Teaching Statistics for Employers in the Twenty-first Century

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1. Abstract

Employers in the twenty-first century are generally seeking to hire a graduate who has a range of skills. Hence, they often require not just a statistician, but rather an information analyst. The graduate is expected not only to be familiar with a range of statistical methods, but also with more general skills useful for collecting, assembling, interpreting, analysing and presenting data, as well as expertise in computer software, report writing and oral communication.

2. Introduction

Over recent years, employers have become more demanding in their requirements of the graduates that they recruit. They expect a graduate who has not only the technical skills to solve problems, but also has good oral and written communication ability. However, designers of university programs need to be aware not only of the range of activities that employers ask their graduates to perform, but they should also bear in mind the role that we would like to see Statistics play in our broader Society.

3. Basic Skills

In many ways, a first subject in statistics is the most difficult one for a lot of students. Many concepts are quite new, but also substantially different to the ideas that students, including those accomplished in mathematics, have been accustomed to. Getting students to grasp the idea of a distribution and its role in collecting and analyzing a set of data on a particular subject, and the associated idea of a variance, is a constant challenge for a teacher of a first subject in statistics.

In designing a statistical study, the standard steps are:

i) determining the research questions
ii) deciding on, and conducting, data collection
iii) specifying an appropriate model (where relevant)
iv) data analysis, including estimating model parameters
v) drawing inferences and conclusions
vi) presenting and summarizing results

Traditional statistics programs have tended to focus on these aspects, although with particular emphasis on elements iii), iv) and v); indeed many courses barely touch on i) and vi). There is also considerable debate about the order in which these aspects should be addressed. However, it does seem sensible to have the student understand about models and how to estimate parameters of a model, data analysis in general and drawing inferences from data, before tackling issues of data collection, and understanding about setting the objectives of, and presenting the outcomes of, a study.

Most business and research organizations have available to them, a vast array of data arising from a variety of sources, both internal and external to the organization, and of different levels of accuracy

and precision. Students trained to specify a model, to estimate its parameters (and measures of precision) and to make inferences based on those estimates, are not well placed to analyse a set of data, when they know very little about the background to the data. Indeed many statisticians feel uncomfortable when asked to analyse data when the assumptions underlying many statistical techniques may not hold or even be testable. However, can we simply walk away from such a task?

It has become increasingly common for statistics courses to include a subject on consulting or a subject where students can choose and carry out a project in an area of interest. Such subjects force students to confront many of the practical problems that arise in statistical studies, and help develop their statistical thinking. We have found that a statistical project as a capstone unit in the student's final semester helps to expand the student's view of statistics and its applications. Taplin (2003) presents arguments for students undertaking a statistical consulting unit at an earlier stage of their studies.

Statisticians have special skills to assist in problem solving. They know about variation as a major source of uncertainty. They also understand about the relevance of the assumptions which underlie many techniques such as regression analysis. Statisticians are good at looking at the patterns in data – separating 'signal' from 'noise'. However, it is important that statisticians are not overly negative – we have a reputation for being very cautious, expressing concerns and warnings, and leaving clients with the impression that no useful conclusion can be drawn from a data set. If the statistician walks away from a problem, there is generally a response formulated by less skilled people.

4. Concluding Remarks

Since employers in the twenty-first century are seeking a well rounded graduate, it is clear that we cannot include in a statistics degree all the statistical techniques that we would like students to know about, as well as incorporating communication and computing skills. In making choices, it is important that we instill in the student, ways of delving into data (exploratory data analysis (Tukey 1962) and data mining), and also expose them to methods for non-standard situations (observational studies) – hopefully to get them to understand something about statistical thinking. We must ensure that a statistics graduate has something extra to contribute (such as understanding patterns in data), and is aware of the important role that statistics can play in our society.

REFERENCES

Taplin, R H (2003) Teaching statistical consulting before statistical methodology *Australian & New Zealand Journal of Statistics, Vol 45 No 2, pp141-152*

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