

Principles and Methods of Teaching Biology

Spring 2011

Instructor: Jennifer Coble

jcoble@bio.unc.edu (the best way to contact me)

Phone: 962-3705 (office), 210-5161 (cell)

Office: 110 Wilson Hall - Office hours: Tues & Thurs from 2pm-4pm and by appt.

COURSE GOALS:

This course will help you develop the knowledge and skills needed to be an effective biology teacher. We will explore the educational research and learning theories that inform current opinion on how students learn science and the most effective teaching strategies. To support our ability to teach others the big ideas of biology, we will reconstruct our knowledge of biology to make it more personal, contextual and interconnected. Over the course of the semester, you will design and present inquiry based biology lessons that will serve as resources for your peers and practicing science teachers. The fieldwork component of the course will provide the opportunity to examine the contexts of high school science classrooms and assess instructional strategies first hand.

BIOLOGY TEACHING DRIVING QUESTIONS

- Why do we teach science?
- What science should be school science?
- What is good science teaching?
- How do you teach for understanding?
- What is student-centered science instruction and what does it look like?
- What are the challenges and obstacles to teaching student-centered science?
- How can we implement student-centered science in current school contexts?
- How can we keep our students safe during laboratory exercises?
- How can we teach controversial topics while respecting student beliefs?

PROFESSIONAL AND STATE TEACHING STANDARDS ADDRESSED IN COURSE:

UNC School of Education Principles

- Principle 1: Candidates possess the necessary content knowledge to support and enhance student development and learning
- Principle 3: Candidates possess the necessary knowledge and skills to conduct and interpret appropriate assessments.
- Principle 4: Candidates view and conduct themselves as professionals, providing leadership in their chosen field.

Interstate New Teacher Assessment and Support Consortium (INTASC) Principles

- INTASC-1: The teacher of science understands the central ideas, tools of inquiry, applications, structure of science and of the science disciplines he or she teaches and can create learning activities that make these aspects of content meaningful to students.
- INTASC-4: The teacher of science understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem-solving, and performance skills.
- INTASC-6: The teacher of science uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.
- INTASC-7: The teacher plans instruction based upon knowledge of subject matter, students, the community, and curriculum goals.
- INTASC-8: The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social and physical development of the learner.
- INTASC-10: The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students' well-being.

North Carolina Core Standards for Teachers

- NCCore-1: Teachers know the content they teach.
- NCCore-2: Teachers know how to teach students.
- NCCore-4: Teachers are leaders.
- NCCore-5: Teachers are reflective about their practice.

North Carolina Core Standards for Diversity

- NCDIV-1: Teachers understand the central concepts, tools of inquiry, and structures of the discipline(s) they teach and can create classroom environments and learning experiences that make these aspects of subject matter accessible, meaningful and culturally relevant for diverse learners.
- NCDIV-6: Teachers of diverse students are reflective practitioners who are committed to educational equity.

North Carolina Specialty Standards for Science

- NCSCI-1: Science teachers understand the unifying concepts of science.
- NCSCI-2: Science teachers understand the nature of science and the development of scientific thought.
- NCSCI-3: Science teachers understand the historical development of scientific thought and the application of science to society.
- NCSCI-4: Science teachers understand the math concepts and processes and the technologies that are used in science.
- NCSCI-5: Science teachers use developmentally appropriate strategies to design and deliver instruction in science.
- NCSCI-6: Science teachers plan and implement appropriate scientific investigations to develop problem solving and critical thinking skills in science
- NCSCI-7: Science teachers organize and manage the science learning environment to ensure optimal learning.
- NCSCI-8: Science teachers create and use appropriate assessment strategies and instruments to improve science instruction for all students.
- NCSCI-9: Science teachers integrate appropriate technology to enhance instruction in science and scientific investigation.
- NCSCI -10: Science teachers develop strategies to address science topics that are controversial to diverse groups.
- NCSCI-11: Science teachers encourage underrepresented groups to engage in science.
- NCSCI-12: Science teachers work with professional colleagues, parents, and community members to improve science instruction for students.
- NCSCI-13: Science teachers research and learn to apply best practice in science education and participate in the dissemination of those ideas.
- NCSCI-14: Science teachers understand safety and liability issues in science and advocate for appropriate safety materials and enforcement practices in the classroom.

