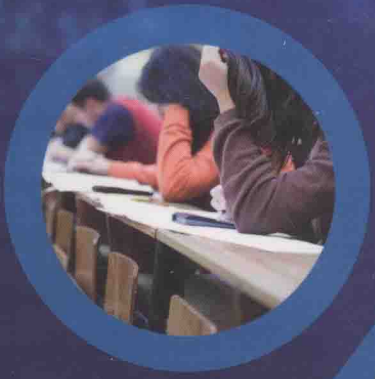
PENELOPE BIDGOOD | NEVILLE HUNT | FLAVIA JOLLIFFE

ASSESSMENT METHODS IN STATISTICAL EDUCATION

AN INTERNATIONAL PERSPECTIVE



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An International Perspective

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Foreword

In education, assessment is amongst the most useful things that we do for ourselves and our students. It is also amongst the most harmful things we do – the best and the worst.

It is useful for our students when it enables them to see what they do not understand and gives them insight and motivation to improve. It is useful for us as teachers when it helps us see where our teaching can be improved, when it gives us insight into the way our students are learning and when we can see the rewards of a job well done. It is useful for administrators when it helps them see which sort of structures work best for learning and which sort of people make good teachers, and ways in which they can improve the overall learning process.

It is harmful when it is seen as an end in itself. It is harmful to students when it makes the goal getting a paper qualification rather than gaining competence. It is harmful when it distorts the learning process and encourages learning and teaching for the test. Assessment is harmful when its contents do not match up with what is important to learn. To quote a phrase I first heard from Professor Hugh Burkhardt of the Shell Centre for Mathematical Education in Nottingham, 'what you test is what you get' – WYTIWYG. It is harmful when it is seen merely as a hurdle and when it promotes fear of failure, so encouraging strategies of getting high scores (particularly 'passing' an examination) at the expense of improving teaching and learning.

The position is made more difficult by the fact that many students studying statistics are not doing so out of choice. They may have to take a basic statistics course because it is an integral part of their main discipline – and they are not necessarily convinced of its usefulness. They may see it as an imposition, not an interesting learning experience to be applied in their profession. This makes it all the more likely that they will do the minimum necessary to get a piece of paper saying they have qualified.

All of the above may appear to say: formative assessment good, summative assessment bad. But it is not as easy as this. It is possible to develop good methods of summative assessment. This is only done by maintaining the focus that all assessment is subservient to the overall aims of improving teaching and learning and improving the statistical abilities of all our students.

In their different ways, the authors of this book explore the dilemmas posed by the need for good, relevant assessment and the wide variety of backgrounds and motives of students of statistics. It is interesting to compare the chapters of this book with those of the earlier book edited by Gal and Garfield (1997) to see how much work has been put in this area over the intervening 10 years. Things will continue to improve as we learn from each others' experiences and develop new ideas and methods.

Peter Holmes
Sheffield, UK

Preface

In 2007, the editors obtained funding from the MSOR Network of the UK Higher Education Academy and the Royal Statistical Society Centre for Statistical Education, to engage in the Variety in Statistics Assessment (ViSA) project. This project aimed to gather and disseminate evidence of successful experiences of assessment from teachers of statistics at tertiary level both within the UK and around the world. Although a number of meetings were convened and conference presentations given, the main focus of the project was the compilation of this book. Towards the end of 2007, a call for contributions was made through various publications and electronic news groups. The final accepted papers form the chapters of this book, which have been arranged into four themed parts.

One of the interesting features of statistics is that it is taught both as a specialist subject, often closely related to mathematics, and also within many other disciplines. Part of the value of this book is the fact that it draws on the experience not only of statisticians but also of educators from within subjects such as psychology, biology, business, health and agriculture. That richness is further enhanced by its international perspective, with authors drawn from six different countries across the world.

Students vary in their abilities and in their approach to learning. It is therefore only fair that the assessment process should allow a variety of opportunities for students to demonstrate their achievement. One of the key roles of the statistician is communication, explaining the results of often complex analysis to a client with little knowledge of the subject. The modern statistics lecturer must take this into account when devising an assessment strategy for a course of study. This theme is explored in Part A, where some authors outline general principles and others recount personal experience of successful assessment strategies.

Within the statistical education community, there is an ongoing debate about what is the essence of the subject. In an age where computers can not only perform all the necessary calculations, but also suggest an appropriate method of analysis and even write an automated report, many would argue that the development of statistical thinking is paramount. Assessing statistical thinking is much more difficult than assessing the ability to perform routine calculations. This is the challenge addressed by the authors in Part B.

Whilst theoretical statistics continues to be a thriving area of research, the vast majority of statistics teaching is in the applied area. Unsurprisingly, the focus

of most statistics assessment is therefore on how what is learned relates to and enriches the world around us. Some examples of this 'real-world' assessment are found in Part C.

The role of technology in assessment has become increasingly important. On the positive side, the Internet has provided access to a wide variety of data sources, while the extensive availability of modern statistical computing packages allows lecturers to set more realistic tasks for student assignments. The negative aspect of technology is that it has facilitated plagiarism and collusion. Part D contains several accounts of how lecturers have responded to this threat to the integrity of the assessment process by developing techniques for individualised assessment.

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Part A

SUCCESSFUL ASSESSMENT STRATEGIES

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Assessment and feedback in statistics

Neville Davies and John Marriott

1.1 Introduction

Statistics is not only a subject in its own right but is also applied to diverse other subjects, including the sciences, geography, psychology, business and economics. Consequently assessment may need to cover a very wide-ranging set of topics and activities taught within a statistics curriculum. In this chapter we consider the implications of the ubiquity of the application of statistics and its pedagogy, the significant impact of this broad 'learning base' on what should be assessed and the plethora of ways assessment and feedback can be provided.

1.2 Types and purposes of assessment

There are four types of assessment that we identify in relation to statistics:

1. *Diagnostic assessment* seeks to identify the starting position of students, to identify gaps and thus enables these to be filled.
2. *Formative Assessment* seeks to use assessment for improvement, to indicate strengths and weaknesses and to give both student and teacher insight into the progress being made; formative assessment can also contribute some marks to overall assessment.
3. *Summative assessment* seeks to evaluate overall achievement, usually at the end of the course. With mid-course summative assessment it is possible to use the resulting feedback for formative purposes.

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