How Statistical Consultants in Universities Can Contribute to Statistical Education

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1.   Introduction

The theme of this paper is that statistical consultants in universities are in an excellent position to broaden the statistical knowledge of their university colleagues and clients, and that they ought to view the provision of statistical education as one of their most important tasks. While the paper will discuss only statistical consultants in universities, most points are pertinent to consultants in other areas, particularly to biometricians in Government Departments of Agriculture, Health, and related areas.

The provision of statistical consulting services within universities seems to be increasing. While the author has no data to support this assertion, anecdotal evidence, direct observation, and the increasing number of references in the literature to consulting in universities all suggest that this is true.

The variety of services provided is enormous. Some consultants provide advice only, and others assist with statistical analyses as well. Some charge every client for the work done, while others charge only those who have research funding. Clients may be restricted to university staff and students or external clients may be welcomed eagerly.

Notwithstanding this diversity of activities, and the view of some people that consultants should have a service role only, I believe that all statistical consulting services have the opportunity - and a responsibility - to contribute to the statistical education of their clients and of the wider university community.

2.   Spreading the word

A distinction can be made between the education of research students and of academic staff. Research students will require moderate statistical education, while academic staff should be qualified researchers requiring more limited help. It would be naive, however, to believe that this is always the case even with basic statistical matters.

Some statistical education will occur automatically. In explaining why you cannot determine instantly how large a sample is needed, some notions of variability and

statistical power should be passed on to the client. When you point out why a Pearson product-moment correlation coefficient is not appropriate if one variable is categorical and the other is ordinal, the client should learn that the assumptions underlying statistical procedures are important.

One colleague felt that, when dealing with academics, you should ensure that, when the client finishes the consultation(s), s/he is able to do the next analysis of that type on his/her own. I believe that this is over-optimistic; the kind of analysis, and the statistical package used, will obviously play a major role. However, you should try to ensure that the client always leaves a consultation knowing a little more than when s/he came in. General areas of weakness are usually obvious, and can be slowly chipped away. If your clients can be made aware of the need to think critically about an appropriate design and analysis, they will come back (an important consideration if you are charging fees), and you will have been successful in your education efforts. Sometimes you have to take your successes where you can: getting a client to look at data using two-way tables instead of one-way tables may represent a major triumph for you.

While the education of your existing clients is very valuable, I believe that it is not sufficient to let statistical knowledge flow in this relatively passive manner. Statistical consultants should go out and deliberately spread the word.

The first step is to become "known". People will be more receptive to what you say, and more likely to seek you out, if they have heard of your name and your position. Most universities publish newsletters, edited by people eager for interesting news items. Your clients are sure to provide you with such items. The material which you give to the newsletter should state that the consultant is available to assist with statistical problems, and give examples of the services which are provided - emphasising the planning of experiments!

The university's newsletter may also alert you to research occurring in the university which obviously needs the input of a statistician. My advice is to send a friendly note to the research leader, expressing interest in the investigation and suggesting that you might be able to be of assistance in further work in the area.

I try to encourage satisfied clients to tell their colleagues of this satisfaction. Research students, in particular, will talk to one another. "I went to see ... and s/he was great; s/he showed me how to ..." is the best way of letting people know that you are there, and getting them to come to see you. Then the education can begin.

You can also contribute to statistical education by presenting seminars to groups of potential users of statistics. Induction days for new staff or students are an obvious avenue. I also try to target departments which use statistics and provide clients to the consulting service. I suggest to a client that I could give a seminar aimed particularly at that department's area of work, and I try to follow this up. If the department suggests a topic which you feel is inappropriate, you may have to compromise, perhaps by offering to present your choice of topic first and their suggested topic at a specified later date.

Part of the consultant's time should be spent keeping the researchers abreast of modern statistical developments. The use of generalised linear models instead of approximate analyses of variance is an example. Most researchers will welcome the introduction of better techniques if they are made aware of the benefits which will accrue.

It should not be difficult to justify these activities. If the consulting service does not charge fees, no-one is likely to challenge strongly any activities which may improve the statistical nature of further research. If the service has to charge its clients, then

these educational activities should be viewed as "advertising", without which there will be less demand for the service.

