

# INTER/MULTI DISCIPLINARY

The following is a list of resources compiled by UROP that relate to inter/multi-disciplinary research, classes, or projects. While this is not an exhaustive list of resources available regarding inter/multi-disciplinary projects, these do give a variety of insight into how others have been successful with multidisciplinary projects. They are available from the UROP library, GT Library, or on-line. UROP library materials can be checked out by coming to the UROP office. Please contact [UROP](#) for availability.

- \* **Integrating Research into Undergraduate Education: The Value Added.** Integrating Research into Undergraduate Education: The Value Added. November 2004. The National Science Foundation and the Woodrow Wilson National Fellowship Foundation, 2004.

This is a conference proceedings booklet that contains the contents of the two-day conference. In addition to the plenary and other welcoming and introductory speeches, it also presents the break-out sessions. Within these break-out session sections, an introduction to the topic is presented and then the summary of the results of the discussion is also described. Breakout session topics included: 1) Bringing research to the classroom - at the institutional level and within fields and majors, 2) Applying principles of learning in diverse undergraduate educational settings (institutional context and disciplinary and interdisciplinary context), 3) Addressing the challenges face with respect to undergraduate education, (4) Providing a quality research-based undergraduate education: critical challenges of the next five years, 5) Incorporating principles of learning into undergraduate education. While not necessarily a primary reference, this could be valuable to read for ideas on what other have done and experienced.

Available From: UROP Office and online

[http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content\\_storage\\_01/0000019b/80/1b/c7/7c.pdf](http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/1b/c7/7c.pdf)

- \* Beck, Jon, Buckner, Brent, and Nikolova, Olga. "**Using Interdisciplinary Bioinformatics Undergraduate Research to Recruit and Retain Computer Science Students.**" Proceedings of the 38th SIGCSE Technical Symposium on Computer Science Education. ACM.

An interdisciplinary undergraduate research project in bioinformatics, jointly mentored by faculty in computer science and biology, has been developed and is being used to provide top-quality instruction to biology and computer science students. This paper explains the benefits of such collaboration to computer science students and to the computer science discipline. Specific goals of the project include increased recruitment of students into computer science and increased retention within the discipline. The project is also intended to be particularly attractive to women students.

<http://doi.acm.org/www.library.gatech.edu:2048/10.1145/1227310.1227436>

- \* Best, Aaron A., DeJongh, Matthew, Barton, Amanda J., Brown, Jeff R., Barney, Christopher C. "**Models of Interdisciplinary Research and Service Learning at Hope College.**" Council on Undergraduate Research Quarterly Vol. 28 Iss. 2 (2007): pp. 18-23.

At Hope College, we are supporting interdisciplinary research and teaching. To give a better sense of these accomplishments and the challenges that interdisciplinary research presents, we present two specific examples of Howard Hughes Medical Institute (HHMI) supported interdisciplinary research teams at Hope College: the Interdisciplinary Research Program in Bioinformatics and Microbial Genomics team and Nursing and Engineering in International Development team.

<http://www.cur.org/Quarterly/dec07/Winter07Hope.pdf>

- \* Bodenbender, Brian E. "**Multidisciplinary Field Investigation: Using Shared Logistics to Increase Research Productivity.**" Council on Undergraduate Research Quarterly Vol. 25 Iss. 4 (2004): pp. 156-161.

In many ways, off-campus field studies are ideal learning opportunities. The things that make fieldwork so memorable for students, however, raise unique challenges for faculty members. Beyond being responsible for supervising students' research activities, in a field research project the faculty member also becomes responsible for a majority of the everyday logistical decisions that students would normally make on their own, up to, and occasionally including, when and where to eat, sleep, and go to the bathroom. Meeting the basic needs of the field crew is obviously an indispensable part of fieldwork, but logistical demands can divert faculty time, attention, and energy away from the research that is the crew's primary purpose. One way to decrease a research project's logistical overhead is to share the load by having two or more faculty members supervise multiple research projects at a single field site. The authors have taken this approach in a collaborative research project, "Paleoenvironmental Characterization of a Dinosaur Site in the Morrison Formation of the Bighorn Basin, Wyoming," funded by the National Science Foundation's Research Experiences for Undergraduates program. The field locality is near Shell, Wyoming (population 50) along the western slope of the Big Horn Mountains on property administered by the Bureau of Land Management (BLM). The project engages each participant in field and laboratory work directed toward our overarching goal - to develop a broad understanding of the ancient environments and fossils represented at the site. Participants, either individually or in pairs, collaborate with faculty to design research projects that focus on specific aspects of the fossils, sediments, or sedimentary rocks at the site.

