Teaching Statement– Jess McLaughlin

Students can have many motivations for taking a course, and one of the challenges of designing effective curricula is meeting the educational goals of a diverse group of students. Whether an enrolled student is pursuing a research career, applying to medical school, starting a career as a teacher or biological professional, or something else entirely, my goal is to have them leave the course with a greater understanding of the methods of biological inquiry, greater scientific literacy, and an appreciation for the specific topics covered, whether it's an introductory biology course or an upper-level course in environmental science or conservation genomics. As part of this, my teaching promotes active investigation of the topics through discussion-guided lectures, independent and group research projects, and engaging laboratory exercises focused on testing student-developed questions.

Prior teaching experience– I realized early on I wanted to teach, so I actively sought opportunities to teach and mentor students starting in my MSc. In 2018, I co-developed and led the lab component of Ornithology at the University of Oklahoma, an upper-division course. I took the lead on developing the laboratory component, in which I designed a collections-based curriculum focused on: 1) familiarity with the common birds of Oklahoma and 2) teaching evolutionary and ecological concepts using birds as models, such as what a species is and how scientists reconstruct evolutionary history through genomics. I wrote weekly activities and assignments, using both OU teaching and research specimens from the Sam Noble Museum ornithology collection. I organized seven field trips throughout the semester to bring the course material to life: 2 birding trips to local parks, a visit to the Oklahoma City Zoo, a mist-netting session led by graduate students from the Oklahoma Biological Survey, a museum collection tour, a Saturday field trip to a wildlife reserve in Texas, and a weekend camping trip to Black Mesa State Park in western Oklahoma. The students reported a deeper understanding for the environment and ecosystems of the southern Plains region from these field trips, with many remarking that they previously had no idea about the ecological diversity of Oklahoma. The course was overall very well-received, with five of the twenty students either becoming involved with undergraduate research in my advisor's lab or recommending the lab to others because of their experience in the course.

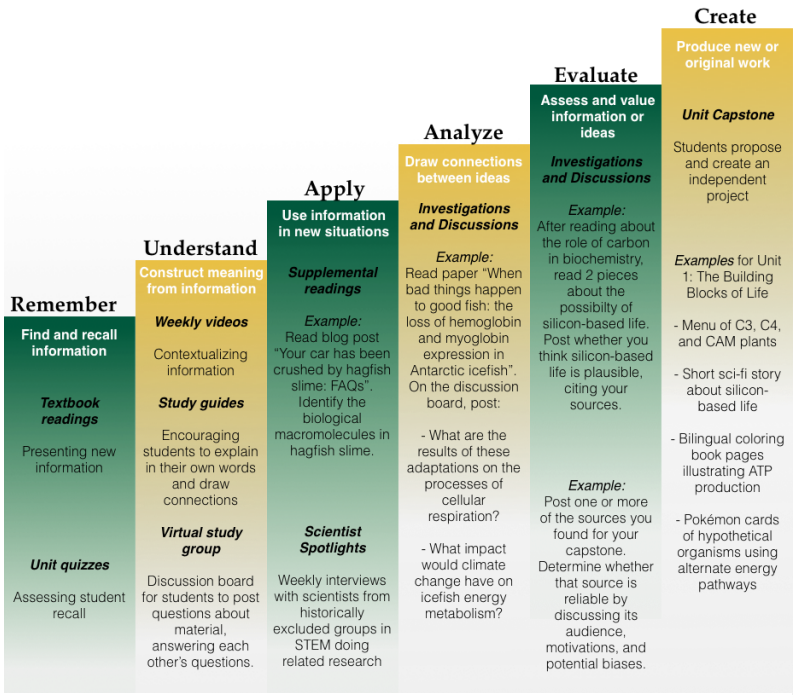

Figure 1: Sample assignments from my BIO 10: Introduction to Biology course at Mission College, Fall 2023. The various class activities are targeted at multiple learning modes, here demonstrated with Bloom's Taxonomy.

