

**BIOL 410 - Principles and Methods of Teaching Biology**  
UNC-Baccalaureate Education in Science and Teaching (UNC-BEST)  
Fall 2020

**Instructor:** Jennifer Coble

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**Phone:** 919-210-5161 (cell). Please feel free to text or call before 9:00 pm. I do not check e-mail often on evenings or weekends so if you have a question, send it via a text.

**Office:** 110 Wilson Hall

**Office hours:** My regular availability is Tuesday from 12:00pm - 4:00pm. Please contact me via e-mail if you want to schedule a meeting during this time or at another time that works better for your schedule.

**COURSE DESCRIPTION:**

This course will help you develop the knowledge and skills needed to implement student-centered science instruction. First, we will explore why we teach science to all students and how our science educational experiences impact our view of good science teaching. Next, we will examine multiple views on how students come to understand science, the teaching strategies research has identified as most effective and how these strategies can be implemented within the contexts of high school classrooms. In addition to learning how to teach biology to a diverse group of students, we will reconstruct our knowledge of biology to make it more contextual and conceptual. Finally, we will explore what it is like to be a science teacher and what type of science teacher each of you would like to be. To demonstrate your ability to design student-centered instruction you will create instructional videos using models former BIOL 410 students have created in the Makerspace. These videos will be shared with UNC-BEST partner teachers and provide additional resources to support online instruction for high school biology students.

**DRIVING QUESTIONS**

At the end of the course, you should be able to answer the following driving questions:

- Why do you want to be science teacher?
- What science should be school science?
- What are the big ideas of biology?
- How do students learn science?
- What is good science teaching?
- What are the implications of traditional science teaching practices?
- What is student-centered science instruction and what does it look like?
- How can we implement student-centered science in current school contexts?
- How can we assess student understandings of science?
- How do you plan a series of lessons to support deep understanding?
- What are the realities of being a high school science teacher?

**ATTENDANCE POLICY**

Attendance in this class is essential as all classes include activities you can only benefit from by being present and involved. I am aware, however, that life and pathogens happen. Therefore, I allow one class absence without penalty. Know that you are still required to submit assignments due that day unless you contact me before the due date for an extension. Please e-mail me when you know you will be absent so I can let you know how you can meet class goals. Missing more than one class and failing to demonstrate you have achieved complete the class activities for a missed class will result in a reduction of your participation grade.

**CLASS PARTICIPATION AND ZOOM EXPECTATIONS**

To reap the full benefits of this course everyone must fully participate in class activities and discussions. To reward you for your consistent hard work, effort and focus, participation in class activities and group work will count for 10% of your final grade. I pay close attention to participation during each class and will randomly collect and evaluate class work. Students may confuse my friendly personality with being laid back about my course expectations. I work hard to make classes interactive and engaging and expect the same effort from my students. To earn all participation points, please be on time for class, come prepared to discuss and apply readings, provide thoughtful input into group activities and discussions and volunteer to share your ideas. Please do not talk about non-class related topics, text, use Zoom chat for unrelated discussions or engage in other activities during class sessions. Full participation requires that you have your video on during synchronous class sessions unless you have spoken with me about video issues. Because we humans are easily distracted, please try to avoid behavior during class that may be distracting such as moving around a lot, eating, including pets, etc. While it would be so much better if we could be together in a classroom on campus, I know we can make the most of the challenging time and work together to build community and support each other in learning!

## GROUP WORK

All classes will involve you working in your groups. Both your learning and the learning of your group members demands your thoughtful inquiry, discussion and participation. It is possible that some group members will contribute more than will others at times. If a group member does not demonstrate a commitment to the project or does not complete tasks as promised, however, the quality of the project can be compromised. If you are experiencing conflict with one of your group members, it is essential that you first communicate this to the person as soon as possible. While this can be uncomfortable, it is an essential communication skill that only improves with practice. If a group member continues to fail to dedicate expected effort after an initial conversation, please contact me to schedule a meeting to discuss. Two times during the semester you will conduct a self-assessment and assessments of your group members using the online version of the The Comprehensive Assessment of Team Member Effectiveness (CATME). The instrument, which can be found at [www.CATME.org](http://www.CATME.org) gathers information and provide feedback to students on their team members' views on their contributions, interactions and quality of work. (Ohland, M. W., Loughry, M. L., Woehr, D. J., Bullard, L. G., Felder, R. M., Finelli, C. J., Layton, R. A., Pomeranz, H. R., & Schmucker, D. G. (2012). The comprehensive assessment of team member effectiveness: Development of a behaviorally anchored rating scale for self and peer evaluation. *Academy of Management Learning & Education*, 11(4), 609-630.)

