Developing Pedagogical and Communications Skills in Graduate Students: The Emory University Biostatistics TATTO Program

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Abstract

Unlike primary and secondary educators, professors in post-secondary education are not required to meet certification requirements in education. Expressly, they are not required to have demonstrated competencies in the areas of education that contribute to the process of educating undergraduate and graduate students, such as pedagogy or evaluation in a subject matter area. To address its responsibility for training graduate students as teachers as well as scholars and investigators, the Emory University Graduate School of Arts and Sciences implemented the Teaching Assistant and Teacher Training Opportunity (TATTO) for all graduate students in 1992. Each graduate department has instituted its own TATTO program with a consistent and Graduate School-approved format. In this paper we describe our experience over the last six years with the evolving teacher-training program in the Department of Biostatistics. In our program, we focus on developing communication skills for all graduates, even those who may not pursue an academic career involving teaching. We also discuss the merits and challenges of our course in pedagogy in biostatistics, as well as other training components, including instruction in statistical consultation. We have found that the interactive dynamic nature of this program is well-received by the students. We have also found that the students benefit from observing good teachers, with attention to the craft of teaching, and from the feedback given by these teachers on student teaching style.

1. Introduction

1 Although hundreds of papers have been written in the area of statistics education, many of these expositions focus on a particular technique for instruction in a given method or area. Relatively few authors have written on statistical or biostatistical pedagogy in a comprehensive manner (see, for instance, Khamis 1991; Watts 1991; Tanner 1985; Urquhart 1971; Dawson-Saunders, Azen, Greenberg, and Reed 1987). Although the papers cited above deal more generally with effective teaching in introductory statistics courses, there is a dearth of material

available on preparation of future statistics teachers at the undergraduate or graduate level. A web search of curricula in graduate programs in statistics and biostatistics revealed four programs that offer formal instruction in pedagogy in the discipline, and, of these, two appear to be giving course credit for the teaching assistantship.

2 The Teaching Assistant and Teacher Training Opportunity (TATTO) program was initiated at Emory University in the Graduate School of Arts and Sciences in 1992. The goal of this program is to prepare graduate students for careers in the professoriate as scholars and investigators, instilling in them the knowledge, competence, and confidence for success in their first academic positions. One of the fundamental premises of the TATTO program is that teaching and research are complementary, rather than conflicting, activities. Another premise is that students will benefit from the course by improving communication skills, regardless of the students' career goals. Hence, a primary goal of this program is the balancing of scholarly preparation with a thorough and thoughtful preparation of each student in the arts of pedagogy.

3 The Emory TATTO program is marked by two distinguishing characteristics. First, all students pursuing the Ph.D. are required to complete the program as part of their academic requirements. Second, the TATTO program is divided into stages, with each stage leading to increased independence in the classroom. These stages are a four day Summer Course covering topics of general interest to all graduate students regardless of discipline, a discipline-specific course on pedagogy in each academic department, the Teaching Assistantship, and the Teaching Associateship.

4 In this paper we summarize the summer course and describe our experience over the last six years in developing the teacher-training program in the Department of Biostatistics. In particular, we focus on the pedagogy course in biostatistics as well as the variation that we have implemented on the Teaching Associateship, specifically incorporating closely supervised biostatistical consultation experiences into this program.

2. The Summer Course

5 During the week prior to fall semester orientation, approximately 300 students from the 20 graduate departments gather to discuss important issues related to teaching at Emory and at other colleges and universities. This course is led by faculty drawn from the best teachers across the institution.

6 Students for the course comprise those serving as teaching assistants for the first time in the fall semester. Generally they are in their second year of graduate study at Emory. Students who have not completed the summer course may not serve as teaching assistants. International students must be evaluated in English as a Second Language, including classes in pronunciation and writing, prior to their participation in the summer course.

7 The course covers a variety of topics, including Lecturing, Writing as a Pedagogical Tool, Use of New Technologies, Voice & Body, Diversity in the Classroom, Syllabi & Grading, Teaching Using Discussion, Conduct of Lab Sessions, Campus Resources, Ethics, and Fostering an Environment for Learning. These topics are covered in two formats, plenary sessions and workshops. The capstone experience of the course is the micro-teaching session. In this session of ten to twelve students, led by a faculty member, each student presents a mini-class before his or her peers, who then offer a critique of the teaching performance.

3. Pedagogy Instruction: How to Teach Biostatistics

8 The course on pedagogy, How to Teach Biostatistics, is offered each fall semester. The content addresses the problems and issues involved in teaching biostatistics courses, focusing on introductory classes. Two semester hours of credit are received for this course. Each session of the course has three components: an open forum to discuss issues that arise in the course of teaching assistant (TA) duties, a discussion of the week's topic, chosen for its relevance in teaching introductory biostatistics courses, and mini-teaching.