As an Associate Faculty member teaching introductory biology at Mission College (Santa Clara, CA), I am leading a fully virtual course at a minority-serving (AANAPISI and HSI) community college. I am teaching about 60 students, including dual-enrolled high school students, full-time students planning to transfer to a four-year institution, and students working on two-year degrees and certificates, building my experience in developing curricula that meets the needs of a diverse group of students. I have developed course materials focused on experiential, inquiry-driven learning that can be delivered completely online and that are accessible to students with diverse life experiences. Most of these students are non-majors, so my pedagogical goals have emphasized allowing students to connect to the material through their areas of interest and experience. In lieu of traditional exams, the unit assessments are student-designed creative projects that demonstrate their learning, from creating art pieces about Antarctic icefish metabolism to developing preschool lesson plans, allowing them to harness their strengths and

interests. The variety of course activities and assignments have given students a chance to build their understanding of biology across different levels of complexity (Figure 1), emphasizing not just memorization of facts but applications of biological principles in their daily lives.

Not all teaching happens in the classroom, so I have actively sought out non-traditional settings to further develop my teaching toolkit. A major focus throughout my career has been teaching computational skills to biologists, from undergraduates to faculty, as these tools become increasingly key to many STEM careers in research, industry, and education. As a genomicist and bioinformatician, most of my research tasks are computational, yet as an undergraduate I received no formal training in topics such as computer programming. Like many scientists, my skills are self-taught; recognizing that reliance on self-teaching, especially in a rapidly-growing field, is unsustainable, I have sought out opportunities to share my knowledge and create materials in this rapidly growing field. I hosted my first bioinformatics training session as a MSc student, aimed at senior undergrads and graduate students, and I have continued to teach workshops and to write tutorials and other materials for both my own mentees and wider audiences[1]. My goal is to familiarize students with the basics of computational tools in biology, and to make them aware of the role of these skillsets in rapidly growing fields of biotech, medicine, and personalized genomics.

Building inquiry-driven, hands-on learning– Most biology students become interested in the field not because they enjoy listening to instructors explain concepts to them– they are interested in biology because they want to *do* biology. One of my goals is to give students the opportunity to generate their own questions about the natural world, creating opportunities for them to step out of the classroom. For every biology course, there are ways to incorporate these learning experiences, whether it is in the form of outdoor labs that survey the natural history of Alaska, tours of museum collections and laboratory facilities, or even sequencing and analyzing genetic data. I will actively seek funding through Alaska EPSCoR, having previously helped undergraduates obtain these funds while at UAF, and through industry programs such as the Oxford Nanopore Education program that decrease the cost of bringing these technologies to the classroom.

I am particularly excited to build on UAA's undergraduate research program by developing course-based undergraduate research experiences (CUREs), both to create a CURE course in genomics and to inform my overall teaching approach in other courses. I plan to structure my teaching around providing undergraduates with opportunities to participate in research while in the classroom. As a teaching assistant for Principles of Genetics, I saw firsthand how such a structure can lead to greater student engagement and learning. The laboratory component of the course was built around a semester-long project in which students identified the contents of herbal supplements using DNA sequencing to answer a relatable question, "does this product I buy actually contain what it claims?". In my current postdoc position at UMass, I am developing a summer field course at the Gloucester Marine Station where undergrads will contribute to ongoing research on marine zooplankton diversity, from sample collection in the field using Nanopore sequencing to basic bioinformatic analyses of the data. I will develop a similar program for students at UAA building on this experience. I envision developing a Principles of Genetics curriculum based around a class project on a topic of the student's interest, such as the composition of coastal zooplankton communities or eDNA monitoring for species of conservation concern, allowing students to participate in hands-on research on important questions about Alaska's changing environment.

Developing inclusive curricula– To create an equitable learning environment, one needs a curriculum and course materials that center an inclusive lens. My efforts in this so far have primarily focused on how the ways in which students are taught about the genetics and development of sexual phenotypes lead to misunderstandings of a complex aspect of biology. I have written for a general audience on how inclusion of transgender, gender nonconforming, and intersex (TGNCI) perspectives in biology education can lead to better learning outcomes[1]. TGNCI students report feeling excluded and alienated by biology curricula that frame being cisgender and non-intersex as "natural" and TGNCI

[1] McLaughlin. 2022. Personal blog. www.jfmclaughlin.org/blog

identities as being aberrant[2]. Introductory biology courses often center around particular groups of humans as the norm, leading to student disengagement and perpetuating harmful stereotypes[3]. Biology courses are particularly well-suited to allowing students to dismantle their assumptions about science and how it informs society, and as part of that, I have been involved in efforts to build curricula that include more diverse voices.

