A: Evidence Provided by the Nominee

I. Philosophy Statement

From my experiences, as both a teaching assistant and a student, it is evident that learning is a cumulative process, much like a living puzzle. Knowledge comes in pieces that distinctly interact with previous knowledge, creating a unique picture of understanding for every student. Thus, the role of a teacher is to facilitate this process by providing information while also supporting students' individual construction of knowledge. As a teaching assistant for Biology 315, Quantitative Biology I, I noticed many students were intimidated about learning to code in the computer program "R" alongside learning new statistical tests. I have begun to realize that student learning can best be cultivated by honouring the distinctness of each student, connecting course concepts with interesting real-world applications, and creating a safe and enjoyable learning environment with open communication.

Individual engagement with course material is universally important for student success. This can be achieved in a number of ways, but I believe it is particularly encouraged by implementing a mosaic of teaching strategies in the classroom. Presenting information in a multitude of ways allows students to employ higher-order thinking by creating connections between concepts and previous knowledge; for example, I was able to facilitate learning for a student who identified as an auditory learner through discussions and prelab "mini-lectures," while also assisting a more visual learner by drawing a conceptual diagram of type I/II statistical errors on the whiteboard that she referenced throughout the semester. My overarching goal as a teaching assistant is to facilitate learning by empowering students to be independent knowledge seekers by tapping into their individual strengths, goals and knowledge base. Providing them with the tools and resources to put the pieces together themselves builds confidence and competence. It also encourages students to go beyond the scope of the course by following their individual curiosities, a valuable attribute for all scientists. Despite their original trepidations, all my students were competent in R by the end of the semester and I even had one exemplary student teach himself how to code new programs and command options in his assignments. Therefore, my integration of different teaching strategies was effective at accommodating each student's unique background and understanding in my classroom and promoting independent learning.

A second imperative component of engaging students is creating **relevancy** of the course material to their goals and everyday lives. I do this by making personal connections with course concepts to help with processing and retaining new information, creating links with prior knowledge and experiences and sparking new curiosities. As an avid birdwatcher, I would tell my students anecdotes and show them photos of particular bird species mentioned in assignment questions. On occasion, I would also brief them about a statistical topic that arose in my graduate-level statistics course that built upon a fundamental concept they were currently learning. This piqued their interest in the statistics we were learning in lab while also prompting the consideration of new applications and extensions of these concepts. While his efforts were slightly premature, I was heartened to see one of my students become so involved in the course material as to read ahead of the pace of the class and attempt to implement an upcoming statistical test in one of his assignments. Another student was able to apply the statistical tests she was learning in the course to her data she had collected for her honours thesis project. These examples demonstrate student engagement in both the applicability of the course material to student's lives and the successful cultivation of a spirit of inquiry within students.

Finally, the establishment of a **supportive learning environment** is another key ingredient in assisting student success. Nurturing a classroom environment where students feel safe to ask questions, bounce

ideas off one another, and enjoy the process of learning I found to be especially effective for a challenging course such as Biology 315. It creates an atmosphere where students feel comfortable making mistakes and thinking outside the box, a crucial part of learning. Open communication including flexible office hours, email and the D2L course site were essential for exchanging consistent dual feedback between myself and my students throughout the semester. Cooperative group work during labs brought about comradery among students, appreciably bolstering their support system for the course. Furthermore, many of my students found my detailed feedback on their assignments valuable as they progressed to subsequent assignments, which they revealed to me in their final reflective portfolios. This impact was also evident in the progressive improvement in assignment grades of several of my students throughout the semester. All those long hours of grading were suddenly worth it! Down the road, I plan to improve this area of my teaching further by establishing two-way expectations at the beginning of the semester about teaching and student roles to build trust, evade unnecessary confusion, and further promote independence.

Learning is a cumulative process, unique to every student. An effective teacher is one who acknowledges this remarkable process, but an extraordinary teacher is one who is intrinsically motivated by the best interests and development of their students; a teacher who sparks curiosity in the minds of students and cultivates an inviting atmosphere to investigate and take-in new knowledge. This is the type of teacher I strive to be.

II. Teaching Strategies

Three teaching strategies that I found to be effective for my students in biological statistics were **providing several sources of information, two-way feedback,** and **connecting concepts to everyday life**. In the following paragraphs, I describe how I implemented these strategies into my classroom and provide evidence of their effectiveness for student learning.