## COURSE ASSIGNMENTS

### Science Education Inquiry Assignments

You will have assignments due each class session or each week and all assignments will be posted on Sakai. Many assignments will be given at the end of class and will be due by the next class. Some assignments will challenge you to think deeply about an issue, question or real-world context and its implications for science teaching topic. Other assignments will challenge you to design an instructional strategy and/or a model to support learning for a particular biology topic. For many of the reading reflections and writing prompt assignments you will complete at the beginning of the semester, I will use the following rubric to provide feedback on your efforts.

<b>Exemplary (10 pts)</b>	<b>Proficient (8 pts)</b>	<b>Poor (6 or below)</b>
Product clearly answers the driving questions or completes tasks and demonstrates, personal reflection, deep thought and exemplary effort.	Product answers the driving questions or completes required tasks.	Product only partially answers driving question or completes task.

### Models-Based Video Lesson Plans

Over the course of the semester, you will work in teams to design model-based video lessons that allow students to explain a real-world topic within the Next Generation Science Standards. Specifically, the video lessons will involve students in both visualizing and analyzing the science behind a real-world phenomena using hand on models former BIOL 410 students have made in the Makerspace. The curriculum videos you design will be shared with UNC-BEST alumni and partner science teachers. Detailed descriptions of each component of the assignment will be discussed in class and available on Sakai.

### Final Exam

The final exam will be held on Saturday, November 21<sup>st</sup> at 12pm. The final will allow you to demonstrate your ability to create a reform-based unit plan. You will be provided with a curriculum topic from the Next Generation Science Standards and data sources for the topic. You are expected to create: a higher order and real-world focused learning objective, an assessment that would provide evidence of students meeting the learning objective. You will also draft an outline of lessons that follow the Learning Cycle model and engage students in multiple scientific practices including at least one activity where students coming to evidence-based explanations from data analysis.

## GRADING

The grading policy for this class is unique as the lesson plans and models will be shared with fellow UNC-BEST alumni and practicing teachers. Since high school students deserve exemplary lessons, the only products that will earn credit are those that meet exemplary expectations. Any lesson products that do not earn exemplary ratings will be recorded as incomplete and returned for revision with feedback to explain required revisions. While revisions will be requested for nearly every lesson product you submit, submitting assignments that do not meet expectations due to lack of effort will result in a reduced grade even after needed revisions have been completed. It is much better to request an extension if you are struggling to complete an assignment than submit one that demonstrates partial effort. Students who do not meet exemplary expectations on all components of the video lesson plan will receive a IN for the class and will have 8 weeks into the following semester to meet expectations or the IN is converted to an F.

<b>Assignment Category</b>	<b>Percentage of total grade</b>
Model-Based Video Lessons Drafts and Final	40%
Science Education Classwork and Assignments	30%
Final Exam	20%
Class and group participation assessment	10%

### **Campus Resources to support Video Lessons**

The Media Resources Center offers media instruction and can provide remote support. They have full course instruction video sessions and video editing using Adobe Premiere Pro hosted online. While the MRC is not circulating equipment due to COVID, the MRC can still provide media production guidance if devices such as laptops and smartphones have been used for recording. Video and audio recorded on these devices can be edited in Adobe's Audition and Premiere, which offer a full-fledged, professional editing environment. For a lighter, mobile-oriented video editing experience, you may want to look at our guides on Adobe Rush. In addition to instruction, the MRC is also available to host Zoom sessions to cover the software and workshop to troubleshoot any questions students may have. If you would like to schedule instruction, workshops, or support, contact them at [mrc@unc.edu](mailto:mrc@unc.edu)

### **Campus Resources to support YOU!**

Life is challenging! Know that there are many resources at UNC to help you! It is essential to ask for help when you need it. Asking for help is not a sign of weakness, but evidence of strength and self-love! We all need help from others at many points in our lives. Here are some campus resources that are created to support you

