TEACHING PHILOSOPHY

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TEACHING GOALS & INTEREST

My primary teaching goals are to help students learn biology content, hone data literacy skills, and challenge misconceptions about the nature of science, all to prepare them for their future careers and to be productive citizens of their community. More broadly, I want to spark and encourage excitement about biology and help students reach goals of serving their communities as educated professionals. My teaching interests are centered around these goals. At the University of Southern Mississippi, I would look forward to teaching Principles of Biology I and II and Human Anatomy and Physiology I and II. I could also teach Biology and Society and Essentials of Human Anatomy and Physiology, and though I do not have formal experience teaching physiology, I feel that with preparation, I could successfully teach advanced physiology courses. I wish to emphasize that even though a lot of my teaching experience at ULM has been upper-division and graduate courses related to my specialty, evolutionary biology, my genuine teaching interest is what I have stated here. My favorite classes to teach are the freshman- and sophomore-level courses, and I would be happy in a position where these courses are my sole teaching focus. That said, if needed, I would also welcome the opportunity to teach more advanced courses related to evolution, ecology, or genetics.

Undergraduate courses I have taught as assistant professor at ULM include Principles of Biology II lecture (95-130 students) and separate lab course, Plant and Animal Form and Function with lab (48 students), and smaller upper-division courses Evolutionary Biology, Ecology with lab, and Life Science and Public Policy. Graduate courses include Organic Evolution, Biogeography, Systematics, and Research Methods with lab. I have also offered seminar courses at the undergraduate (Senior Biology Seminar) and graduate levels. As a graduate assistant, I taught labs for Introductory Biology for Majors I, Herpetology, and Anatomy & Physiology, as well as problem-solving sessions for Genetics.

The following final exam comment from a student in Evolution, Spring 2021, illustrates my vision and goals as an educator of both teaching content and preparing students to be confident, educated citizens:

[STUDENT COMMENT HERE AS BLOCKQUOTE, REDACTED FOR PUBLIC POSTING]

PHILOSOPHY

Attitude and Teaching Methods

I am a biologist with a formal background in education. Four and a half years of teaching at ULM with strong mentorship from senior faculty and the Director of the School of Sciences has helped me hone my philosophy and mature as an educator. I continue to learn from mentors, colleagues, and the pedagogy literature. Below, I describe my philosophy and some of the methods I implement.

There is some evidence that instructor enthusiasm increases student motivation (Patrick et al., 2000; Schmidtke, 2009), and based on course evaluation comments, I have been successful. This is crucial in Principles of Biology because we want to hook students on biology to retain them in the major, and it is equally important in nonmajors courses that might be the only college science class a student takes. I also try to make my classes engaging. Active learning leads to better student performance (Freeman et al., 2014), but that does not require total abandonment of lecture. In any given course, some of my class days will be more "active" than others (case studies, reading discussions, computer sims). But even in lectures, I regularly

include videos, clicker polling with Poll Everywhere, think-pair-share, and exit tickets. Polling is especially useful because in addition to enhancing focus, it lets students practice recall and lets me quickly check understanding. Polling is also a great tool for addressing misconceptions. I open my Principles II lecture on speciation with a series of slides displaying two animal photos and students judge whether the animals are members of the same or different species. Some are "obvious": tiger vs. lion. But the "trick" question of two frog species that look identical challenges the misconception that species are easy to define and distinguish.

Beyond content learning, I believe students in science-related fields should learn to "think like a scientist" – in particular, data literacy skills. In all courses, I incorporate exercises in data analysis and interpretation. This can be as simple as showing a graph during Principles II lecture and having students talk with their neighbor before answering a poll question about what the graph shows. In smaller, upper-division courses, I plan in-class activities where I guide students in collaborative problem solving with data analysis. I would like to incorporate this type of data analysis into all courses.

I am especially interested in teaching methods that are supported by evidence. In 2018, I attended the Gulf Coast Summer Institute on Scientific Teaching at LSU. This weeklong workshop introduced faculty to evidence-based teaching strategies in the sciences. "Active teaching" and "scientific teaching" are often used interchangeably, but the instructors emphasized that ***scientific teaching*** refers specifically to methods that have been supported by published research as effective in enhancing student learning. Scientific teaching may also increase buy-in from students because we can show them the evidence. Not all students may appreciate group discussion, for example, and think they are not learning if the instructor is not lecturing. So on Day 1 of Fall 2021, for the first time I gave my Biogeography class a study showing that active discussion participation increases long-term retention of information (van Blankenstein et al., 2011) to justify structured small-group discussions. Based on conversations with students and observations of discussions, this addition seemed to be one factor in dramatically increased buy-in for discussion days compared to the previous year.