A key belief previously expressed in my teaching philosophy highlights the inherent differences among students in learning preferences. By **providing several sources of information** to address a concept, students were able to pick what perspective or form of information from which they were best able to learn. Given an array of learning materials, including the textbook, lab manual, lecture notes, online resources, and both the course instructor and myself, students were able to choose what sources of information presented concepts in ways that best resonated with them. For example, when I was introducing the Central Limit Theorem (CLT) in lab, many students found this concept to be particularly challenging. After presenting the pre-lab, I noticed many blank faces staring back at me and I knew that most of the information had gone right over their heads. To combat this, I directed them to a computer simulation that walked them through fundamentally how and why the CLT works in a visual way using diagrams and interactive graphics. As they progressed through the skills for the lab, I could see that many students were beginning to understand the concept as they worked with real data in R. One particular student was still not satisfied with the general overview provided by the information given. He wanted to know mathematically why the CLT emerges and not just how to apply it. As this request required very advanced knowledge of mathematics, I told him that I would look into it for him. Later that day, I scoured the web for mathematical proofs of the CLT and came across a series of videos on YouTube that I forwarded to my student to satisfy his curiosity. Likewise, when I introduced the concept of linear regressions in my labs some of my students found it helpful when I verbally described the different perspectives taken by a t vs F test. However, one student in particular still struggled with understanding this concept. As he was a math tutor I knew he was particularly adept at working with numbers and equations, so I provided him with the mathematical formulae. We worked

through each part together until he understood what each test was calculating and how to interpret the results. Seeing his “aha” moment when the information clicked into place for him was satisfying for us both.

Two-way feedback is vital for all successful relationships, and I found this to be true for my relations with my students. From my perspective, receiving informal feedback from my students was invaluable for allowing me to adapt and improve the effectiveness of my teaching. I was appreciative to have the opportunity to work with all my students one-on-one in the lab as well as a sample of them during my office hours. These interactions were my favourite part of my job as a teaching assistant. They were able to ask me their specific questions directly and I was able to get a feeling for if they were on the right track and if they had a solid understanding of a concept. When I noticed their uneasiness about part of a concept or felt that I could better communicate a concept, for example with the assumptions of a randomization test, I would email my students with a further explanation and occasionally an annotated diagram. Formal feedback was also important for clarity of expectations and areas needing improvement. I did my best to provide all my students with detailed and specific feedback on their assignments that would allow them to improve on subsequent assignments. We also went over common mistakes made in each assignment at the beginning of the following lab. All the comments made were available to students in their individual feedbacks, but this provided an opportunity for me to address the class and take questions. However, my comments did not just include error analysis. If I saw a student go above and beyond, such as one student who taught himself to code innovative programs in R for standard error and other summary statistics, I would make sure to acknowledge their efforts to encourage independent exploration.

My third teaching strategy that I found to be effective involved implementing a variety of teaching strategies to make concepts **relevant and accessible** for students. Biology 315 labs were never monotonous computer labs. Every week I would begin lab by presenting a roughly 15-minute mini- lecture to introduce the newest statistical test and R code. For most of the semester, this mini-lecture would start with an overview of general mistakes made on the previous assignment, as mentioned in my second teaching strategy. Incorporated into a few mini-lectures were computer simulations that I walked students through as a large group to explain key concepts. I anticipated that these simulations would cause a large headache for most students if attempted individually, so I suggested to the lab coordinator that we run through it as a group. At times, I would also project my R code and run it in front of the class to demonstrate how the output should look and what information could be extracted. At this point, I would set my students free to attempt the lab manual skills with a partner as I circled the room to answer their questions. While the resources presented up to this point provided excellent information, I truly feel that the most potent learning occurred while students worked on their assignments.

These assignments always included real data from case-based studies, which both myself and my students found interesting and helpful in connecting course concepts to everyday life. It allowed students to engage with the course material by applying the knowledge they had learned. It also opened their eyes as to how the statistics they were learning could be applied later in their scientific careers. As mentioned in my teaching philosophy, my shared birdwatching experiences and photos of species reported in lab assignments, such as Boreal chickadees and Juncos, seemed to go over well with my students; it brought an individualized touch to an otherwise dry set of numbers.