

**MENTORING GRADUATE STUDENTS IN APPRENTICESHIP POSITIONS AS
RESEARCH ASSISTANTS: THE EXPERIENCE AT THE UNIVERSITY OF NORTH
CAROLINA AT CHAPEL HILL**

Shrikant I. Bangdiwala

The University of North Carolina at Chapel Hill, United States

kant@unc.edu

Graduate training programs in applied statistics are the formal method to provide future professionals with the necessary theoretical and methodological tools for a successful career as a statistician. Mentoring is considered as another form of education at the post secondary level, and should complement the formal coursework with individualized hands-on experiences with real world problems in addition to providing students with career counseling. This manuscript describes the mentoring process at the Department of Biostatistics of the School of Public Health of the University of North Carolina at Chapel Hill.

INTRODUCTION

A graduate training program in applied statistics equips students through formal courses with the necessary theoretical and methodological tools for a successful career as a statistician. During their graduate years, students are quite concerned with coursework and with thesis/dissertation activities. However, in order to be successful applied statisticians, mentoring should be a crucial component of their training. Mentoring is considered as another form of education at the post secondary level. A mentoring program should help students develop the statistical intuition and maturity needed to solve practical real-world problems and provide them with sound advice for their career development as statisticians (Bangdiwala, 1999). A sound mentoring program should provide students with opportunities to make connections among courses and practice using course material to address the complex, non-textbook problems that are typically brought to statisticians “in real life.”

Many may not consider ‘mentoring’ as the most effective teaching modality for the theoretical aspects of statistics. However, mentoring could be considered as the best way to teach applied statistics concepts, how to apply statistical techniques to real-life situations, and the art of statistical consultation. Engaging in collaborative research is a common method of mentoring in statistics; but it is not clear how much mentoring in terms of job and career counseling occurs with graduate students of statistics. Through their research training, much more than through their coursework, graduate students internalize the norms of their discipline - intellectual, methodological, and ethical.

UNC EXPERIENCE

At the beginning of the first year, each incoming graduate student is assigned an academic advisor from the faculty. The faculty member advises on coursework and fulfilling the student’s chosen academic program requirements in a timely manner and according to the student’s capabilities. Master’s level students can choose to either complete a formal thesis or to write a ‘masters paper,’ while doctoral students choose their dissertation advisor and doctoral committee. The thesis/masters paper/dissertation advisor is chosen by the student, and this faculty member is a second potential mentor after the academic advisor.

The third possibility comes when a student chooses to have a graduate research assistantship (GRA) experience. These positions are ‘learn as you work’ jobs under a faculty advisor, and are from 10-20 hours per week. Typically students work in data management and/or analysis tasks in ongoing funded research projects of the supervising faculty member. Unlike the other two mentoring possibilities, not all students choose to have the GRA experience. Those that do, often do it out of financial need, since the GRA positions are paid and many include a tuition reduction as well. Most faculty searching for GRAs often prefer doctoral students since they usually have already completed a masters degree, have more experience, and more biostatistical and programming skills. Also, they are likely to be around longer than masters students since the

masters program takes about 18-24 months to complete. The percentage of GRAs annually among the doctoral graduate students is fairly high, about 60-70%.

The three mentoring possibilities may be fulfilled by the same faculty member, but may also be with up to three different faculty members. To the extent it is the same, one presumes a more consistent mentoring experience for the student.

GRADUATE RESEARCH ASSISTANTS

As a graduate research assistant, under the guidance of a faculty member in the Department of Biostatistics, students are provided the opportunities to participate in a large variety of research projects, ranging from the various areas of application of biostatistics, such as statistical genetics, epidemiology, sample survey methodology, demography, and so forth. For a given research project, students may be involved in developing or managing the statistical aspects of design of studies, data collection, data management, analysis, and interpretation and presentation of results.