**Dean of Students:** If at any time during the semester you experience a personal or family illness, loss, financial stress, academic access, living issues, interpersonal violence response, alcohol or similar substance related issues, and other forces that may interfere with your well-being and success and/or academic retention please contact the Dean of Students immediately (or contact your professor and we will do so for you). Website: [deanofstudents.unc.edu](http://deanofstudents.unc.edu)

**Counseling and Psychological Services (CAPS):** If you are experiencing any distress please speak with a medical professional in a confidential setting. The CAPS office has daily drop in hours or you may call them for an appointment (919-966-2281) or schedule online ([healthyheels.unc.edu](http://healthyheels.unc.edu)).

**LGBT Center:** Provides educational services, resources and advocacy. Website: [lgbtq.unc.edu](http://lgbtq.unc.edu)

**Carolina Women's Center:** Aims to provide an equitable working and educational environment regardless of gender. Provides assistance to all individuals regardless of gender orientation. Website: [womenscenter.unc.edu](http://womenscenter.unc.edu)

**International Student and Scholar Services:** offers services to help international students adjust to life in North Carolina and UNC. Website: [iss.unc.edu](http://iss.unc.edu)

### **Disability Services Information**

If you have a medical condition/disability that may require reasonable accommodation to ensure equal access to this course, please contact the Department of Disability Services at 919.962.8300, on the internet at <http://disabilityservices.unc.edu/eligibility> or via email at [disabilityservices@unc.edu](mailto:disabilityservices@unc.edu)

### **Honor Code Information**

The University of North Carolina at Chapel Hill has had a student-administered honor system and judicial system for over 100 years. The system is the responsibility of students and is regulated and governed by them, but faculty share the responsibility. If you have questions about your responsibility under the honor code, please bring them to your instructor or consult with the office of the Dean of Students or the Instrument of Student Judicial Governance. If you require further information on the definition of plagiarism, authorized vs. unauthorized collaboration, unauthorized materials, consequences of violations, or additional information on the Honor Code at UNC, please visit <http://honor.unc.edu>

### **Diversity is Valued**

The Department of Biology values the perspectives of individuals from all backgrounds reflecting the diversity of our students. We broadly define diversity to include race, gender identity, national origin, ethnicity, religion, social class, age, sexual orientation, political background, and physical and learning ability. We strive to make our classrooms and this department an inclusive space for all student.

**The University's Policy on Prohibited Harassment and Discrimination** prohibits discrimination or harassment on the basis of an individual's race, color, gender, national original, age, religion, creed, disability, veteran's status, sexual orientation, gender identity or gender expression. Appendix B of this Policy provides specific information for students who believe that they have been discriminated against or harassed on the basis of one or more of these protected classifications. Students who want additional information regarding the University's process for investigating allegations of discrimination or harassment should contact the Equal Opportunity /ADA Office for assistance at 919.966.3576 or via email at [equalopportunity@unc.edu](mailto:equalopportunity@unc.edu)