Available From: UROP Office and online

<http://www.cur.org/Quarterly/jun05/BodenDemko.pdf>

- \* Cook, Jennifer A., and Dick, Wesley. "**A Window on America: Bringing Home Interdisciplinary Research.**" Council on Undergraduate Research Quarterly Vol. 26 Iss. 1 (2005): pp. 16-21.

This article examines Albion College's process in developing and implementing an undergraduate research program, funded by a NCUR/Lancy Grant, entitled "Boom, Bust, Recovery: Explorations of Albion, Michigan-The Last Half-Century," which focused on the city of Albion, MI from historical, sociological, environmental, and creative viewpoints. This article will examine a college's grant journey from gestation period to the hands-on stage of interdisciplinary summer seminars and interactions with its home community.

<http://www.cur.org/Quarterly/Sept05/Sept05Albion.pdf>

- \* Davis, Larry E., and Eves, Robert L. "**The Natural History of a Modern Carbonate Ecosystem: Field Studies That Integrate Undergraduate Research.**" Council on Undergraduate Research Quarterly Vol. 25 Iss. 4 (2005): pp. 175-179.

The author describes a field research semester consisting of an 8 week content development and a 10 day research based field experience at the Gerace Research Center, San Salvador Island, Bahamas.

Available From: UROP Office

- \* Davis, Larry E., et al. "**Integration of Field Studies and Undergraduate Research into an Interdisciplinary Course.**" Journal of College Science Teaching Vol. 36 Iss. 6 (2007): pp. 22-27.

How the authors organized, prepared for and evaluated a class called Natural History of Tropical Carbonate Ecosystems where 8 weeks of course study on campus are also combined with a 10 day field-study trip to the Bahamas to study ecology of Pigeon Creek tidal lagoon. Also discussed is how to form interdisciplinary teams that mesh well together. Also included is a grading rubric that they used.

<http://proquest.umi.com.www.library.gatech.edu:2048/pgdlink?index=4&did=1278179891&SrchMode=1&sid=2&Fmt=6&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1248381993&clientId=30287>

\* Desai, Ketaki V., et al. **"Integrating Research and Education at Research-Extensive Universities with Research-Intensive Communities."** Advances in Physiology Education Vol. 32 Iss. 2 (2008): pp. 136-141.

Although the Boyer Commission (1998) lamented the lack of research opportunities for all undergraduates at research-extensive universities, it did not provide a feasible solution consistent with the mandate for faculty to maintain sustainable physiology research programs. The costs associated with one-on-one mentoring, and the lack of a sufficient number of faculty members to give intensive attention to undergraduate researchers, make one-on-one mentoring impractical. We therefore developed and implemented the "research-intensive community" model with the aim of aligning diverse goals of participants while simultaneously optimizing research productivity. The fundamental organizational unit is a team consisting of one graduate student and three undergraduates from different majors, supervised by a faculty member. Undergraduate workshops, Graduate Leadership Forums, and computer-mediated communication provide an infrastructure to optimize programmatic efficiency and sustain a multilevel, interdisciplinary community of scholars dedicated to research. While the model radically increases the number of undergraduates that can be supported by a single faculty member, the inherent resilience and scalability of the resulting complex adaptive system enables a research-intensive community program to evolve and grow.

<http://advan.physiology.org/cgi/reprint/32/2/136>

\* Duron, Robert, Limbach, Barbara, and Waugh, Wendy. **"Critical Thinking Framework for Any Discipline."** International Journal of Teaching and Learning in Higher Education Vol. 17 Iss. 2 (2006): pp. 160-166.