9 The open forum is usually the first component of each week's session. Students are encouraged to raise issues that arise in the course of their first semester as teaching assistants. All students are encouraged to participate in the ensuing discussion, to try to resolve problems and to identify solutions. Examples of issues that arise for discussion include how to deal with students who monopolize the TA's time in the help sessions, TA's not knowing the answer to a question, and students who need help with course prerequisites (e.g., algebra or math). Occasionally these sessions leave the confines of the particular course and move into the realm of departmental and university policy and politics. Examples of issues that arise for discussion in these sessions include discrimination or harassment based on race or sex, cheating, and copying homework. According to the written comments on the course evaluations, the students particularly enjoy this aspect of the course. They like the opportunity to discuss issues, as well as to touch base and review their previous week as a TA. They appreciate the flexibility that this gives them to take the class in a direction that they need.

10 The course topics for discussion are listed in Table 1. The textbook and other reference material used are listed in Table 2. As part of the introductory material, students are introduced formally to concepts relevant to designing a new course, for example, the Bloom taxonomy for educational objectives (Bloom, Engelhart, Furst, Hill, and Krathwohl 1956). Homework assignments are also given. Students are expected to read the assigned material from the textbook and other papers prior to a given session. Assignments include writing course objectives for some of the departmental service courses and developing syllabi for these courses. As the course progresses, topics become subsequently more and then less focussed on the issues faced in teaching biostatistics courses.

Table 1. Topics for the Course in Biostatistical Pedagogy

- Organizing a course - objectives, syllabus
- Roles of the teaching assistant
- Lecturing and alternative teaching formats
- Evaluating student performance
- Tests, exams, and grading
- Cheating
- Teacher-student relationships
- Teaching students with weak quantitative skills
- Teaching students with diverse backgrounds
- Teaching biostatistics students
- Teaching epidemiology students
- Teaching medical, health science, adult, undergraduate students
- Use of audio-visual techniques
- Use of computers
- Evaluating your teaching
- Student motivation, learning, and thinking

Table 2. Reference Materials Used in Biostatistical Pedagogy

- Text: McKeachie, W. J. (1999), *Teaching Tips: Strategies, Research, and Theory for College and University Teachers* (10th ed.), New York: Houghton Mifflin.
- Selected portions from Case, B. A. (ed.) (1994), *You're the Professor, What Next? Ideas and Resources for Preparing College Teachers*, Washington, DC: The Mathematical Association of America.
- Brogan, D., and Kutner, M. H. (1986), "Graduate Statistics Service Courses," *The American Statistician*, 40, 252-254.

- DeMets, D. L., Anbar, D., Fairweather, W., Louis, T. A., and O'Neill, R. T. (1994), "Training the Next Generation of Biostatisticians," *The American Statistician*, 48, 280-284.

- Dawson-Saunders, B., Azen, S., Greenberg, R. S., and Reed, A. H. (1987), "The Instruction of Biostatistics in Medical School," *The American Statistician*, 41, 263-266.

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11 The third component of the course is mini-teaching. Each student is expected to prepare a brief (20-minute) presentation to the group on a topic that s/he would include in an introductory biostatistics course. These presentations are videotaped. After the presentation, constructive feedback is given. Over time we have found that it is not useful to replay every video for the entire class; rather, each student is obliged to view his or her own video immediately after class dismissal. The students receive their videos so that they can view them subsequently at their leisure. The students have remarked positively on course evaluations that they like preparing the presentations as well as seeing how other students organize and deliver their presentations. However, the students perceive additional stress from the presence of the video camera. This stress has been alleviated somewhat in recent years since we no longer routinely replay the tapes in class.

12 Student course evaluations are taken very seriously, and this course has benefited greatly from changes implemented in response to student feedback. Our current challenge is to incorporate sessions on new technology into the course, which is limited by availability of equipment.

13 Although only the second year doctoral students are required to take this course for academic credit, over the years we have found that there are other professionals new to the department who have benefited by sitting in on the course as well. In particular, post-doctoral fellows and new faculty have found selected sessions useful in preparing for their first excursions as teachers.

4. The Teaching Associateship: Instruction in Statistical Consultation

14 In most other graduate departments at Emory, the required teaching associateship experience is fulfilled by co-teaching a course with a faculty member. We have modified this for our department. The final step of the TATTO program in biostatistics is satisfied through studying and participating in statistical consulting activities, a major part of the work of almost every biostatistician. Statistical consulting is viewed as an activity that includes explaining biostatistical concepts and methods to professionals from other biomedical and health-related fields. Our departmental philosophy is that it is not sufficient that students learn when and how to apply various statistical methods in order to become effective consultants. Rather, students must learn how to communicate with different clients, such as physicians, investigators, and students from other disciplines, many of whom have had very little training in biostatistics. Therefore, the development of good oral and written communication skills is essential for a biostatistical consultant. Moreover, we do not offer undergraduate classes in biostatistics. Thus, there is limited opportunity for co-teaching, unlike many other departments at Emory that have TATTO.

