

## A GUIDE TO CUR RESOURCES FOR DESIGNING A RESEARCH-SUPPORTIVE CURRICULUM

Unless otherwise noted, all resources are in: Karukstis Kerry K. & Elgren Timothy E., eds. *Developing & Sustaining a Research-Supportive Curriculum: A Compendium of Successful Practices*. Washington, DC: Council on Undergraduate Research; 2007.

### EFFORTS ADDRESSING SPECIFIC COURSES/PROGRAMS

| Discipline                     | Title  | Details  |
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| <b>Applied Health Sciences</b> | A Writing-Intensive Clinical Research Course   | pp. 241-242, David Cherney   |
| <b>Art</b>                     | Integration of Teaching and Research through Digital Fabrication Projects in the Curriculum                                      | pp. 115-118, James Thurman   |
| <b>Biochemistry</b>            | Fostering Research Skills with the Incorporation of Bioinformatics Tools in Upper-Level Biochemistry                             | pp. 252-253, Jennifer K. Inlow   |
|                                | The Holy Cross Biochemistry Concentration: An Integrated Four-Year Program to Develop Undergraduate Research Scholars            | pp. 394-396, Robert M. Bellin, Kenneth V. Mills  |
| <b>Biology</b>                 | Research Link 2000: Building and Sustaining Research-Based Undergraduate Curricula   | Chapter 4, pp. 61-68, Jim Hoerter, Sibdas Ghosh  |
|                                | Investigative Learning in Introductory Physiology  | pp. 119-123, Scott D. Hawke, Stasinos Stavrianeas, Gary Tallman  |
|                                | Grant Proposal Writing for Undergraduates  | pp. 242-244, Cahleen Shrier  |
|                                | From Genotype to Phenotype   | pp. 257-258, Willetta Toole-Simms  |
|                                | Animating a Biology Curriculum with Research   | Chapter 20, pp. 371-378, Kathleen A. Tweeten, Marcie J. Myers, Lynne H. Gildensoph, Cynthia G. Norton, Deborah D. Wygal, Martha M. Phillips, John J. Pellegrini, Jill R. Welter, |
|                                | How to Design, Implement, and Sustain an Interdisciplinary Investigative Laboratory  | Chapter 22, pp. 415-424, Gerald R. Van Hecke   |
|                                | Integrated Biological and Chemical Laboratory Experiences for Enhanced Education, Research Opportunities, and Career Development | Chapter 26, pp. 461-469, David W. Seybert, Jeffrey D. Evanseck, John S. Doctor   |
| <b>Chemistry</b>               | Cooperative Learning and Project-Based Laboratories as a Way to Broaden Learning Outcomes  | Chapter 2, pp. 21-40, Thomas Wenzel  |
|                                | Best Practices for a Research-Supportive Curriculum  | pp. 108-109, Gina MacDonald  |

