

Book Review

Creating Effective Undergraduate Research Programmes in Science: The Transformation from Student to Scientist

By Taraban R & Blanton RL (eds.)

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This collection of papers analyses the effects and effectiveness of exposing undergraduate science students to research. The background is the growing US movement for major teaching institutions to offer significant research opportunities to students. Many of these opportunities are additional to, rather than integral parts of degree courses and may be taken in the early as well as later stages of study. They comprise summer lab placements, internships and other periods of intense and focussed research work, much of it publically or charity funded. The book aims to describe and measure, possibly for the first time in a scholarly manner, how research influences students' attitudes to science, their career choices, and their personal and professional development.

Two papers in Part I illustrate strategies for providing undergraduate research opportunities. The University of Michigan's programme of extended projects for first and second year students has been effective in promoting student engagement, particularly for minority groups. Washington University, St Louis, offers course-embedded research through advanced lab classes. Students report significant gains in understanding, research skills and appreciation of how science works.

Part II offers three survey-based analyses of the student research experience. These are impressive in their coverage, ranging from a national survey with 15,000 respondents, a multi-faceted (students, faculty, alumni) evaluation of a single university, and an analysis of summer undergraduate research experiences covering 41 universities, colleges and other institutions. Such large studies provide solid reference data on participation, reasons for choices, levels of satisfaction and influences on success and career prospects. Whether they offer insight into the value of the experience is less clear (apart from some verbatim responses); however, data are exhaustively analysed and can be used to support views or develop arguments as required.

Part III considers how research influences students' development as scientists. The first article is the most readable and appealing in the book. Using coded interview data from four colleges, it illustrates statistical findings with carefully selected and revealing quotations. These describe "science as a way of knowing", the highs and lows of laboratory toil, the value of team participation and the confidence boosting effects of publication. One gets a real sense here of students maturing as scientists, reflecting on achievements and making experience-based life decisions. The second article analyses critical factors in student-scientist development; it needs a very strong statistical stomach and comes to the not altogether surprising conclusion that encouragement and hard work are crucial.

Part IV looks at the social factors which may influence the pursuit of research science by women. The conclusion seems to be that gender plays little part in students' reaction to their experience, provided the research environment itself is adaptive and encouraging. The book concludes with some engaging personal reflections from established scientists on their formative experiences, and a historically-based editorial overview.

This is not, despite its title and a statement in the Preface, really a how-to book. Most contributions are concerned with analysing programme outcomes rather than explaining operation or management. The authors and editors clearly feel themselves to be pioneers in expecting undergraduates to be front line researchers. To a UK bioscience reader this may seem a little odd, given our long history of inclusion of research projects in “honours” degree courses and the clear expectation of our subject benchmarking groups that this will happen. On the other hand, we tend not to engage students in research during their early years and there may be new possibilities on offer in that direction. There is also a concern with issues of gender and minority inclusion which are not under particular scrutiny on this side of the pond. However, the detailed analyses presented certainly fill a gap: several of the benefits of research which we may have assumed (for example, enhanced personal and intellectual development, keener critical faculties, and first-hand experience of how real science works) now have a firm evidential base.

The contributors to this book evaluate an exclusively US scenario but their conclusions will have universal application and resonance. Anyone needing to explain the pedagogic importance of undergraduate research or defend it against external threats (limited funding, curriculum squeeze, unappreciated scientific or educational validity) will find here a rich source of evidence and ammunition.

Reviewed by Martin Luck

University of Nottingham
School of Biosciences
Loughborough
LE12 5RD

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