ATTENDANCE POLICY

Attendance in this class is very important as most classes will involve activities that you can only benefit from by being present and involved. I am aware, however, that life and pathogens happen. Therefore, I will permit one class absence without penalty. While you will still be responsible for the information gathered in class, I trust that you will figure out what you missed and make up for your absence on your own. Know that you are still required to submit any assignments due that day, even if you are not able to come to class. If you must miss a second class, you must make up for your absence. Missing a second class and failing to make up for the absence will result in a reduction of your grade. I strongly recommend you save your free absence for a time when you really need it. Making up absences is more difficult than coming to class.

PARTICIPATION POLICY

To reap the full benefits of this course you will need to participate fully in all class activities and discussions. Many class activities will involve you working in groups where your learning, as well as that of your group members, relies on you thinking deeply and sharing your ideas. To reward you for your consistent hard work and effort, participation in class activities counts for 25% of your final grade. In every class, I will pay close attention to the level of participation you dedicate so I can assign you the participation grade you deserve. I will also collect class worksheets to assess the level of thought and effort dedicated toward class activities. To take advantage of this opportunity to improve your grade, please be on time for class, come prepared to discuss and apply readings, think deeply about the challenges posed during class and volunteer to share your ideas. Please do not text, surf the internet, talk about non-class related topics during group discussions or engage in other activities that will prevent you from gaining the valuable understandings this class is designed to develop.

COURSE ASSIGNMENTS

You will have assignments due every week. All assignments and due dates will be posted on the course BB site. Since the flow of class will be determined by your needs and interests and those of your peers, it is impossible to know exactly when a particular assignment will be due at the start of the semester. Even stated due dates are subject to change if I believe more preparation is needed. I appreciate your understanding and patience as I try to create a course pace that works for all. Please visit our BB course site frequently as you are responsible for assignments and due dates posted there. Announcements will also be made in class about all upcoming assignments and due dates.

Biology Unit Plan (UP)

Demonstrating the ability to develop student-centered and inquiry-based lesson plans and curriculum resources is one of the driving goals for this course and a requirement for a N.C. teaching license. You will design a student-centered and inquiry-based unit plan for a specific topic within the NC Biology Standard Course of Study. You will determine the essential understandings within your topic, create a content resource to help identify big ideas and real world connections, design a series of student-centered and differentiated lessons/assessments and create a final assessment that will allow students to demonstrate their understandings. The curriculum products you design will be shared with your classmates, UNC-BEST alumni and high school science teachers across the state. We will complete the Unit Plan piece by piece, working together over the course of the semester. A detailed assignment description for each component will be provided and posted on BB.

Fieldwork Reflections (FR)

Each week, you will have the opportunity to work within a local high school classroom. These experiences will be instrumental to your growing understanding of the complexities of teaching science in the contexts of today's high schools. For every two fieldwork visits, you will submit a written reflection. These reflection statements will challenge you to think deeply about the contexts of high school science classrooms, the nature of the teaching occurring in your classroom and how the lessons could be revised to be more in line with current opinions of good science teaching.

Reading Responses (RR)

For most classes, readings will be assigned to help us explore science teaching and answer our course driving questions. For each reading or set of readings, there will be an assignment that challenges you to think deeply about the authors' arguments and its implications for a science education topic we will explore in a subsequent class or a component of your unit plan. For most readings, you will post a short discussion (approx. ½ -1 page single spaced) discussing how the ideas in the article help you answer the driving question. Your discussion should reference specific ideas in the reading and apply or expand upon the ideas to answer the driving question. In addition, you are required to post at least 2 questions you have about ideas or terms discussed in the reading. Reading response grades will be calculated by dividing the total points earned by the total points possible.