Assessment of Learning Goals

I assess mastery of course objectives in undergraduate courses in a variety of ways, including traditional exams, online quizzes and problem sets, concept maps, the in-lecture polling described above, and creative projects, all aligning with course objectives. This variety enables students to succeed and demonstrate understanding even if they do not always excel on high-stakes exams. One objective in several of my courses is that students will clearly *communicate* course concepts. My favorite addition to a course I have taught so far is the UnEssay project, which I have adapted for Principles II, Ecology, and Evolution. This project allow students to demonstrate mastery of a course concept that interests them through a creative medium, and they describe how their project helps them connect with or communicate the concept. Examples of projects include a canvas painting of salamanders separated by a river (speciation) and a children's book about a whale discovering it has rudimentary hind limb bones (vestigial structures, evolution of whales). Feedback from students in reflection statements has been overwhelmingly positive. I am currently Co-PI on an IRB-approved **pedagogy study** on the effectiveness of UnEssay projects in student learning.

Not every assessment I have trialed has been successful. In particular, two alternative assessments I designed in Spring 2021 for my newly online Principles II and Evolution courses to replace exams bombed as summative assessments but could work in future courses as scaled-down activities that achieve different goals rather than trying to replace exams. In Principles II, students created nature journal entries following guidelines. In Evolution, students created infographics on selected course topics. Both assignments, but especially the nature journals, were hard to grade objectively. But many students submitted highly creative work, and multiple students noted that they enjoyed the nature journals as a creative outlet.

Creating a Classroom that Embraces Diversity

One of the biggest challenges I have faced as a teacher at ULM is a wide range in college preparation and academic achievement among students in a class. In an effort to better support *all* students and narrow this achievement gap, I have adopted ideas from culturally responsive teaching, which seeks to bridge the gap between the backgrounds/experiences of culturally minoritized students and their academic experience (Gay, 2018). Some approaches include incorporating cultural diversity into course materials regularly and

making course content relevant to students (Gay, 2002). These approaches benefit all students, not just those from underrepresented backgrounds.

One way I incorporate diversity into my course materials is by choosing readings and examples from work by diverse scientists and featuring photos of the scientists on lecture slides a visual cue. One assignment I modified that has been well received by students in Evolution utilizes the DiversifyEEB database (https://diversifyeeb.com/), which "highlight[s] ecologists and evolutionary biologists who are women and/or underrepresented minorities." Students choose a current evolutionary biologist from the database and create an infographic about their chosen scientist, including their education background, current position, and research activity. I have noticed that students largely appear to choose scientists who they can identify with in some way – race, gender, disability, status as first-generation student, etc. I could easily adapt this activity to any course level, content, and class size.

Relevance is also key to retaining student interest and motivation for learning (Hurtado et al., 2007). Where possible, I incorporate examples from life experiences and current or recent events to show students how the concepts they are learning are applied in society. I now begin Evolution with a discussion of the SARS-CoV-2 pandemic and zoonotic diseases. In Principles II, many students struggle to see the relevance of phylogenetic trees when they have no career interest in how species are related to one another. So I talk about the case of Richard Schmidt, a physician in Lafayette, Louisiana, who was convicted of murder in 1998 for injecting his lover, a nurse, with HIV. Phylogenetic evidence presented at trial showed that the victim's infection derived directly from the infection of a patient the doctor had taken blood from hours earlier. I have no formal data on effectiveness but multiple students over the years have told me that this case sparked them to do independent reading about forensic phylogenetics.

COVID-19 & ONLINE TEACHING

Since March 2020, I have redesigned five courses for 100% online delivery: Principles II lecture, Plant and Animal Form and Function ("PAFF;" lecture and lab), Evolution, and the graduate courses Research Methods (computational biology) and Systematic Biology (designed from scratch). This list also includes the second half of the graduate Organic Evolution course, which I last taught in Spring 2020. This was time-intensive and would have been impossible without the support of our ULM Online faculty and staff, who quickly created faculty resources for online course design. I also did extensive reading on my own about strategies for effective online teaching. This included regular use of Moodle (LMS) online help pages to design creative Moodle-based assessments and activities, such as "quizzes" formatted as guided tutorials with interactive feedback and flexible multi-part quiz questions.

