Vision & Change in Biology Undergraduate Education

UPDATE

BIO Advisory Committee Meeting
30 April 2009
A quick walk through recent history...
“Nurturing Discovery – A Strategic Plan for BIO” approved by BIO AC
Highlights relevant to undergraduate education from *Nurturing Discovery*:

- integrated education/research experiences
- community college and other undergraduates
- underrepresented groups
- evolution education
- mentoring
- educate teachers
- hands-on exposure to science
- partnerships
- curricula
BIO-EHR Working Group charged by Dr. Collins:

1. Examine and address key issues in biology undergraduate education
2. Recommend strategy and actions
Strategy and framework developed by BIO/EHR Working Group:

Conversations – listen for shared vision and the changes needed to achieve it

Big Conference – crystallize initiative and partnerships

Report – that articulates the vision, synthesizes previous efforts; recommends changes needed & roles; addresses sustainability

Implementation – including investments; commitments; communication; feedback loops
Strategy of Working Group approved by joint BIO AC – EHR AC meeting
NSF-funded conversations took place during 2007-2008:

211 participants from…

community colleges, PUIs, MSIs, major R1 universities, museums, science centers, professional societies, education organizations, other federal agencies, National Academies, field stations
We listened...

OTHER INPUTS:
- AIBS summit
- Society meetings
- AC meetings
- NRC Theory Report
- Review panel meetings
- Etc.
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<th>Conversation participants</th>
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Alberts Bruce Univ. of California San Francisco
Allen Caitlyn American Phytopathological Society - University of Wisconsin Madison, Plant Pathology
Allen Larry American Society of Ichthyology and Herpetology
Allen Deborah University of Delaware
Anderson Michelle Clark Fork Watershed Education Program
Ares Manuel University of California Santa Cruz
Armbruster Peter Georgetown U
Asai David Harvey Mudd College
Baker Pam Bates College
Baker Earnestine Meyerhoff Scholarship Program - University of Maryland Baltimore County
Bakhiet Nouna Southwestern College
Bauerle Cynthia Spelman College
Baumstark Barbara Georgia State University
Beck Christopher Ecological Society of America (ESA) - Emory University
Behar Donna AAAS
Berkowitz Alan Institute for Ecosystem Studies
Bernstein Penny Animal Behavior Society - Kent State University
Bevier Cathy Society for the Study of Reptiles & Amphibians
Binford Greta Lewis and Clark College
Blum Paul University of Nebraska
Blumer Larry Morehouse College
Bomar Charles Orthopterists’ Society
Bond Judith Penn State University-College of Medicine
Boone Richard D. University of Alaska Fairbanks
Bradshaw William Brigham Young University
Brakke David James Madison University
Conversation participants

Derrick Brazill  
Carol Brewer  
Robert J. Brooker  
Peter J. Bruns  
Malcolm Campbell  
Todd Carter  
Celeste Carter  
Amy Chang  
Bob Chen  
Ida Chow  
Rita Colwell  
Elizabeth Conner  
David Cooke  
Lee Couch  
Keith Crandall  
Yolanda Cruz  
Richard Cyr  
Diana Darnell  
Charlene D'Avanzo  
Tom Davis  
LaJoyce Debro  
Christopher D'Elia  
John Demboski

CUNY Hunter College  
American Institute of Biological Sciences - University of Montana  
University of Minnesota  
Howard Hughes Medical Institute  
Davidson  
National Association of Biology Teachers - Seward County Community College  
National Science Foundation  
American Society for Microbiology (ASM)  
University of Massachusetts/Boston  
Society for Developmental Biology  
American Institute of Biological Sciences  
University of Mass-Amherst  
Morehouse College  
American Society of Parasitologists  
Society of Systematic Biologists  
Society for Developmental Biology  
Penn State University  
Library of Educational Annotated Developmental Biology Resources (LEADER)  
Ecological Society of America - Hampshire College  
Association of College & University Biology Educators (ACUBE)  
National Science Foundation  
American Institute of Biological Sciences - University of South Florida  
Denver Museum of Nature & Science

Experiential learning
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<td>Horwitz</td>
<td>University of California, Davis</td>
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Conversation participants

