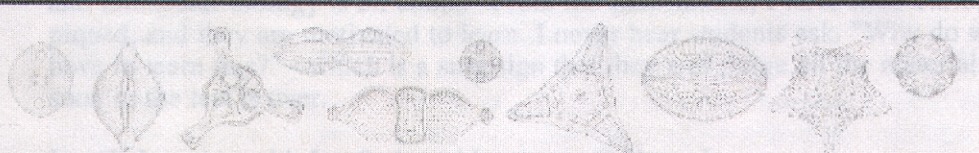


**BioMedNet**  
 Information for advertisers  
 > click here <

**HMS BEAGLE**  
 The BioMedNet Magazine

[www.hmsbeagle.com](http://www.hmsbeagle.com)



**FIELD NOTES**

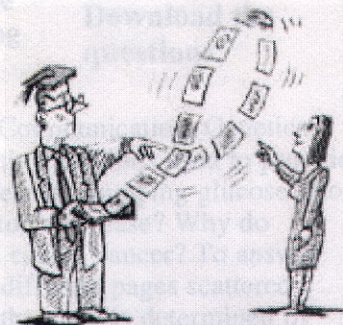
**ADAPT OR DIE**

- ▶ Adapt or Die
- [BioFeedback](#)
- [Featured Lab Pages](#)
- [Meeting Brief](#)
- [Profile](#)

# New Paradigms Teaching in Context, and on a Need-to-Know Basis

by A. Malcolm Campbell

Posted May 12, 2000 à Issue 78



[E-mail this article to a friend](#)

**VIEWPOINTS**

- [Debate](#)
- [Feedback](#)
- [Letters to the Editor](#)
- [Opinion](#)
- [Press Box](#)

**REVIEWS & RESOURCES**

- Books
  - [Book Alert](#)
  - [Book Review](#)
- Products
  - [Lab Consumer](#)
  - [Product Alert](#)
- Software
  - [Software Alert](#)
  - [Software Review](#)
- Web
  - [In Situ](#)
  - [Job Alert](#)
  - [Web Picks](#)

**Abstract**

*Rather than march his students systematically through a textbook, A. Malcolm Campbell teaches in a way that encourages discovery rather than rote memorization. In this article, Campbell describes his method and argues that learning in context and on a need-to-know-basis is the best way to learn.*

**EXCURSIONS**

- [Art Gallery](#)
- [Contest](#)
- [Essay](#)
- [Fiction](#)
- [Games](#)
- [Humor](#)
- [Poem](#)
- [Quotations](#)
- [Top Ten](#)

When a child asks why the grass is green, we do not start researching the answer by systematically reading through the encyclopedia, starting with "aardvark", until 16 volumes later "photosynthesis" shows up. Equally, when a researcher needs to learn about a new protein, he or she does not read every paper in *Nature* magazine, hoping to hit on something relevant. So why do we teach undergraduates by starting a textbook with chapter 1, and a discussion of atoms and water, when what students really want to know is why their hearts start pounding in their chests when a blind date shows up?

The typical textbook is arranged by topic, in a way that makes sense to trained biologists who understand the information, but not to beginners/first-year undergraduate students. Most teachers march their students through the textbook one chapter at a time.

**Why not teach  
 the way we  
 learn?**

We need to treat textbooks like encyclopedias and not curricular guides. We should teach biology the same way we learn any new information - in the context of an interesting question, and on a need-to-know basis. Teachers need to provide a more realistic setting for learning.

**DAILY UPDATES**

- [Headlines](#)
- [Journals](#)
- [Special Reports](#)

**ABOUT HMS BEAGLE**

- [About/Citing Beagle](#)
- [Beagle Masthead](#)
- [Contents](#)
- [Contributors](#)
- [What's New](#)

Since students want to know why their hearts beat harder sometimes, I use that natural curiosity to motivate their learning of cell and molecular biology. The very first day of class, I arrive about 30 seconds late. The students are nervous and wonder where I am. I sneak into the back of the class, whistle very loudly, and then ask them to feel their hearts beating in their chests. "How did that loud sound get from your ears to your heart in less than a second? That's what cell and molecular biology is all about." From the first minute, I have their curiosity piqued, and they are motivated to learn. I never hear students ask, "Why do we have to learn this?" - which is a sure sign that they will purge all the material as soon as the test is over.

In collaboration with Jan Serie at Macalester College, I have developed a study guide, which can be adapted to any standard text, for introductory cell and molecular biology. The Study Guide can be downloaded via the World Wide Web, by anyone, free of charge, as long as the authors are given appropriate credit.

**Never mind the answers.  
Download the questions.**

The Study Guide is divided into four sections: Cell Communication, Genetics, Bioenergetics, and Interesting Topics. Examples of the questions used to provide a context include: How does your liver respond to fear by dumping glucose into the blood? What is the molecular cause for Huntington's Disease? Why do terrorists use cyanide as the poison of choice? What causes cancer? To answer these questions, the Study Guide directs students to different pages scattered throughout the text. The order of topics covered in the class is determined by what information students need to know at a given moment, in order to pursue their investigation of the question at hand.

Since this approach is unfamiliar to students, the Study Guide provides very clear expectations. There is a daily reading schedule that includes "focused readings" from the text, the Study Guide, and the World Wide Web. At the end of each focused reading, there are study questions which help students concentrate on the main points, and which form the basis of my test questions.

**Flexibility comes with clear expectations.**

Another advantage of the Study Guide is that it can be updated more rapidly than textbooks. This is especially important in the area of AIDS and molecular genetics. Finally, the Study Guide has "News Items," which are brief summaries of recent research. This helps students realize that what they are learning is the foundation for current discoveries in biomedical breakthroughs.