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|                               | POGIL: A Learning Strategy that Promotes Undergraduate Research  | pp. 118-119, Carl Salter   |
|                               | Development of a Phytoremediation Freshman Chemistry Laboratory  | pp. 122-123, Bert E. Holmes  |
|                               | A Read-Analyze-Write Approach to Research- Related Literacy Skills for Upper-Division Chemistry Majors                           | Chapter 10, pp. 175-190, Marin S. Robinson, Fredricka L. Stoller   |
|                               | Using ‘‘Write Like A Chemist’’ at Nazareth College, Rochester, NY  | pp. 191-192, Timm Knoerzer   |
|                               | Piloting the Text ‘‘Write Like a Chemist’’ in an Upper-Division Writing Class for Chemistry Majors                               | pp. 192-193, Donald R. Paulson   |
|                               | Chemistry Research Methods: A Capstone Course  | pp. 244-246, Holly D. Bendorf  |
|                               | A Sophomore Course on Methods in Chemical Research   | pp. 254, Carl Salter   |
|                               | Designing and Conducting Experimental Approaches to Research Questions with a Consideration of Environmental Issues              | pp. 255-257, Kerry K. Karukstis  |
|                               | Developing 180 Researchers Each Year in Chemistry at Holy Cross College  | pp. 406-408, Ronald M. Jarret  |
|                               | How to Design, Implement, and Sustain an Interdisciplinary Investigative Laboratory  | Chapter 22, pp. 415-424, Gerald R. Van Hecke   |
|                               | Integrated Biological and Chemical Laboratory Experiences for Enhanced Education, Research Opportunities, and Career Development | Chapter 26, pp. 461-469, David W. Seybert, Jeffrey D. Evanseck, John S. Doctor   |
|                               | An Undergraduate Interdisciplinary Course in Computational and Theoretical Chemistry: Two Approaches Are Better than One         | pp. 476-478, Scott E. McKay, Rene´e S. Cole  |
|                               | ACS Student Affiliates Chapters: Education, Outreach, and Research   | pp. 552-554, LaTrease E. Garrison  |
| <b>Communication</b>          | Debate in the Classroom: A Means to an Educational End   | pp.109-112, Brent M. Foster  |
| <b>Computer Science</b>       | Integrating an Undergraduate Elective with Research Experiences  | pp. 248-252, Zachary Dodds   |
| <b>Engineering</b>            | Engineering Clinics: An Integration of Research into the Undergraduate Engineering Curriculum                                    | Chapter 19, pp. 359-370, Beena Sukumaran, Dianne Dorland, Kauser Jahan, Jess Everett, Jennifer Kadlowec, Zenaida Gephardt, and Steven Chin |
| <b>Environmental Sciences</b> | Research-Based Learning in an Introductory Environmental Sciences Course   | Chapter 6, pp. 87-102, David H. Firmage, Thomas H. Tiegtenberg, F. Russell Cole  |

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|                     | A Public University Science Department's Experience with Problem-Based Cohort Learning  | Chapter 15, pp. 295-314, Travis Wagner, Samantha Langley-Turnbaugh, Robert Sanford, Merrie Cartwright              |
| <b>Geosciences</b>  | Preparing Students for Research at the Introductory-Level with Technology   | pp. 112-113, Laura Guertin   |
|                     | Integrating Research into a Small Geology Department's Curriculum   | Chapter 17, pp. 331-340, Linda Reinen, Eric Grosfils, Robert Gaines, Richard Hazlett                               |
|                     | Establishment of an Investigative Curricular Approach across the Geology and Physics Programs at Western Carolina University and Implementation at Other Institutions | Chapter 23, pp. 425-448, Virginia L. Peterson, Mark L. Lord, Kurt Vandervoort                                      |
| <b>History</b>      | Designing a Research-Driven History Program   | pp. 388-389, Dennis G. Glew  |
| <b>Mathematics</b>  | Including Undergraduate Research in the Mathematics Curriculum  | CUR Quarterly 26(3) March 2006, Jean McKemie and David Naples  |
| <b>Neuroscience</b> | Multi-Level Integration of Student Research in a Psychology/Neuroscience Curriculum   | Chapter 21, pp. 379-387, Sandra K. Webster, Jamie G. McMinn, Kirk Lunnen, Mandy Medvin, Sherri Pataki, Alan Gittis |
| <b>Physics</b>      | Establishment of an Investigative Curricular Approach across the Geology and Physics Programs at Western Carolina University and Implementation at Other Institutions | Chapter 23, pp. 425-448, Virginia L. Peterson, Mark L. Lord, Kurt Vandervoort                                      |
|                     | How to Design, Implement, and Sustain an Interdisciplinary Investigative Laboratory   | Chapter 22, pp. 415-424, Gerald R. Van Hecke   |
| <b>Psychology</b>   | How I Teach Experimental Psychology: Incorporating Research in a Research Design Course   | pp. 113-115, Andrew M. Herbert   |
|                     | Encouraging Undergraduate Research in Psychology: Two Approaches  | pp. 246-247, Theresa Brown, Linda James  |
|                     | Utilizing a Senior Capstone Research Course to Promote Undergraduate Research   | pp. 247-248, Tsu-Ming Chiang   |
|                     | Implementing a Capstone Honors Research Experience in Psychology  | pp. 259-261, Jane R. Williams, Kathy E. Johnson  |
|                     | Multi-Level Integration of Student Research in a Psychology/Neuroscience Curriculum   | Chapter 21, pp. 379-387, Sandra K. Webster, Jamie G. McMinn, Kirk Lunnen, Mandy Medvin, Sherri Pataki, Alan Gittis |
|                     | Psi Chi's Contributions to Undergraduate Research   | pp. 555-556, Vincent Prohaska  |

