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Teaching Statement

Teaching is a responsibility that I take very seriously, but also enjoy very much. While completing my MSc and PhD at Simon Fraser University (SFU), I had the privilege to teach two very different courses for the Department of Statistics and Actuarial Science. In the summer of 2003, after completing my MSc, I taught STAT101: Introduction to Statistics which covers basic topics in probability, descriptive statistics, study design, regression, and hypothesis testing. Most students enrolled in STAT101 are in their first year at SFU or have major concentrations in the arts, and so are not expected to have completed any mathematics courses beyond high school. The material must be presented with limited mathematics, and the focus is on describing and interpreting methods and providing students with hands-on experience analysing data.

In 2005, the second year of my PhD, I taught STAT450: Statistical Theory. This is the second of two courses at SFU that provide a mathematical treatment of probability and statistics theory for students with major concentrations in statistics or actuarial science. The course material comprises the fundamental theories of frequentist and Bayesian inference including point and interval estimation, hypothesis testing, likelihood theory and convergence concepts. For both of these courses, I planned the lectures and wrote my own lecture notes, created the course assignments and examinations, and handled all aspects of course administration. While at SFU I also assisted as a tutorial leader and marker for a range of courses on linear regression, the design of experiments, and quantitative statistical methods for students in the School of Resource and Environmental Management.

To complement my practical experience in these courses, I have also taken opportunities to learn about teaching and to improve my teaching abilities outside of the classroom. In the first year of my PhD, prior to teaching STAT450, I completed the Certificate Program in University Teaching and Learning (CPUTL) hosted by the Learning and Instructional Development Centre (LIDC) at SFU. This 8-month (120 hour) program for graduate students provided weekly seminars, discussion groups, and assignments covering a range of topics in course design, presentation skills, using technology in lectures, and student evaluation. Prior to this, I also completed the Instructional Skills Workshop (ISW), an 3-day interactive workshop also organized by the LIDC composed of a series of activities introducing topics in university teaching and learning.

As our final assignment for the CPUTL, students were required to submit a literature review on a topic that they felt would improve their own teaching practice. For my assignment, I chose to review the use of authentic assessment methods in teaching and learning statistics. Authentic assessment, also called outcome-based assessment, is one of the key components of the learner-centred paradigm of teaching which has been developed in all areas of higher education, and which I believe should be adopted in teaching statistics at all levels. Traditional (instructor-centred) courses are driven by a syllabus listing the material that an instructor must deliver to the students. The instructor presents this material during the course and the main assessment of students is based on one or two comprehensive examinations. These examinations may test only the basic learning skills, the memorization and recall of knowledge or simple computation, and often fail to assess students' abilities to reason, synthesize material, and apply skills to new problems.

In contrast, learner-centred courses are organized around a set of learning outcomes based on these higher level skills. The instructor's role in a learner-centred course is not simply to deliver material, but to construct learning experiences which allow students to reach these outcomes. Authentic assessment methods require students to demonstrate that they have fulfilled the learning outcomes and combine learning and evaluation in a continual process. Ideally, students learn by completing the assessment activities and their

output serves as the basis for their evaluation in the course.

In teaching STAT450, I tried to incorporate the ideas of active learning and authentic assessment in teaching statistical theory. Much has been written about the use of active learning in teaching statistics, but the discussion tends to concentrate on introductory and applied courses. For example, a common technique requires students to analyse real (or realistic) data sets asking them to choose between different methods they have learnt during the course and to address any problems that arise. To adapt these methods for STAT450, I had to design my own learning activities for the course.

One outcome I defined for STAT450 was that students be able to demonstrate how the theoretical concepts they were learning impacted real problems. To address this, I developed a series of S-plus programming assignments that required students to demonstrate the theoretical concepts through data simulation. For example, one assignment asked students to write their own programs to generate output illustrating the asymptotic normality of the maximum likelihood estimator for a specific estimation problem. These assignments allowed me to assess the students' understanding of the material, and also provided the students with concrete tools to explore the abstract, mathematical concepts. At the end of the semester, most indicated that these exercises helped them to understand the material, though some noted that their lack of programming experience, both generally and in S-plus specifically, was an impediment. As I continue to teach, I hope to refine this approach, perhaps by finding a simpler computing environment or by providing more of an introduction to S-plus, and to develop further activities to help students take a more active role in their own learning of statistics. Other strategies I have tried so far include providing students with in-lecture exercises so that they can immediately apply and evaluate their learning, having them construct mind-maps (visual representations of the connections between different material), and asking students in STAT101 to collect newspaper articles to help them engage with everyday uses of statistics.

Another issue that I believe is crucial in teaching statistics is to understand the diversity of students in the courses we teach. One activity that I remember well from the ISW was an exercise concerning diversity in learning styles. To start the activity, the course participants completed a simple questionnaire about learning preferences and then were categorized according to learning styles. I remember being amazed at how the participants – who were all graduate students that I considered similar to myself – differed in their approaches to learning.

Understanding this diversity was especially important to me in teaching STAT101 because the students came from a wide range of backgrounds. Teaching to one style of learning, particularly the very abstract, mathematical style of learning that I was familiar with, would have alienated a large proportion of the class. Because of my experience in the ISW, I tried to vary my presentation of the material in the lectures and to adapt my approach to meet an individual student's needs if they came to see me during my office hours. On my teaching evaluations, students have commented that I “would explain problems in different ways until [they] finally grasped the concept”, was “very helpful and approachable... patient and understanding”, and “always willing to help and could always explain so [they] understood”.

There are many aspects of teaching that I find rewarding, but this is probably the most important. Mathematics and statistics have always been topics that I have found intuitive and important, but I am aware that this is not the case for many students. I enjoy the moment when a student who has struggled with an idea suddenly comes to understand. I also find that teaching provides an important balance in my academic career. Whereas the goals of research may have broader impact, they usually take a long time to realize. Teaching provides immediate rewards and gives me an energy that I take to all aspects of my work.