Previously I have worked with the Racially-Just, Inclusive, and Open STEM (RIOS) collaborative and Gender-Inclusive Biology, which produce STEM educational materials for both K-12 and postsecondary instructors, to develop best practice guides for educators to use inclusive language in the classroom, focusing on TGNCI inclusion. Working with these groups has also deepened my knowledge of how other historically excluded groups have been impacted by the lack of classroom inclusion, prompting me to seek further training in culturally-responsive teaching and best practices for equitable pedagogy, as well as including classroom discussions which critically examine who is centered in our examples and language, as well as directly confronting how biological concepts have been used to harm people throughout history. I have further built on this by taking part in additional training in my current role at Mission as part of the 2023 Equity Pedagogy Community of Praxis, a 30-hour course exploring principles of classroom equity culminating in a personal final project implementing these practices in one's courses. I see my role as a biology educator not just to convey facts, but to demonstrate how scientists think about the world and how society and biology are deeply intertwined. My goal is that even those students who never take another biology class leave with a more comprehensive understanding of the complexity of the field and that they can apply this knowledge and critical thinking skills to be a better-informed member of society. I'm excited to work with the diverse student body of UAA, and I will be actively engaging with efforts to particularly support the rural, Indigenous, and first-generation students that make up such an important part of the student body.

Empowering students to see themselves in STEM– Too often, students who want to pursue a career in STEM are dissuaded by the lack of representation of those who share their identities[4]. As a young nonbinary person in biology, I felt unsure of whether there was truly a place for me in STEM until I found LGBTQIA+ role models through social media, and I want to do what I can to make sure students don't have to search as hard as I did for representation. This experience is common for students from many historically excluded groups, as even those who have made important scientific contributions have been written out of history[5]. As an instructor, I highlight research done by biologists from historically excluded groups. In my current Introduction to Biology class, I have featured a short interview with a scientist from a historically excluded background every week, and I have included supplemental readings highlighting the work of researchers from diverse backgrounds. I have also been developing a library of additional resources in the many languages spoken by my students, particularly Spanish, Vietnamese, and Arabic, and I expect this will be an important resource in serving students from Anchorage's vibrant immigrant communities.

At UAA, I will particularly focus on the work of Indigenous scientists, both in the classroom and by partnering with UAA programs like Native Student Services, the Alaska Native Science and Engineering Program, and the Alaska Native, Indigenous, and Rural Outreach program to develop culturally-responsive learning environments for UAA's student body. I will build on my existing commitment to featuring Indigenous ways of knowing in the classroom, such as featuring readings on the topic, by active collaboration with Alaska Native scholars and community members.

Overall, my teaching philosophy centers on creating spaces where all students, regardless of backgrounds, prior experience, and academic goals, feel safe and confident to explore the natural world and practice methods of scientific inquiry. This student-centered attitude is a key to increasing student engagement and promoting classroom equity[6]. While the exact material I teach will vary from course to course, this approach– inclusive, inquiry-based, and engaged with broader societal topics– remains at the core of my work as both a scientist and an educator.

---

[2] Zemenick *et al.* 2022. *BioScience* 72: 481–92

[3] Bazzul and Sykes. 2011. *Cult Stud of Sci Ed* 6: 265–86; Hales. 2020. *CBE Life Sci Ed* 19: es2.

[4] Casper *et al*. 2022. *CBE Life Sci Ed* 21: ar69; Perrin-Stowe *et al*. 2023. *Ecol Evol* 13: e9719.

[5] Miriti *et al*. 2020. *Nat Eco Evo* 4: 1282.

[6] Tanner. 2013. *CBE Life Sci Ed* 12: 322–31.