READING RESPONSE RUBRIC			
	Exemplary (2 pts)	Proficient (1 pt)	Poor (0 pt)
Reading Reference	Response clearly discusses how the ideas expressed in the article help answer the posted driving question, referencing multiple specific ideas contained in the reading.	Response discusses how the ideas in the article help answer the posted driving question referencing at least one idea presented in the reading.	Response is vague, unclear or fails to discuss specific ideas in the reading.
Personal Reference	Response makes thorough and insightful connections between ideas in the readings and personal ideas, experiences and/or beliefs.	Response includes connections between ideas in reading and personal beliefs.	Response fails to include connections between ideas in reading and personal beliefs.
Questions	Response ends with at least two insightful questions that probe deeper into the meaning of the ideas in the reading.	Discussion ends with at least two questions about the meaning of ideas in the reading.	Discussion does not end with questions or questions are superficial.

Course Readings All readings will be available on BB. Some readings may be added during the semester.

- American Association for the Advancement of Science (1990) Project 2061: Science for All Americans, Oxford U. Press.
- American Association for the Advancement of Science (1994) Project 2061: Benchmarks for Science Literacy, Oxford U. Press
- Budiansky, S. (2001). The Trouble With Textbooks. Prism, February.
- Meuler, J. (2005). Authentic Assessment Toolbox. <http://jonathan.mueller.faculty.noctrl.edu/toolbox/>
- National Academy of Science (2008) *Science, evolution, and creationism*. Washington, D.C. : National Academies Press.
- Seiler, G. (2001). Reversing the "standard" direction: Science emerging from the lives of African American students. *Journal of Research in Science Teaching*, 38(9), 1000-1014.
- Wiggins, G. P., & McTighe, J. (2005). *Understanding by design*, Introduction and Chapter 1 (Expanded 2nd ed.). Alexandria, VA

GRADING POLICY

The work we are doing in this class is very important since it will help you and your peers develop the knowledge, skills and resources needed to be successful science teachers. Rubrics will be used to assess all assignments and establish whether assignments are Exemplary/above expectations, Proficient/meet expectations or Unsatisfactory/below expectations. I strongly recommend you use the rubric I provide to self-assess your work and ensure you are meeting the established expectations. Please see Reading Response rubric above for expectations for each Reading Response. Each Unit Plan Assignment will also have a rubric, which will be provided when the assignment is assigned.

Because high school teachers and their students are the beneficiaries of your Unit Plans, Unit Plan assignments that do not meet expectations will receive the grade of incomplete (IN) and will be returned to you for revision. Failure to revise work to an Exemplary or Proficient level will result in an IN for the assignment. Students who fail to revise a unit plan assignment to meet expectations will receive an IN for the course, which will convert to an F if assignments are not revised to meet expectations by July 15th. While revisions will be allowed for Proficient ratings and required for Unsatisfactory ratings, revisions will not be accepted more than 2 weeks after the assignment has been returned. Multiple attempts that are below proficiency due to lack of effort (i.e. not due to a lack of understanding) will result in a reduced grade even after revisions bring the assignments up to required expectations.

Your final grade will be established by comparing the collective number of points you receive on your assignments (as established on the rubric) compared to the total number of points available for each assignment category and multiplied times the percentage of total grade each assignment category is worth (detailed in table below). Since assignments will evolve as needed, the total number of points for each assignment category will not be determined until the end of the semester.

To receive an A in this course, the majority of your rubric ratings need to be Exemplary. Submitting more than two assignments after the established deadline or missing more than one class without making up the work will make you ineligible to receive an A for the course.

Assignment Category	Percentage of total grade
Biology Unit Plan	30%
Class Participation	25%
Reading Responses	25%
Fieldwork Reflections	10%
Final Exam	10%