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| <b>Writing</b> | Intrinsically Meaningful Goals and the Process of Peer Review: Why and How Teaching Can Make a Difference | pp. 240-241, G. Scott Acton |
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### INTERDISCIPLINARY APPROACHES

| Title   | Details  |
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| Team-Oriented, Project-Based Learning as a Path to Undergraduate Research: A Case Study   | Chapter 5, pp. 69-86, Ari W. Epstein, Rafael Bras, Kip Hodges, Alberta Lipson  |
| How to Design, Implement, and Sustain an Interdisciplinary Investigative Laboratory   | Chapter 22, pp. 415-424, Gerald R. Van Hecke                                   |
| Establishment of an Investigative Curricular Approach across the Geology and Physics Programs at Western Carolina University and Implementation at Other Institutions | Chapter 23, pp. 425-448, Virginia L. Peterson, Mark L. Lord, Kurt Vandervoort  |
| Integrating the Sciences at Haverford College   | Chapter 24, pp. 449-454, Julio C. de Paula                                     |
| The Clean Water Institute at Lycoming College   | Chapter 25, pp. 455-460, Mel Zimmerman   |
| Integrated Biological and Chemical Laboratory Experiences for Enhanced Education, Research Opportunities, and Career Development                                      | Chapter 26, pp. 461-469, David W. Seybert, Jeffrey D. Evanseck, John S. Doctor |
| A Project in Integrating Undergraduate Research with Service Learning   | pp. 470-473, Michael F. Bassman  |
| Living for the City: An Interdisciplinary Course  | pp. 473-475, Vincent F. A. Golphin, Danielle T. Smith                          |
| An Undergraduate Interdisciplinary Course in Computational and Theoretical Chemistry: Two Approaches Are Better than One  | pp. 476-478, Scott E. McKay, Rene'e S. Cole                                    |
| Teaching the Watershed: Interdisciplinary Undergraduate Research and Learning   | pp. 479-481, Rachel O'Brien, Eric Pallant                                      |
| A Projects-Based Course at Colgate University: Environment Studies 480, Interdisciplinary Investigation of Environmental Issues                                       | pp. 482-483, Mary Jane Walsh   |

### APPROACHES INVOLVING LARGE-ENROLLMENT CLASSES OR LARGE NUMBERS OF COURSES

| Discipline          | Title   | Details  |
|---------------------|---|--|
| <b>Biochemistry</b> | The Holy Cross Biochemistry Concentration: An Integrated Four-Year Program to Develop Undergraduate Research Scholars | pp. 394-396, Robert M. Bellin, Kenneth V. Mills  |
| <b>Biology</b>      | Animating a Biology Curriculum with Research  | Chapter 20, pp. 371-378, Kathleen A. Tweeten, Marcie J. Myers, Lynne H. Gildensoph, Cynthia G. Norton, Deborah D. Wygal, Martha M. Phillips, |