The importance of being involved 'hands-on' in a research project activities forces students to integrate class work with 'real-life' functioning of a statistician. The mentoring takes place by the example provided by the faculty member in scheduling, prioritizing and management of the work, and by discussions with the students on the alternative statistical methodologies for the tasks. However, a very important aspect of mentoring that is also part of the GRA experience is the learning of the 'human side of consulting,' since typically the activities are from funded applied research projects and the faculty statistician will interact with non-statisticians as part of the collaborative work.

A few real examples may help to illustrate the issues mentioned above. Juan (not his real name) was a doctoral student from Latin America, arrived with a masters in statistics and several years of experience teaching at his university, but no training in statistical consultation practice. As part of his doctoral program at UNC, he was a GRA under me. He worked 20-hours per week (the maximum allowed for GRAs) during the academic year, but as much as 40 hours per week between sessions in order to make ends meet as his family was also with him. He was technically very sound, but I placed him to direct the biostatistical support services provided to the faculty and other investigators of a university-based research institute. This involved meeting with investigators, understanding their request for services, providing service or supervising a junior co-worker providing the service, administration in keeping track of outstanding requests and tackling conflicting priorities and deadlines. The above activities were done under my guidance and supervision. The tasks are part of the daily functioning of an applied biostatistician in an academic, governmental or private-industry setting, and provided valuable mentoring experience for the student. Since graduation, he used his experience in the GRA context to create a similar experience at his university.

A second example is Yun-wei (not her real name), a doctoral student from Asia. She arrived in the department with little experience as a statistician, directly into the masters-doctoral from an undergraduate degree. Most GRAs tend to be foreign students, since only USA citizens can be offered federal training grant funds and North Carolina residents have much lower in-state tuition. She was not offered a GRA until her second year in the department, since she needed to acquire basic programming skills in statistical software. Once hired, since she had not completed a masters degree, she initially performed routine programming tasks. I asked that she participate in discussions that I would have with investigators on their projects, and slowly she learned how to interact with investigators, what questions to ask and how to ask them, and as she acquired more statistical skills, she was able to carry out more sophisticated analysis and to also interact directly with the investigators. By the time she graduated, she was working independently.

The third example is Peter (not his real name), a US citizen doctoral student. Peter was admitted as one of the brightest students, and thus enticed to pursue his doctoral training with a fully-paid scholarship from a US-government training grant. This grant covered tuition and fees, plus provided a living stipend while enrolled. The scholarship only requirement was that Peter work as a biostatistician anywhere upon graduation, or he would have to pay back all funds received. This was basically a 'free ride' for doctoral training, a very coveted funding packet reserved for the best students. Peter was a 'straight through' student, having no work experience

and coming to the masters-doctoral program directly from an undergraduate degree in mathematics. The training program forbade him from having a secondary source of income, and so a GRA was not possible or necessary financially. However, Peter felt the need to get some experience with working on a real project under the guidance and mentoring of a faculty member, and so he volunteered to work for no pay in one. This experience enabled him to understand the issues of messy data, data management and the statistical coordination of complex datasets in a research project. Upon graduation, he was able to successfully pursue a career in academia, but has made collaborative research and project management an integral part of his career based on the mentored experience he acquired.

The above examples illustrate the variety of skills, backgrounds and experience of incoming graduate students. Our aim is to provide them with not only the academic and theoretical background to be successful career biostatisticians, but also to know how to work effectively in collaborative research endeavors. The latter requires the additional mentoring that is best provided under a guided GRA experience.

DISCUSSION

Because human relations issues can have a major impact on the success or failure of a statisticians' work, mentoring looks at the "human side of consulting" as well as the technical issues. The desired impact of the mentoring program is to increase the quality of statistical education in the Department as a result of early emphasis on research, and the experiences gained from direct participation in statistical consultation on real life problems.

Over the years, students that have opted for the GRA have emerged from the Department as experienced applied statisticians, able to work as colleagues alongside other scientific investigators. The mentoring program essentially works as a 'post-doctoral' training for the graduate students, but it occurs during their doctoral training.

REFERENCES

- Bangdiwala, S. I. (1999). The role of the biostatistician in biomedical research (in Spanish), *Revista Médica de Chile*, 127, 223-228.