Reward systems
Conversation participants

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Tools & networks

MacDonald James American Phytopathological Society
MacGregor Jean Evergreen State College
Madsen Bob Chief Dull Knife College (Montana)
Magrath Christi Troy State University
Malcom Shirley AAAS
Marinez Diana I. Texas A&M University-Corpus Christi
Marsteller Patricia Emory College
Masler Edward Society of Nematologists - United States Department of Agriculture (USDA)
Mattos Roberts Carla North Carolina State University
May Scott The BioTech Institute
Meir Eli Michigan State University, Biological Sciences Program
Merrill John Ecological Society of America - Howard University
Middendorf George American Society of Human Genetics
Mills Shaw Kenna American Society for Photobiology
Mitchell David Anne Arundel Community College
Mody Javakina National Association of Biology Teachers (NABT)
Moore John University of Washington
Morse M. Patricia Ecological Society of America (ESA)
Mourad Teresa Oklahoma City Community College
Mulvihill Charlotte American Institute of Biological Sciences (AIBS)
Musante Susan American Society of Ichtyologists & Herpetologists
Mushinsky Henry J. Sargeant Reynolds CC
Neely-Fisher Deborah Morehead College
Nelson Linda National Science Foundation
Oates Karen Kashmanian
Institutions

O'Dowd       Diane      University of California, Irvine
O'Grady      Richard    American Institute of Biological Sciences (AIBS)
Olivera      Baldomero  University of Utah
Ostertag     Rebecca    University of Hawaii Hilo
Parfitt      Karen      Pomona College
Pennock      Robert     Society for the Study of Evolution
Persons      Matthew H. American Arachnological Society
Pfund        Christine  University of Wisconsin Madison
Pham         Daphne     University of Wisconsin Parkside
Pierson      Leland (Sandy) University of Arizona
Podos        Jeffrey    University of Massachusetts
Pohlad       Bob R.     Ferrum College
Poodry Ph.D. Clifton A. National Institute of General Medical Sciences/NIH
Poston       Muriel     Skidmore College
Potter       Sherri     American Institute of Biological Sciences (AIBS)
Ramirez      Julio      Davidson College
Rankin       Mary Ann   University of Texas
Riem         Jennifer   Ecological Society of America (ESA)
Rissing      Steve      Ohio State University
Rodriguez    Eloy       Cornell University
Rypstra      Ann        American Arachnological Society - Miami
Savin        Mary       American Society of Agronomy
Savitzky     Alan       Society of the Study of Amphibians & Reptiles
Schildbach   Joel       Johns Hopkins University
Scotchoomoor Judy      University of California Museum of Paleontology
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<td>Zamudio</td>
<td>Kelly</td>
<td>Society of Systematic Biologists - Cornell University</td>
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Some of the Professional Societies represented:

American Association for the Advancement of Science (AAAS)
American Institute for Biological Sciences (AIBS)
American Physiological Society (APS)
American Society for Biochemistry & Mol Bio (ASBMB)
American Society for Cell Biology (ASCB)
American Society for Microbiology (ASM)
American Society for Plant Biologists (ASPB)
Biophysical Society
Botanical Society of America (BSA)
Ecological Society of America (ESA)
Genetics Society of America (GSA)
Genetics Society of America (GSA)
Howard Hughes Medical Institute (HHMI)
National Academies
National Association of Biology Teachers (NABT)
Project Kaleidoscope (PKAL)
Society for Integrative and Comparative Biology (SICB)
Society for the Study of Evolution (SSE)

And many others at the various conversations
Research Coordination Networks – Undergraduate Biology Education (RCN-UBE) Dear Colleague Letter released
Highlights of the RCN-UBE announcement:

Research Coordination Networks Program: interactions among scientists to create new research directions or advance a field.

UBE track focuses specifically on proposals that address the integration of education and research

Enhanced collaboration will benefit:
  • Application of new technologies to enhance pedagogy,
  • increased use of inquiry based learning,
  • enhancement of curricula with ideas from the frontiers of science, and
  • building research into curricula to motivate the next generation of scientists

BIO and EHR/DUE are jointly supporting the RCN-UBE Track
FY09 RCN-UBE awards:

**Gordon Uno**, University of Oklahoma-Norman: Through a series of small and large meetings this network will connect biologists, biology education projects, and biological societies allowing them to articulate a shared vision and mobilize leading faculty in undergraduate biology education.