<b>Fall 2020 BIOL 410 Class Chart</b>				
White rows = online/independent classes & Yellow rows = synchronous class sessions				
		<b>Class Driving Questions</b>	<b>Class activities</b>	<b>Assignment due</b>
8/11	1	Why do we teach science?	<ul style="list-style-type: none"> <li>Science Teaching Inquiry Study</li> </ul>	
8/13	2	What science should be school science?	<ul style="list-style-type: none"> <li>Individual meetings with Jennifer Coble</li> </ul>	Science Teaching Inquiry Study
8/18	3	How can science lessons focus on real world inquiry?	<ul style="list-style-type: none"> <li>Curriculum comparison</li> </ul>	Into Thin Air documentary
8/20	4	What are the implications of traditional science curriculum?	<ul style="list-style-type: none"> <li>Curriculum Implication Illustrations</li> </ul>	
8/25	5	What is the future of the science curriculum?	<ul style="list-style-type: none"> <li>Next Generation Science Standards(NGSS) Exploration</li> </ul>	Seiler Reading Response
8/27	6	How do we teach through real world phenomena and explanatory models?	<ul style="list-style-type: none"> <li>Carbon Capture and Biggest Loser Explore</li> </ul>	
9/1	7	What is the learning cycle model of instruction?	<ul style="list-style-type: none"> <li>Learning Cycle planning</li> </ul>	Explanatory Model #1
9/3	8	What are the benefits of Explore stage of the learning cycle?	<ul style="list-style-type: none"> <li>Backward Design exploration</li> </ul>	
9/8	9	How can students be actively involved during the Explain stage?	<ul style="list-style-type: none"> <li>Modeling and Active Notes</li> </ul>	Explanatory Model #2
9/10	10	How can science labs be revised to support authentic inquiry?	<ul style="list-style-type: none"> <li>Revising Photosynthesis lab</li> </ul>	Backward Design Stage One Research
9/15	11	How can teachers support students in making evidence-based conclusions?	<ul style="list-style-type: none"> <li>Claim-Evidence-Reasoning</li> <li>Argument Driven Inquiry</li> </ul>	
9/17	12	How can students learn through manipulating models?	<ul style="list-style-type: none"> <li>POGIL exploration and activity design</li> </ul>	Model-based POGIL
9/22	13	How can students demonstrate learning through explanatory models?	<ul style="list-style-type: none"> <li>Model Design Session #1</li> </ul>	
9/24	14	How can teachers assess explanatory models to support deep understanding?	<ul style="list-style-type: none"> <li>Model Design Session #2</li> </ul>	Explanatory Model for curriculum
9/29	15	How can you keep students safe during laboratory investigations?	<ul style="list-style-type: none"> <li>Science Safety case study</li> </ul>	
10/1	16	How do educational theories impact instruction?	<ul style="list-style-type: none"> <li>Learning Theory Explore and Card Sort</li> </ul>	Lesson Video storyboard Draft 1
10/6	17	What legal precedents inform the teaching of evolution?	<ul style="list-style-type: none"> <li>View Judgement Day: Intelligent Design on Trial</li> </ul>	
10/8	18	How can we teach evolution with respect for religious beliefs?	<ul style="list-style-type: none"> <li>Evolution and the nature of science knowledge</li> </ul>	Lesson Video storyboard Draft 2
10/13	19	How can students explain the evidence for evolution?	<ul style="list-style-type: none"> <li>Evolution and Evidence based explanations</li> </ul>	
10/15	20	How can students make evidence-based predictions about homeostasis?	<ul style="list-style-type: none"> <li>Hold your Wee for a Wi</li> <li>Shell-less egg lab</li> </ul>	Lesson Video Take One
10/20	21	How can students make evidence based conclusions about genetics?	<ul style="list-style-type: none"> <li>Claim evidence reasoning</li> <li>Explanatory Model</li> </ul>	
10/22	22	What causes weather? How can you teach weather through inquiry?	<ul style="list-style-type: none"> <li>Weather Explore</li> <li>Weather map investigation</li> </ul>	Lesson Video Peer Feedback
10/27	23	How can students make evidence based conclusions about cell division?	<ul style="list-style-type: none"> <li></li> </ul>	
10/29	24	Why can some people continue to digest milk past childhood while others cannot?	<ul style="list-style-type: none"> <li>Lactaid Inquiry Lab and redesign</li> </ul>	Lesson Video Take Two
11/3	25	How did lactase persistence evolve in the human population?	<ul style="list-style-type: none"> <li>Lactose tolerance and natural selection simulation and data</li> </ul>	

11/5	26	What do NGSS aligned and student-centered curriculum look like?	<ul style="list-style-type: none"> <li>• Video lesson presentations and critique</li> </ul>	Final Lesson Video Presentations
11/10	27	How can the video lessons be improved?	<ul style="list-style-type: none"> <li>• Video lesson presentations and critique</li> </ul>	
11/12	28	How can the video lessons be improved?	<ul style="list-style-type: none"> <li>• Model curriculum presentations and critique</li> </ul>	Prepare for practice final exam
11/17	29	What are the expectations for the final exam?	<ul style="list-style-type: none"> <li>• Practice Final Exam</li> </ul>	
11/21	30	BIOL 410 Final Exam – Saturday, November 21 <sup>st</sup> 12:00-3:00pm		