessibility of information: is the information presented in such a manner as to be easily understood by the intended audience while challenging them to learn?
Accountability of information: Is the information precisely supported by reputable sources (that were appropriately cited)?
Engagement: Do you develop a project or presentation that is engaging?
Completeness and Timeliness of the Project: Did you complete it and turn it in/ present it on time?
Grading strategy Did you provide a complete and well-developed plan for grading your assignment?

Your last exercise will be to address a set of Science Standards: How would each of your assignments and a set of assignments provided by the instructor fit with the relevant science standards? You may choose between those from the State of Tennessee and those from the National Science Teachers Association (NSTA). If you have another state that you would like to use as a guide, please ask the instructor.

Discussion/ Participation points will be awarded based NOT on attendance, but on making a valuable contribution in class or our online community. Grade will include both presence and frequency of

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contribution, with special note being taken of succinctness, reasoning, and evidence of drawing upon reading of the text or relevant life experience.

Letter	Percent of total	Description
A+	98-	Work of the highest professional quality and demonstrating independent and exemplary performance
A	96-98	Excellent work demonstrating independent and high-quality performance
A-	90-95	Very good work, carefully executed but offering opportunity for improvement
B+	86-89	Good work, indicating careful thought and attention to task, but with several areas that could be improved.
B	82-85	Work of graduate standard, but with omissions or lack of care
B-	80-82	Effort is evident, omissions and lack of care exceed evidence of insight
	Below the Graduate Standard	
C+	76-79	Some effort was made, but work indicates lack of understanding
C	72-75	Poor quality work with little attention to detail and the demands of the task
C-	69-71	Work demonstrates a lack of understanding of the depth of analysis required.

This course sequence is subject to change, but outlines the primary objectives, activities and Due Dates.

Session/ Date	Objectives	Work for Next Class
Unit 1	What is this thing called "Science"? Who are scientists? How does one tell a good story in science?	Readings on science: Zimmer; (Derry Ch 1-6), Choose a scientist and develop their story
	What is the difference between "Science says" and "scientific research indicates"?	Reading and biography plan
	Keeping an open mind for science- while being aware that some things violate unbreakable laws.	Reading and Discovery research
	Biography presentations	Assignment 1 due
Unit 2	How do Thomas Kuhn's ideas about scientific discovery affect our understanding of the nature of science?	Read Derry Ch 7--13
	How do we teach with the History of Science? WHAT do we teach with the History? How do economics/ politics influence the stories of science?	Assignment 2 due Biography presentations
Unit 3	What are the most important science stories for your discipline? Why?	Lesson/ lab presentations
	What makes a good question? How do we use questions to focus in class?	Assignment 3 due
	The myths students learn – what do they understand about facts, laws, models, hypotheses and theories?	Developing responses to what you have discovered
	Teaching with controversy	Assignment 4 is due

All assignments must be submitted to pass the course.

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Late Assignments For every day the assignment is late, there is 5% deduction. Once the assignment is 7 days late, if will not be graded, but it must be turned in to pass the course.

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