COMMENTARIES

Commentaries are informative essays dealing with viewpoints of statistical practice, statistical education, and other topics considered to be of general interest to the broad readership of *The American Statistician*. Commentaries are similar in spirit to Letters to the Editor, but they involve longer discussions of background, issues, and perspectives. All commentaries will be refereed for their merit and compatibility with these criteria.

Career Information for Statistics Graduate Students

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A method is proposed for statistics graduate student self-assessment of appropriateness for public, private, or academic workplace.

KEY WORDS: Practitioner; Vocational guidance; Workplace.

During nearly three decades of teaching biostatistics students registered for the M.S. or Ph.D. degree at the University of Minnesota and through informal follow-up of alumni, we have noticed a problem that deserves attention and for which there is a cost-effective solution. Although our experience is with biostatistics, we believe the problem is generic to the field of statistics. The problem is that students and faculty address the students' career interests too near the end of the students' program. The faculty instinctively consider early whether an M.S. student should be encouraged to go on for the Ph.D., but because the discipline requires the learning of much technical material in mathematics, statistics, computing, and perhaps an area of application, the choice of career path is often left to the last minute. It is then too late to choose elective courses appropriate for the intended workplace; with little time for decision, the risk of poor career path choice is high. A contributing factor is the common faculty belief that career path decisions are the students' business and that faculty are not, nor should they try to be, vocational counselors.

There are statistics students who, through experience or natural savvy, are good at making career decisions. However, there are many, including some who are academically gifted, who would benefit greatly from formal guidance. The main point of this communication is to recommend that statistics departments, at a minimum, routinely inform students of the reward systems and cultures of the three major categories of workplaces, namely the public, private, and academic settings. The workplace reward systems and cultures of these settings are sufficiently different from each other that student personality and value system differences, especially regarding responses to authority, structure, profit motive, and time pressures make certain student–workplace matches much better than others. Some students are a natural fit for the academy with its generally low-key but nevertheless relentless pressure to produce; others have value systems that make them best suited for the private sector with its frequent time pressures and profit motive orientations; still others will find satisfaction in the public sector, tolerating the bureaucratic structure while working toward the ideal of helping a governmental unit accomplish its regulatory, research, or service task. We recommend that description of workplace reward systems and cultures be not only made available to all statistics students, but that it be required. The reason for requiring it is the ironic fact that those students who would benefit most are most oblivious to the importance of nontechnical factors in their workplace decisions.

This workplace orientation need not take much time; three or four 50-minute class periods could accommodate the proposal. It could be imbedded in a course already required. If the department requires a course in consulting, that course would provide a natural setting. Other courses would do, but the more applied the tenor of the course, the more natural the setting. One class period could be devoted to each of the three sectors with a possible fourth period for summarization, discussion, and opinion formation.

Any senior faculty member should be able to describe the academic workplace reward system and culture, although some are undoubtedly better "sociologists" than others. Surprisingly, many Ph.D. students are unaware of what it takes to succeed as faculty in the academy and how deeply the publish-or-perish system is entrenched in major research universities. They are also unaware of the distractions awaiting the new faculty member, such as the invitations to serve on committees and to help out with departmental chores that will not "count" toward tenure. Students often see only the rewarding aspects of academic life. They see faculty coming and going at all hours, clearly not punching a

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clock, and conclude "I would like to have a job like that." The realities of life of faculty in both smaller colleges and large research universities should be laid out clearly and candidly.

Descriptions of workplace realities for statisticians employed as practitioners in the private and public sectors are best given by statisticians currently (or recently) employed full time in those settings. In our experience, many practitioner alumni welcome an invitation to describe life in their organizations and have instant credibility with the students. It is helpful to have a faculty member in the classroom during the alumni practitioner's discussion with the students in order to ensure that all student questions regarding life in practitioner workplaces are addressed.

In addition to the proposed formal presentations of workplace realities by faculty and alumni practitioners, there already exist other practice-setting opportunities within statistics departments that have been utilized for many years. These are the teaching and research assistantships. A teaching assistantship in which the graduate student grades papers, delivers lectures, tutors students in elementary courses, and participates in the grade negotiations with disgruntled students gives some taste of the teaching role of faculty. The tension between the nurturing aspect of teaching and the evaluative aspect of grading needs to be experienced to be appreciated. A research assistantship can serve an important experiential role, the kind and extent depending on the department's involvement in research projects and the consultations of its faculty. The more a student can observe closely the negotiations of budgets and relationships, or even assume responsibility in such matters, the better a student can assess her or his psychosocial ability to handle awkward relationships and ill-defined problems of content or process. It is, however, the exception rather than the rule that graduate students are required to be both teaching and research assistants and few such departments would have "full menu" experiences for all students.

For the orientation process to be effective, not only must students be aware of the different workplace reward systems and cultures, but they also need to initiate a self-assessment of appropriateness for the various workplaces. The relevance of such self-awareness has been discussed previously by Boen and Zahn (1982, p. 175) in the context of consulting. Discussion with fellow graduate students holding differing views is an important and useful ingredient in such a self-assessment; to facilitate this, time could be set aside for initiating targeted discussion during one or more of the proposed classroom sessions. Some graduate students who excel in the classroom and thesis roles are very uncomfortable with ill-defined scientific problems and awkward or hostile personal relationships, and would be well-advised to discover those facts about themselves before they leave the relatively sheltered environment of their graduate department to seek employment. It is quite an adjustment to go from the sanitized problems appearing in statistics texts that illustrate applications of methodology with clean data to working with researchers who haven't defined their goals, let alone their outcome variables. Some students are tempermentally suited to making order out of chaos, while others simply aren't and don't know that they aren't. Helping determine the amount of structure in which they work most effectively, or may require, is one of the most useful things a faculty can do for students deciding on their workplace setting.

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REFERENCE

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

What's Missing in Statistical Education?

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There is a growing feeling in the statistical community that significant changes must be made in statistical education. Statistical education has traditionally focused on developing knowledge and skills and assumed that students would create value for the subject in the process. This approach hasn't worked. It is argued that we can help students better learn statistical thinking and methods and create value for its use by focusing both the content and delivery of statistical education on how people use statistical thinking and methods to learn, solve problems, and improve processes. Learning from your experiences, by using statistical thinking in real-life situations, is an effective way to create value for a subject and build knowledge and skills at both the graduate and undergraduate levels. The learnings from psychology and behavioral science are also shown to be helpful in improving the delivery of statistical education.

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