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|   |  | John J. Pellegrini, Jill R. Welter   |
| <b>Chemistry</b>  | Developing 180 Researchers Each Year in Chemistry at Holy Cross College  | pp. 406-408, Ronald M. Jarret  |
| <b>Engineering</b>  | Engineering Clinics: An Integration of Research into the Undergraduate Engineering Curriculum                            | Chapter 19, pp. 359-370, Beena Sukumaran, Dianne Dorland, Kauser Jahan, Jess Everett, Jennifer Kadlowec, Zenaida Gephardt, and Steven Chin |
| <b>History</b>  | Designing a Research-Driven History Program  | pp. 388-389, Dennis G. Glew  |
| <b>Inter/Multidisciplinary Or Courses across the Curriculum</b> | Team-Oriented, Project-Based Learning as a Path to Undergraduate Research: A Case Study                                  | Chapter 5, pp. 69-86, Ari W. Epstein, Rafael Bras, Kip Hodges, Alberta Lipson  |
|   | A Culture of Research and Critical Thinking: Core to Liberal Arts  | Chapter 16, pp. 315-330, Carole Pfeffer, Daylene Zielinski, Gail Henson  |
|   | Research Tracks for Undergraduates in the Calvin College Science Division  | pp. 396-398, Janel Curry, David DeHeer   |
|   | College-Wide Curricular Reform to Provide Faculty-Student Collaborative Scholarly Experiences at Baldwin-Wallace College | pp. 398-400, G. Andrew Mickley   |
|   | Developing an Understanding of the Integration of Research and Society   | pp. 401-402, Kerry K. Karukstis  |
|   | Faculty Commitment to an Inquiry-Based Curriculum: The Discovery Program   | Chapter 29, pp. 507-523, Michael O'Hare  |
|   | Creative Activity and Undergraduate Research across the Disciplines  | Chapter 30, pp. 523-528, Lori Bettison-Varga   |
| <b>Psychology</b>   | Multi-Level Integration of Student Research in a Psychology/Neuroscience Curriculum                                      | Chapter 21, pp. 379- 387, Sandra K. Webster, Jamie G. McMinn, Kirk Lunnen, Mandy Medvin, Sherri Pataki, Alan Gittis                        |
| <b>Writing Programs</b>   | How Writing Programs Support Undergraduate Research  | Chapter 11, pp. 195-208, Joyce Kinkead   |

## MECHANISMS EMPHASIZING COLLABORATIVE LEARNING

| Title   | Details   |
|---|---|
| Stimulating Attitudes of Inquiry with Problem-Based Learning  | Chapter 1, pp. 9-20, Harold B. White, III   |
| Cooperative Learning and Project-Based Laboratories as a Way to Broaden Learning Outcomes                               | Chapter 2, pp. 21-40, Thomas Wenzel   |
| Best Practices for a Research-Supportive Curriculum   | pp. 108-109, Gina MacDonald   |
| POGIL: A Learning Strategy that Promotes Undergraduate Research   | pp. 118-119, Carl Salter  |
| Implementing Inquiry- or Problem-Based Learning in the Undergraduate Science Curriculum: Ideals, Examples, and Concerns | Chapter 3, pp. 41-60, Marie T. Balaban  |
| Research Link 2000: Building and Sustaining Research-Based Undergraduate Curricula                                      | Chapter 4, pp. 61-68, Jim Hoerter, Sibdas Ghosh   |
| Team-Oriented, Project-Based Learning as a Path to Undergraduate Research: A Case Study                                 | Chapter 5, pp. 69-86, Ari W. Epstein, Rafael Bras, Kip Hodges, Alberta Lipson                         |
| Research-Based Learning in an Introductory Environmental Sciences Course  | Chapter 6, pp. 87-102, David H. Firmage, Thomas H. Tiegtenberg, F. Russell Cole                       |
| A Public University Science Department's Experience with Problem-Based Cohort Learning                                  | Chapter 15, pp. 295-314, Travis Wagner, Samantha Langley-Turnbaugh, Robert Sanford, Merrie Cartwright |
| Transforming Undergraduates into Skilled Researchers Using Laddered Teams   | pp. 402-406, Jerusha Detweiler-Bedell, Brian Detweiler-Bedell   |

