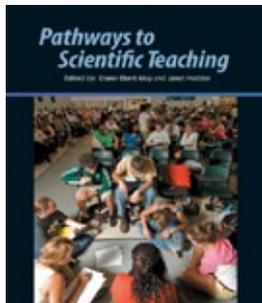


## BREAKING TRADITION WITH SCIENTIFIC LEARNING

**Book Title:**

Pathways to scientific teaching

**Book Cover:****Edited by:**

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**ISBN:**

978-0-87893-222-1

**Publisher:**

Sinauer Associates, Inc.;  
2008, p. 212. US\$ 29.95\*

\*Book price at time of Review

**Review Title:**

Breaking tradition with scientific learning

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**How to cite this book review:**

Wossler T. Breaking tradition with scientific learning. *S Afr J Sci.* 2010;106(1/2), Art. #46, 1 page. DOI: 10.4102/sajs.v106i1/2.46

**This review is available at:**

<http://www.sajs.co.za>

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*Pathways to scientific teaching* is a compilation of previously published, two-page articles in *Frontiers in ecology and the environment*, a publication of the Ecological Society of America. In 2004, this publication instituted a new education section, entitled *Pathways to scientific teaching*, in response to a challenge given to professional societies to stress the need for reform in education. The idea behind this reform is that science should be taught as rigorously as it is practiced.

One of the major concerns about science education is that it often consists of fact-jammed lectures, based on a lecturer-centred approach rather than an interactive, student-centred one. Moreover, large, introductory courses usually involve teaching students from diverse backgrounds, who differ in levels of knowledge, skill and motivation. Consequently, the underlying objective of this book is to suggest methods and teaching strategies to lecturers and teachers seeking to promote student-centred learning. The book introduces science educators to a variety of teaching, learning and assessment strategies by adapting various mainstream ecological journal articles as instructional material. Its methodology focuses on the teaching of large classes, while at the same time employing cooperative learning strategies which are deemed effective. Although *Pathways to scientific teaching* does not present novel information (it was previously published in *Frontiers in ecology and the environment*), its new format now conveniently provides that series of articles as a compact handbook.



Source: Photograph taken by N. Theron

**Stellenbosch University students engage in active learning**

The first chapter describes how to structure and maintain an active learning environment through scientific discovery. Subsequent chapters each start with a synopsis of how students learn and proceed by giving advice on how to encourage student-centred learning. The book is divided into six main areas: organizing classroom flow, doing science, reading science, assessment techniques, homework strategies, and practical advice for faculty interested in classroom research. Each section is written as an instructional unit to promote active learning and also serves as a guide to instructors on how they can incorporate such strategies within a classroom environment. Each section lists the learning goals for a particular teaching approach, as well as a step-by-step strategy to engage students, the time that should be allocated to each activity, and homework activities if applicable. Some of the pedagogical approaches communicated include:

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- the learning cycle (the construction of understanding through interaction)
- learning through debate, role playing, data interpretation and statistical testing
- developing critical thinking skills through problem solving and case studies
- 'jigsaw' strategies for cooperative learning (placing emphasis on the value of each student's contribution)
- building conceptual models and concept maps
- designing and solving experimental procedures
- peer assessment
- 'Just-in-Time Teaching' (a teaching and learning strategy based on the interaction between web-based study assignments and an active learner classroom).

Each learning goal and accompanying activity can be completed within one or two formal teaching periods.

Diane Ebert-May is a plant ecologist, and her field of interest is long-term ecological research on alpine tundra plant communities. She is also an advocate of learner-centred instruction, which led her to expand her research programme to include questions concerning the teaching and learning of biology. Together with Janet Hodder, who is the academic coordinator of the Oregon Institute of Marine Biology, she set up a national network of teaching collaborators to mentor each other and inform their classroom teaching through research. This was made possible through the Faculty Institutes for Reforming Science Teaching programme, funded by the US National Science Foundation, in which many faculty members from campuses across the US have participated. This initiative has subsequently brought about significant changes in US science teaching methodology, as well as expanding the understanding of how people learn.

The reformation of instructional practice in higher education must begin with the efforts of academic staff. An excellent first step would be to select effective strategies that promote active learning. To this end, this book offers a number of engaging examples and practical approaches that can be implemented by any academic teacher. ■