**Patricia Harrison**, Botanical Research Institute of Texas: This project will develop an interdisciplinary network of scientists and other professionals to explore the use of emergent web-based technologies to facilitate continual exchange of educational techniques, materials, and experiences in ethnobiology.

**Christopher Kvaal**, St. Cloud State University and **Lori Scott**, Augustana College: Participants in this workshop will share and develop ideas regarding the use of genome annotation as a tool to involve undergraduate biology students in meaningful research.
Toolkit task team established. Working with HHMI
Toolkit progress:

Goal: develop community consensus on key concepts; identify tools to promote instruction and assessment methods

Task team working with HHMI

Target audience: majors and non majors

Input from: Professional societies; potential employers; AP Biology working group; AAAS.

In planning: a conversation with participating groups (likely Fall 2009)
Conversations with undergraduates ongoing
Conversations with undergraduates:

Following a pilot conversation with NSF interns last fall, participants from the national conversations are holding “mini conversations” for both biology majors and non-majors on their campuses.

Purpose:
1) To engage students in the dialogue regarding educational reform;
2) To gauge which issues students find most important; and
3) To solicit student participants for the Vision & Change meeting in Summer 2009.

As of today, 14 respondents have confirmed that they have held or will hold a conversation. AAAS is working on a parallel agenda for students who will attend the July meeting.
Grant awarded to AAAS for Vision & Change Conference.
GOAL of Vision & Change conference:

- mobilize a community of people concerned about undergraduate biology education
- engage them in shared, directed, provocative, and ongoing discourse
- develop a blueprint for change about where biology education needs to go and what we need to do to get there
- the conference will serve as a catalyst for ongoing, shared activities.

[as developed by Steering Committee]
Steering Committee:

**Chairs**
Carol A. Brewer – University of Montana  
Alan I. Leshner – AAAS

**Members**
Peter J. Bruns - Howard Hughes Medical Institute  
Ingrid C. Burke - University of Wyoming  
Alan P. Covich - University of Georgia  
Lynn W. Enquist – Princeton Neuroscience Institute  
Louis J. Gross - University of Tennessee, Knoxville  
Felicia Keesing - Bard College  
Jay B. Labov – NAS National Research Council  
Thomas Pollard – Yale University  
Mary Poss – The Pennsylvania State University  
Muriel E. Poston – Skidmore College  
Robert S. Seville – University of Wyoming  
Daniel Udovic - University of Oregon  
Thomas A. Woolsey – Washington University in St. Louis  
Maria Elena Zavala - California State University Northridge
Breakout sessions for Vision & Change conference:

[DRAFT]

Key concepts and competencies
Assessing both content knowledge and process skills
Student-centered learning: How students learn & pedagogy
The role of scientific research in the curriculum
Implementing and evaluating educational innovations
Developing current faculty
Developing future faculty: Grad students and post-docs
Changing institutional culture: overcoming barriers & creating incentives

[as developed by Steering Committee]
Products planned from Vision & Change conference:

Mobilized people who are members of an online community united around an agenda/gameplan in a synthetic book, and who have made a contract to follow up on what they tried, what worked, and what they need, and who have access to a suite of specific resources to continue the development and implementation of ideas and strategies raised at the conference.

[as developed by Steering Committee]
Possible next steps:

Increase investment in RCN-UBE

Support planning activities within RCN-UBE

Partner with EHR on integrating research into the curriculum and infusing new pedagogical techniques into the faculty

Coordinate with HHMI on complementary programs (e.g. HHMI Experiments in Undergraduate Science Education)

Provide supplements to more fully integrate education and research activities at existing Centers

Figure out climate change education

Other ideas bubbling up
Possible next steps:

Climate change education

Conference report on the 2009 Omnibus Appropriations Act (H.R. 1105; Public Law 111-8): “Climate change education program.—The National Science Foundation shall consult with the National Academies in the development of a plan for the distribution of funds provided herein for the climate change education program.”