## APPROACHES INCORPORATING TECHNOLOGY

| Title   | Details  |
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| Using GIS Technology to Develop Research Skills: Learning to Think Spatially and Use GIS in Higher Education          | Chapter 7, pp.103-106, Ann B. Johnson                            |
| Preparing Students for Research at the Introductory-Level with Technology   | pp. 112-113, Laura Guertin                                       |
| Integration of Teaching and Research through Digital Fabrication Projects in the Curriculum                           | pp. 115-118, James Thurman                                       |
| Investigative Learning in Introductory Physiology   | pp. 119-121, Scott D. Hawke, Stasinios Stavrianeas, Gary Tallman |
| Integrating Information and Scientific Research Skills Training within a Research-Supportive Undergraduate Curriculum | Chapter 9, pp. 137-174, Eleanor M. Smith                         |
| Fostering Research Skills with the Incorporation of Bioinformatics Tools in Upper-Level Biochemistry                  | pp. 252-253, Jennifer K. Inlow                                   |

## APPROACHES WITH AN EMPHASIS ON READING, WRITING, AND SPEAKING

| Title   | Details  |
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| Debate in the Classroom: A Means to an Educational End  | pp.109-112, Brent M. Foster                                      |
| Integrating Information and Scientific Research Skills Training within a Research-Supportive Undergraduate Curriculum | Chapter 9, pp. 137-174, Eleanor M. Smith                         |
| A Read-Analyze-Write Approach to Research- Related Literacy Skills for Upper-Division Chemistry Majors                | Chapter 10, pp. 175-190, Marin S. Robinson, Fredricka L. Stoller |
| Using “Write Like A Chemist” at Nazareth College, Rochester, NY   | pp. 191-192, Timm Knoerzer                                       |
| Piloting the Text “Write Like a Chemist” in an Upper-Division Writing Class for Chemistry Majors                      | pp. 192-193, Donald R. Paulson                                   |
| Intrinsically Meaningful Goals and the Process of Peer Review: Why and How Teaching Can Make a Difference             | pp. 240-241, G. Scott Acton                                      |
| A Writing-Intensive Clinical Research Course  | pp. 241-242, David Cherney                                       |
| Grant Proposal Writing for Undergraduates   | pp. 242-244, Cahleen Shrier                                      |

## INITIATIVES USING EXTERNAL PARTNERSHIPS

| Title   | Details  |
|---|--|
| Team-Oriented, Project-Based Learning as a Path to Undergraduate Research: A Case Study   | Chapter 5, pp. 69-86, Ari W. Epstein, Rafael Bras, Kip Hodges, Alberta Lipson        |
| The National Institutes of Health Study Group: A Research-Oriented Off-Campus Undergraduate Study Opportunity at Colgate University                                   | pp. 390-391, Roger Rowlett   |
| Establishment of an Investigative Curricular Approach across the Geology and Physics Programs at Western Carolina University and Implementation at Other Institutions | Chapter 23, pp. 425-448, Virginia L. Peterson, Mark L. Lord, Kurt Vandervoort        |
| The Clean Water Institute at Lycoming College   | Chapter 25, pp. 455-460, Mel Zimmerman   |
| A Project in Integrating Undergraduate Research with Service Learning   | pp. 470-473, Michael F. Bassman  |
| Living for the City: An Interdisciplinary Course  | pp. 473-475, Vincent F. A. Golphin, Danielle T. Smith                                |
| Teaching the Watershed: Interdisciplinary Undergraduate Research and Learning   | pp. 479-481, Rachel O’Brien, Eric Pallant  |
| Research Experiences for Undergraduates with Disabilities in Science, Technology, Engineering, and Mathematics Majors   | Chapter 31, pp. 529-530, S.J. Langley-Turnbaugh, S. Locke, L. Cohen, Nancy Lightbody |

