Statement of Teaching Philosophy Phoebe Cook

My goal as an educator is to make science accessible to my students, either as a career or as knowledge they can engage with in their lives as citizens and consumers. In other words, my goal is for my students to develop self-efficacy. Self-efficacy is an individual’s belief that they can achieve a goal,1 whether that is interpreting the results of a study or testing their own hypothesis. Students who believe in their own ability are more likely to succeed, especially in fields in which they are underrepresented.2 In fact, a meta-analysis of 241 studies found that out of 50 factors, self-efficacy was the single best predictor of university GPA, better even than GPA in high school.3 Crucially, the evidence also shows that educators can improve student self-efficacy.4 My approach is to raise my students’ confidence by 1) building personal relationships, 2) focusing on core skills, 3) having students use these skills repeatedly to develop mastery, and 4) ensuring they see their progress.

This perspective was informed by coursework in educational psychology along with working with students over time. As a TA for introductory biology discussion sections in college, I saw first-hand how self-beliefs can shift. Students in these sessions were given challenging discussion questions to work through in small groups, and all TAs studied evidence-based STEM pedagogy to learn how to best support them. Working through challenges gave students more confidence in themselves as biologists, and the school’s gap in biology degree completion between underrepresented minorities and other students closed after this program was started.5

My approach to building student confidence has developed through mentoring independent research students in the Distinguished Major and Mountain Lake REU programs. Mentoring is an amazing chance to build a personal relationship, learning where students start from and seeing their progress over time. This has helped me learn how to support students in developing core skills. One student who had never read a scientific paper before was intimidated at first. As we read papers together, breaking them down and practicing strategies like diagramming out possible results, she gained confidence. She now says: “I always understand how the authors got their results and what the

takeaways are.” I helped another student with little coding experience learn R by scaffolding him through asking simple questions about a real dataset. I slowly gave him space to grapple with more complex programming, with frequent check-ins and encouragement. He will soon complete the analysis for his honors thesis, and is now confident enough to apply for jobs requiring work in R.

Their reflections align with the research: the largest gains in self-efficacy come from “mastery experiences” in which students complete challenging tasks.4

In teaching a seminar for senior biology students, I have scaled up these practices. At the start of the semester I met with each student individually get to know them. During this meeting, I asked them to record their current level of comfort with reading scientific papers and coding. They have now started to use those skills and will do so every week throughout the semester, building up difficulty and independence. Other than a short presentation of concepts needed to understand the next paper, all class time is spent in small group work and discussion. Each time they read a paper or tackle a new programming task, I ask them to jot down which of the strategies for conceptual organization, troubleshooting, or help-seeking we have discussed they tried and how they worked. The last weeks

1) Zimmerman *Contemporary Educational Psychology* 2000. 2) Nauta et al. *Journal of Counseling Psychology* 1998.

3) Richardson et al. *Psychological Bulletin.* 2012 4) Bartimote-Aufflick et al. *Studies in Higher Education* 2016.

5) Kudish, et al. *CBE Life Science Education* 2016.

of the semester will be spent on an independent project in which they analyze a real dataset to test a hypothesis and present both the code and the results in a polished R Markdown report—a task many of them say feels intimidating now, but that by then I expect to be a satisfying mastery experience. At two points during the semester I will ask them to complete learning reflections. In these reflections, the final step will be considering whether any of these strategies or insights about their own learning could be transferred to learning something else in the future. By building personal relationships early, focusing heavily on active learning, and requiring writing about metacognition, my hope is that this course will replicate the most important aspects of one-on-one mentoring in

building students’ confidence in their ability to tackle new problems.

Although self-efficacy can help underrepresented students succeed, personal internal changes are never the full solution to systemic problems. Minoritized students may be entirely confident in their abilities but still feel unwelcome if they are receiving signals that they do not belong, whether overt or subtle. I have done and continue to do the work to make sure all students can thrive in my classroom, seeking out workshops and other resources. I have learned how to demystify academic language and customs, be mindful of implicit bias, intervene to reduce the impact of racial microaggressions, and set course norms so that everyone feels safe when discussing sensitive topics. My syllabus includes clear statements that all students belong and that discriminatory behavior will not be tolerated, as well as resources available for support. I reiterate throughout the semester that everyone brings a wealth of personal and experiential knowledge. My course evaluations and feedback so far have shown that students appreciate this and feel welcome, and I will continue to educate myself on how best to support all students in developing identities as capable scientists.