Many "reform" efforts in education emphasize process over content so much that some teachers feel that there is not enough content left. The Study Guide has maintained a very high level of content, but the amount of information is not overwhelming because it is presented in a context that makes sense to students.

**More context doesn't mean less content.**

This approach is not built around a theatrical presentation style, nor is it dependent upon class size. Due to its modular design, it can be tailored by instructors at different institutions to meet local curricular needs. As a result, it can be adapted for use by a wide range of institutions and teachers.

At the beginning of the semester, students are uncomfortable with my course. Three weeks later, however, almost every student is convinced that learning in context and on a need-to-know-basis is the best way to learn. Upon graduation, one student told me that she did not like my course because she had to study every day for class, and did not have much time left to cram the night before the exam. To this day I am not sure if she was trying to criticize or compliment me, but either way I am satisfied with the comment. Now that I have taught this way, I will never go back to marching through the chapters of a text. In fact, I have

redesigned all of my courses to accommodate this way of teaching.

Adopting this approach to teaching has permitted me to build my courses around my educational goals. I have been freed from the constraints of choosing the "right" textbook, since they are all about the same anyway, and I like to jump around the chapters. This approach has improved student motivation, and thereby increased information retention. Equally important is the fact that since I can change the context of the information by choosing a different question to frame the subject, my enthusiasm and enjoyment of the class are sustained.

**This approach motivates teachers as well as students.**

*A. Malcolm Campbell is an assistant professor of biology at Davidson College. He has made numerous presentations about teaching as an "alternative" career option, and has written [How to Get a Teaching Job at a Primarily Undergraduate Institution](#).*

*Andrzej Krauze is an illustrator, poster maker, cartoonist, and painter who illustrates regularly for HMS Beagle, The Guardian, The Sunday Telegraph, Bookseller, and New Statesman.*



E-mail this article to a friend

Tell us what you think.



Feedback

### Endlinks

[Beyond Bio101: The Transformation of Undergraduate Biology Education](#) - a report from the [Howard Hughes Medical Institute](#) on undergraduate biology education.

[Coalition for Education in the Life Sciences](#) - offers extensive links to educational resources, organizations, essays, and an issues-based framework for introductory biology curricula.

[Workshop Biology](#) - a great resource for curriculum development and assessment materials, software, and related course and project materials.

[BioQUEST Curriculum Consortium](#) - a collection of software, modules, and workshops that use a problem-solving approach to teaching biology.

[Cornell Theory Center Math/Science Gateway: Biology](#) - links to resources in mathematics and science for educators and students in grades 9-12. Teachers of other levels may find these materials helpful.

[Access Excellence](#) - an excellent resource for biology teachers and students that contains online mysteries, interactive resources, lesson plans, and general information related to biology.

Related HMS *Beagle* articles:

- [Pictures of Life: Using Web Images to Teach Biology](#) - a review of visual tools available on the Web to help students comprehend biological

<http://www.biomednet.com/hmsbeagle/78/notes/adapt>

processes.

- [Access Excellence](#) - a review of the premier online resource for secondary science education.
- [Virtual Reprints as Reading Assignments](#) - A. Malcolm Campbell explores the use of virtual reprints in teaching biology.

### Previous Adapt or Die Articles

- ▶ [How About a Marketing Career?](#)  
by Christopher G. Edwards (Posted April 28, 2000 á Issue 77)
- ▶ [Scientist Exchange Network: The Scientific Travel Agents](#)  
by David Bradley (Posted April 14, 2000 á Issue 76)
- ▶ [The Art and Science of Effective Email](#)  
by Christopher G. Edwards (Posted March 31, 2000 á Issue 75)
- ▶ [Testing the Postbaccalaureate Waters at NIH](#)  
by Amanda Leigh Haag (Posted March 17, 2000 á Issue 74)
- ▶ [Make Your Figures Count](#)  
by Christopher G. Edwards (Posted March 3, 2000 á Issue 73)
- ▶ [Profiting from Your Thesis: The Merrill Lynch Innovation Grants Competition](#)  
by Lara Pullen (Posted February 18, 2000 á Issue 72)

[more](#)

[CONTENTS](#) | [SITE MAP](#) | [SEARCH](#) | [FEEDBACK](#) | [ARCHIVES](#) | [BIOMEDNET](#)

©2000 BioMedNet Ltd. All rights reserved.

*Rather than march his students through a textbook, A. Malcolm Campbell teaches in a way that encourages discovery rather than rote memorisation. In this article, Campbell describes his method and argues that learning in context and on a need-to-know basis is the best way to learn.*

When a child asks why the grass is green, we do not start researching the answer by systematically reading through the encyclopedia, starting with "aircraft" until 16 volumes later "photosynthesis" shows up. Usually, when a researcher needs to learn about a new protein, he or she does not read every paper in Nature magazine, hoping to hit on something relevant. So why do we teach undergraduates by starting a textbook with chapter 1, and a discussion of atoms and water, when what students really want to know is why their hearts start pounding in their chests when a blind dog shows up?

The typical textbook is arranged by topic, in a way that makes sense to trained biologists who understand the information, but not to beginners. Most teachers march their students through the textbook, one chapter at a time.

**Why not teach the way we learn?**

We need to ditch textbooks like encyclopedias and not curricular guides. We should teach biology the same way we learn any new information - in the context of an interesting question, and on a need-to-know basis. Teachers need to provide a more realistic setting for learning.