**APPROACHES INVOLVING ISSUES OF RESEARCH RESPONSIBILITY AND/OR INTEGRATION OF RESEARCH AND SOCIETY**

| Title  | Details                                  |
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| Responsible Conduct in Research Instruction in Undergraduate Research Programs | Chapter 12, pp. 209-239, Amy M. Shachter |
| Developing an Understanding of the Integration of Research and Society         | pp. 401-402, Kerry K. Karukstis          |

**MECHANISMS TO SUPPORT FACULTY**

| Title  | Details  |
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| Research Link 2000: Building and Sustaining Research-Based Undergraduate Curricula   | Chapter 4, pp. 61-68, Jim Hoerter, Sibdas Ghosh                                      |
| POGIL: A Learning Strategy that Promotes Undergraduate Research, A Practical Strategy for Designing Effective and Innovative Courses | pp. 118-119, Carl Salter   |
| Undergraduate Research Programs: Is There a Magic Bullet for Success?  | Chapter 8, pp. 127-136, Barbara J. Tewksbury, R. Heather Macdonald                   |
| Flexible Curricular Structures to Provide Time for Research within the Curriculum  | Chapter 13, pp. 271-284, James Gentile   |
| Integrating Undergraduate Research into the Curriculum – SUNY, College at Buffalo  | Chapter 14, pp. 285-294, Linda Rueckert  |
| College-Wide Curricular Reform to Provide Faculty-Student Collaborative Scholarly Experiences at Baldwin-Wallace College             | pp. 391-394, Jill K. Singer  |
| Transforming Undergraduates into Skilled Researchers Using Laddered Teams  | pp. 398-400, G. Andrew Mickley   |
| SUMR: Colgate University’s Program to Support Faculty Mentoring Student Summer Research  | pp. 402-406, Jerusha Detweiler-Bedell, Brian Detweiler-Bedell                        |
| Research Experiences for Undergraduates with Disabilities in Science, Technology, Engineering, and Mathematics Majors                | pp. 410-411, Mary Jane Walsh   |
| Curricular Assessment Practices that Enhance the Undergraduate Research Environment  | Chapter 31, pp. 529-530, S.J. Langley-Turnbaugh, S. Locke, L. Cohen, Nancy Lightbody |
|  | Chapter 32, pp. 541-549, Katherine Whatley   |



## INSTITUTIONAL CONTRIBUTIONS

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| Undergraduate Research Programs: Is There a Magic Bullet for Success?  | Chapter 13, pp. 271-284, James Gentile                              |
| Flexible Curricular Structures to Provide Time for Research within the Curriculum  | Chapter 14, pp. 285-294, Linda Rueckert                             |
| How Writing Programs Support Undergraduate Research  | Chapter 11, pp. 195-208, Joyce Kinkead                              |
| Facilities and Resources that Promote a Research-Supportive Curriculum   | Chapter 27, pp. 485-494, Neal B. Abraham                            |
| The Role of Campus-Wide Undergraduate Research Centers in Supporting a Research Curriculum                                       | Chapter 28, pp. 495-506, Mary Crowe                                 |
| Administrative Contributions to a Research-Supportive Curriculum   | Chapter 33, pp. 565-578, Sheldon Wettack                            |
| Institution-Wide Attention: Essential to Building Robust and Sustainable Research-Rich Undergraduate Stem Learning Environments? | Chapter 34, pp. 579-586, Jeanne L. Narum                            |
| The Role of Academic Administration in Achieving Academic Excellence   | pp. 589-591, Tom Bultman, Moses Lee                                 |
| Using Institutional Funds to Promote Undergraduate Research across the College: A Strategic Initiative                           | pp. 591-594, Timothy E. Elgren, William J. Billiter, David C. Paris |