Beginning in March, Spring 2020 courses were all taught in "emergency online" mode; at this point I honestly can't remember if we were attempting synchronous instruction yet. In Fall 2020, I taught PAFF and Research Methods as synchronous-optional "hybrid": lecture delivery over Zoom, lectures recorded and posted to Moodle. I modified PAFF labs (animal specimen dissections) for online by recording videos of dissections; I felt that the dissection experience itself was not a crucial enough component of this course to outweigh COVID-19 risks. But I did also offer the lab F2F for students who wanted the option, and a few students each week chose to attend.

I felt that synchronous delivery did not add value to my lectures, so my Spring 2021 courses were online asynchronous: Principles II, Evolution, Systematics. I took special care in redesigning Principles II because most of these students were freshmen and needed more structure. I modestly reduced the amount of content covered in each course so I could streamline the schedules with one topic per week. I quickly learned that in online teaching, schedule consistency and predictability are among the most important considerations. I pre-recorded the lectures each week as if I were giving them F2F but without student interaction and posted them on Moodle, along with supplemental readings, quizzes or homework assignments, and other assignments. Systematics consisted of both lecture and weekly data analysis tutorials. **Our past courses are still available to us on Moodle, and I would be happy to show examples of my courses and any course materials if desired.** I feel that I'm in the middle of a crash course on effective online course design, and despite the horrific circumstances, I have accumulated a lot of tools that I plan to continue using in the future – materials I developed, LMS and other online skills, and course policy ideas to increase accessibility.

EVIDENCE OF TEACHING EFFECTIVENESS

Numerical scores from my student course evaluations at ULM are highly consistent across my courses, so I present only the most relevant course (Principles II) below. In supplemental documents I compiled teaching evaluations from all semesters at ULM, Fall 2017 through Fall 2021, and also include two peer evaluations, Ecology (Fall 2019) and Evolution (early Spring 2020), that I submitted in my Mid-Tenure Review portfolio. ULM does not have any departmental or college summary data readily available on the website. My scores in almost all categories are >4.0 (scale: 1-5, with 5 indicating strong agreement). The one exception is the item regarding effort, but this requires a caveat. Prior to Fall 2020, the wording of the item was, "The effort required to succeed in this course was:" and the scale presumably indicated level of effort (little to substantial; range for my courses was 3.13-4.40). Starting in Fall 2020, the wording was changed to, "Effort required to succeed in this course was appropriate to course level," so the scale reverted back to disagree/agree; for these courses, my scores were all >4.0. This difference suggests that many students feel that even though a course might not have been the most difficult for them, it was not inappropriately easy for the level. The makes sense in context of my courses because even though most students take Principles II and PAFF during their first or second year, some students in each class are seniors, who may have a different perception of difficulty than the lower-division students the courses are designed for.

I think the fact that the scores overall are high tells me that in my first 4.5 years of independent teaching at the college level, I have designed course materials and implemented teaching methods that are at least perceived by students to be effective in promoting learning and creating a healthy class environment. At the same time, the lower scores for effort required suggest that I need to continue evaluating the rigor of my courses and modify them if necessary to ensure that my assessments of student learning reflect the high standards I set for my students. Overall, the anonymous comments from students are overwhelmingly positive. They also highlight appreciation for activities such as videos, group work, and the UnEssay. While I understand the limitations of these course evaluations, I have also found them helpful as I continue developing my teaching philosophy and course materials as a junior faculty member. For example, I received two helpful comments after my first semester teaching Principles II suggesting that I increase the length of my exams, and I improved my exams for the subsequent year based on this constructive feedback.

COURSE EVALUATIONS (Principles of Biology II)

*100% online .	**S18**	**S19**	**S20***	**S21***
# responding/total enrollment:	*85/107*	*65/97*	*58/97*	*18/115*
Overall: I have a positive opinion of the instruction & learning in this course.				
Presented material in interesting & effective way.				
Seemed well prepared & demonstrated clear understanding of course material.				
Promoted respectful interaction.				
Encouraged questions or discussions in class.				
Motivated me to do my best in this class.				
Created productive classroom environment that promotes learning.				
Clearly stated course requirements on syllabus.				
Provided feedback on graded items quickly.				
Responded to questions/email in timely manner.				
Activities/assignments on Moodle were organized clearly & easy to navigate.				
F17-S20: Evaluated & tested on material covered & assigned in course. **F20-21:** Course activities/assignments helped me understand course topics.				
Was willing to work with me outside of class. *Worked with me if unexpected or extenuating circumstances occurred.				
F17-S20: The effort required to succeed in this course was: **F20-21:** Effort required to succeed in course was appropriate to course level.				

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