This paper identifies a 5-step framework that can be implemented in virtually any teaching or training setting to effectively move learners toward critical thinking. This interdisciplinary model, which is built upon existing theory and best practices in cognitive development, effective learning environments, and outcomes-based assessment, provides teachers with a useful framework. This framework can be used to move students toward a more active-learning environment which, ultimately, is more enjoyable and effective for teachers and students alike. An example of the model is applied in the context of accounting education, which represents a business discipline in which critical thinking has been consistently cited as both necessary and difficult to implement.

<http://www.isetl.org/ijtlhe/pdf/IJTLHE55.pdf>

\* Hernandez, Michael, and Armstrong, John. **"Development of the Interdisciplinary GIS Program at Weber State University: Its Growing Impact on Undergraduate Research."** Council on Undergraduate Research Quarterly Vol. 27 Iss. 3 (2007): pp. 107-112.

The use of Geographic Information Systems (GIS) to support student education and research at predominantly undergraduate institutions has steadily grown in recent years. However, resources at such institutions are limited and undergraduate research grants cannot typically support the management, hardware, and software requirements of department labs. Consequently, student needs outweigh adequate computer resources. To address this issue at Weber State University (WSU), an interdisciplinary GIS program was started so students, faculty and staff would have the necessary resources (educational opportunities, GIS software licensing, and adequate computer lab access) to utilize GIS in support of their research and teaching efforts. The three major stages that make up the core GIS program are described below, along with examples of how GIS is being used in undergraduate research.

<http://www.cur.org/Quarterly/Mar07/Mar07Hernandez.pdf>

- \* Karukstis, Kerry K., and Elgren, Timothy E., eds. **Developing and Sustaining a Research-Supportive Curriculum: A Compendium of Successful Practices**. Washington, DC: Council on Undergraduate Research, 2007.

The Council on Undergraduate Research is pleased to announce a new publication designed to share successful practices that enable faculty and institutions to design, implement, and sustain a research-supportive curriculum. The volume focuses on three broad areas: curricular elements and teaching and learning strategies that develop critical research skills, curricular infrastructure that enhances a research-supportive curriculum and administrative contributions that initiate and sustain a research-supportive curriculum. Authors across disciplines and from a variety of types of institutions have contributed over 30 chapters and 50 "highlights" describing curricular approaches, methods and techniques developed for their courses and programs of study to enhance the research experience of students and the research culture of their institutions. Topics include curricular approaches to build research skills such as inquiry-based laboratories and interdisciplinary courses and programs, institutional infrastructure and assessment practices that promote a research-supportive curriculum, and the role of the faculty and the administration in nurturing a curriculum to support a research culture. Specific examples of known practices at particular institutions are included in each chapter. This compendium of successful curricular and institutional practices to develop critical research skills emphasized the importance of the collective efforts of the undergraduate community to integrate research and education. By collecting and disseminating a variety of mechanisms that are effective means of creating a research-supportive undergraduate curriculum, the Council on Undergraduate Research aims to encourage faculty and institutions to continue to seek creative, useful, and significant ways to promote "learning through research".

Available From: UROP Office, Table of Contents available online:  
<http://www.cur.org/publications/CompTOC.pdf>

- \* Killeen, Timothy L. "**Mentoring Interdisciplinary Undergraduate Courses**." New Directions for Teaching and Learning Vol. 2001 Iss. 85 (2001): pp. 95-108.

Within a multidisciplinary context, mentoring can improve student learning and raise levels of interest in the sciences. Such an approach can even be used in large class settings where the use of faculty teams and new instructional technologies can be applied.

<http://www3.interscience.wiley.com.www.library.gatech.edu:2048/journal/89016483/issue>

- \* Kinkead, Joyce. **Valuing and Supporting Undergraduate Research**. New Directions for Teaching and Learning Vol. 93. San Francisco: Jossey-Bass Publishers, 2003.