You can attend seminars which your clients give. This reassures the client and makes your face known, and it enables you to comment on any matters of particular statistical importance and to provide a small amount of statistical education. If you have to charge all clients for your services, but your client cannot pay for you to attend the seminar in a consultative role, this activity may be regarded as "after-sales service".

3.   Difficulties, and how to overcome them

One obvious problem is that, unlike the lecturer or teacher of a statistics class, the statistical consultant has no captive audience. The consultant must retain an audience by showing that what is being said is of practical value to it. This means targetting the audience carefully.

Some academics are notoriously touchy, and difficult to persuade that their knowledge and understanding of statistics is inadequate. They may actively resist any suggestion that their research projects, or the advice they give their students, could be improved. My approach has been to try to circumvent these people. Research students and younger academic colleagues are often more amenable to statistical advice and, provided that you explain why you are proposing a certain procedure and what its advantages are over the one suggested by "Dr Difficult", they will be prepared to follow your suggestions - especially if you provide regular encouragement. There is no need to mention "Dr Difficult" by name; let your statistical work speak for itself.

Another difficulty arises when consultants must charge for their time. Some clients will resist the idea that they should learn any statistics, arguing that "We're paying you to do the statistical work. Why should we need to know about it?" The argument "If you know how and why to do this, the benefits to you will be ..." can be effective, especially if those benefits can be expressed as dollars or hours saved.

Perhaps the greatest difficulty may be sheer pressure of work. If the consulting load is extremely heavy, it is very easy to concentrate solely on the jobs which come in, and to forget any notions of reaching out to a wider audience. The best advice I have heard for such situations is to "make regular appointments with yourself", and to keep them as sacrosanct as appointments with other clients. In these appointments with yourself, plan how you will extend statistical education around the university, and carry out such activities.

4.   Planned future activities

Statistical computer packages play an important role in statistical education. I dislike some of the packages which my clients use, but if their failure to get the output they want (or to understand what they get) causes them to come to me when otherwise they would not, it gives me an opportunity to do some statistical educating. I believe it is desirable for the client to have some part in the data analysis if possible: this policy reduces the "black box" mystique and prevents the client from thinking that the statistician is just a technician to be used to "crunch the numbers", it keeps in contact

the data and the person who knows most about them, and it may help the client to learn about statistical methods.

In view of this, I would like to compare the main statistical packages used on campus, to determine which are best for particular tasks. It is educational for statisticians to look at different packages, and I believe that it will help in the education of non-statisticians as well.

Despite "Dr Difficult" and his ilk, there are many staff and research students who are aware of their statistical shortcomings. I would like to promote a course on statistical methods for researchers. The presence of a consultant statistician amongst the lecturers, and the promise that many research-oriented examples will be included, should lend credibility to the course and reassure prospective attendees that it will be pitched at the right level. The experience of one Australian university suggests that an appropriate course will attract a fee-paying audience, so this is not an activity which only funded consulting services can provide. Indeed, it may be argued that to charge a fee (even if only a modest one) will ensure a greater commitment on the part of the audience.

I hope, as time goes on, to be in the position where I can say to a client "You're the second person from your department to have this kind of problem. Why don't I give the department a seminar on it?" This is distinctly better than suggesting that the client discuss the problem with the colleague who had the same difficulty at an earlier time.

5.   Concluding remarks

I feel that every statistician should try to educate those around him/her to the need for, and benefits of, sound statistical techniques. However, some statisticians are in a better situation than others to do this, and a statistical consultant at a university (or appropriate Government Department) has one of the best opportunities of all. This opportunity should not be wasted. There are potentially major benefits to the client, to the organisation, to wider groups in society - and to the statistician as well.

The advantages of bringing statistical education to academics and research students in universities are several: most of the potential audience are in situations where they recognise the need for statistical expertise and will respond to your comments; you have the opportunity to make a profound contribution to important research in many areas; and there is a good chance that, after a while, you may get some research ideas or the chance to participate in some joint work.

The disadvantages are probably common to all teaching: some people won't appreciate your efforts, and no sooner do you educate the research students than they move on and you have to begin with a new group. At the research level, however, you meet them when they want to learn, and your influence may linger on.