15 In order to satisfy the consulting requirements, students enroll in the required biostatistical consulting course, taught by faculty of the Biostatistical Consulting Center. This course explores the roles, responsibilities, and other issues related to the biostatistician as consultant or collaborator in the biomedical field. This consulting course has evolved over the years from a more traditional format of slowly integrating students into the consulting process to one of immersion and discussion of relevant consulting topics.

16 Formerly, the course was structured in two parts. The first part of the course was dedicated to preparing students to act as consultants through discussions of consulting models, interpersonal communication, ethics, common client types, time and financial management, and other issues. In the second part of the course, students gained experience by participating in the consulting process. Initially under supervision of a faculty member,

students collaborated with researchers to develop the design and/or the analysis of quantitative investigations. With experience, the collaboration between student and researcher was carried out more independently and subsequently reviewed and critiqued by faculty and students. Students then discussed their consulting experiences during class meetings, and they prepared a final report to serve as both a class project and a summary of their work for the researcher.

17 The main problem with the above approach to teaching statistical consulting is that most students enter the class with so little consulting experience that they have a difficult time appreciating or relating to the concepts in the first half of the course. Thus, an alternative approach has been adopted in which students are required to act as consultants at the beginning of the course. This immersion into the consulting process is done by bringing in mock clients, usually faculty or staff members from the Department of Biostatistics, with consulting problems. In the classroom, a pair of students conducts the mock consulting session while other students and the instructor observe. The mock clients bring in contrived problems that focus the students' learning on particular discussion topics such as consulting models, ethics, or common client types. In addition, there are required reading assignments emphasizing a topic prior to the classroom session, many of which come from the text of James Boen and Douglas Zahn (Boen and Zahn 1982). After a mock consulting session, the instructor and students engage in a critique and discussion of the session, and the learning points from the primary discussion topic are highlighted. Usually one mock consulting session and discussion require a 90-minute class session. Repeating these mock consulting sessions using a variety of topics and all of the students appears to better educate and prepare the students for their real consulting with external researchers in a later component of this course. The ensuing discussions incorporate the topics covered by Derr in the context of communications (Derr 2000). Topics covered in this course are found in Table 3.

Table 3. Topics for the Course in Biostatistical Consulting

- What is statistical consultation?
- Consulting techniques and expectations
- The ideal consultant
- Client types
- Client expectations
- Communication, fear, and anger
- Research teams
- Interpersonal skills
- Improving your consulting
- Business aspects of consulting
- Ethical issues in statistical consulting

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5. Future Directions

18 Response to this program has been very positive. Students often cite the TATTO program as a positive factor influencing their decision to matriculate at Emory. Faculty have received warm responses in describing this program to other statistics educators. Since our annual cohorts of students are small in number, averaging four or five per year, there have been very few students who have graduated from the program and entered the academic job market from whom we can gather follow-up data.

19 We continue to fine tune the program to respond to course evaluations as well as to the evolution of statistics education. In the Fall 1999 pedagogy course, we changed the syllabus dramatically to include sessions regarding use of instructional technology and distance learning techniques. These topics will continue to be included in

future offerings. The consulting course has recently changed its text to emphasize development of communications skills.

20 Implementation of this type of program in other doctoral programs in statistics or biostatistics could be readily accomplished. It requires relatively modest investments in video equipment, as well as dedicated faculty. More importantly, however, it requires the organizational will to allot a modest amount of doctoral study to an area of less technical skills. Thus, such a commitment is possible only when there is buy-in from high levels of administration, from department chair to graduate dean to provost.

21 This program has allowed Emory University to demonstrate a commitment to the development of scholarly excellence through pedagogical development. The Department of Biostatistics at Emory University is leading the way in developing the next generation of biostatistics educators.

References

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., and Krathwohl, D. R. (eds.) (1956), "Taxonomy of Educational Objectives: The Classification of Educational Goals," *Handbook I, Cognitive Domain* (1st ed.), New York: David McKay.

Boen, J. R., and Zahn, D. A. (1982), *The Human Side of Statistical Consulting*, Belmont, CA: Lifetime Learning Publications.

Dawson-Saunders, B., Azen, S., Greenberg, R. S., and Reed, A. H. (1987), "The Instruction of Biostatistics in Medical School," *The American Statistician*, 41, 263-266.

Derr, J. (2000), *Statistical Consulting: A Guide to Effective Communication*, Belmont, CA: Duxbury Press.

Khamis, H. J. (1991), "Manual Computations - A Tool for Reinforcing Concepts and Techniques," *The American Statistician*, 45, 294-299.

Tanner, M. A. (1985), "The Use of Investigations in the Introductory Statistics Course," *The American Statistician*, 39, 306-310.

Urquhart, N. S. (1971), "Nonverbal Instructional Approaches for Introductory Statistics," *The American Statistician*, 25, 20-25.

Watts, D. G. (1991), "Why Is Introductory Statistics Difficult to Learn? And What Can We Do to Make It Easier?" *The American Statistician*, 45, 290-291.

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