This is a special issue from the journal "New Directions for Teaching and Learning" edited by Joyce Kinkead devoted to discussing undergraduate research and institutional attitudes towards supporting undergraduate research and consists of 7 separate articles. The article titles are: "Learning through Inquiry: An Overview of Undergraduate Research"; "The Boyer Commission Report and its Impact on Undergraduate Research"; "Undergraduate Research at the Research Universities"; "A Research-Across-the-Curriculum Movement"; "Undergraduate Research at Two-Year Colleges"; "Interdisciplinary Research: The NCUR-Lancy Awards"; "What One Faculty Member Does to Promote Undergraduate Research". While these are well written, because they were published in 2003 and the topics discussed relate to what has happened primarily in the late 1990's to 2002, some of the material presented regarding analysis of undergraduate programs and community involvement is dated as much has changed in the ensuing years. However, for those who are interested in a recent historical perspective on undergraduate research, the effect of the Boyer Report/Commission on undergraduate research at research universities in the years immediately following its recommendations, and background on undergraduate research being conducted at primarily undergraduate institutions (PUI's) and community colleges these articles can provide this background.

Available From: UROP Office and GT Library

<http://www3.interscience.wiley.com.www.library.gatech.edu:2048/journal/104527789/issue>

- \* Nuhfer, Edward B. "**Motivation in Interdisciplinary Programs.**" New Directions for Teaching and Learning Vol. 1999 Iss. 78 (1999): pp. 79-86.

Holistic motivation is required to sustain interdisciplinary learning communities. This chapter describes the stakeholders in such communities and offers methods of sustaining their motivation and participation.

<http://www3.interscience.wiley.com.www.library.gatech.edu:2048/journal/101523918/abstract>

- \* Research Committee on Facilitating Interdisciplinary, and Committee on Science, Engineering, and Public Policy. **Facilitating Interdisciplinary Research.** Washington, DC: National Academy of Sciences, National Academy of Engineering, Institute of Medicine, 2005.

This report is a "call to action" for all those who perform, administer, support, and organize interdisciplinary research and training. Its purpose is to facilitate collaborative practices that can increase the productivity of science and engineering. The majority of the report suggests "incremental" changes that will facilitate interdisciplinary research. In Chapter 9, however, the committee provides suggestions for "transformative" changes for those institutions that are willing to experiment with new approaches. Research partnerships must be especially tailored to address scientific and societal challenges in innovative ways. The purpose of this report is not to privilege the pursuit of IDR over disciplinary research, but rather to seek to provide suggestions to those interested or engaged in interdisciplinary research to optimize its effectiveness and strengthen both IDR and the disciplinary foundations from which it springs. Interdisciplinary research (IDR) can be one of the most productive and inspiring of human pursuits—one that provides a format for conversations and connections that lead to new knowledge. As a mode of discovery and education, it has delivered much already and promises more— a sustainable environment, healthier and more prosperous lives, new discoveries and technologies to inspire young minds, and a deeper understanding of our place in space and time. Despite the apparent benefits of IDR, researchers interested in pursuing it often face daunting obstacles and disincentives. Some of them take the form of personal communication or "culture" barriers; others are related to the tradition in academic institutions of organizing research and teaching activities by discipline-based departments—a tradition that is commonly mirrored in funding organizations, professional societies, and journals. Under the sponsorship of the Keck Foundation, the National Academies Committee on Facilitating Interdisciplinary Research examined the scope of IDR. It drew conclusions and made recommendations based on the committee's deliberations and on suggestions it received from undergraduate and graduate students, postdoctoral scholars, researchers, academic and nonacademic institutional leaders, funding organizations, and professional societies at its convocation and via its survey; the focus groups held at the National Academies Keck Futures Initiative Conference; and interviews with leading scholars.

Available From: UROP Office and Online (free online from the National Academies Press)

[http://www.nap.edu/catalog.php?record\\_id=11153](http://www.nap.edu/catalog.php?record_id=11153)

- \* Young, Gregory. "**Interdisciplinary Research Seminars in the Arts and Humanities at Montana State University.**" Council on Undergraduate Research Quarterly Vol. 29 Iss. 2 (2008): pp. 30-33.

The author gives examples of how Montana State has instituted Interdisciplinary Undergraduate Research seminars where undergraduates have the opportunity to make connections between disciplines but also to conduct original research in areas not often explored in classic classroom classes. He reviews four classes - Musi-Tecture, a music-architecture class; Music and Economics, Music and Literature, and Music and Sculpture. This is one example of how to expand undergraduate research to students in the arts and humanities in larger numbers than just one student working with one faculty.

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