

CTE NOTEBOOK

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"Integrating Research and Undergraduate Teaching"

Inside This Issue

"Integrating Undergraduate Research and Teaching" 1

"A Worthwhile Partnership Between Faculty and Students" 2

Tips From Faculty 4

Effective Teaching Seminar Schedule 6

"Technology Corner" 7

"From the Director" 8

Reinert CTE Mission Statement

The mission of the Paul C. Reinert, S.J. Center for Teaching Excellence is to support Saint Louis University faculty and graduate students so that they can better serve the intellectual, spiritual, and social needs of all learners.

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Integrating Undergraduate Teaching and Research

*By Donald G. Brennan, Ph.D.
Dean of the Graduate School and
Associate Provost for Research*

We all know that good teaching is not a simple matter of lecturing the course content with students serving as passive learners of rote material. Good teaching engages students as active learners developing critical thinking and inquiry skills. In the same way, we should not limit the way we think about research by defining it in terms of publications and external grants, but rather we should think of it in terms of how we actively engage undergraduate students in developing those same critical thinking and inquiry skills.

In 1990, Ernest Boyer published *Scholarship Reconsidered: Priorities of the Professorate*. This book stimulated nationwide discussions in higher education, including whether the pendulum had swung too far in supporting research priorities with a consequent devaluation of good teaching.

Unfortunately, I think many of these discussions were misguided because too much emphasis was placed on the supposed dichotomy between research and teaching, often viewing them as conflicting priorities.

One of Boyer's observations was, "Surely, scholarship means engaging in research. But the work of the scholars also means stepping back from one's investigation, looking for connections, building bridges between theory and practice, and communicating one's knowledge effectively to students." This broader view can lead to the conclusion that research and teaching should not be viewed as dichotomous, but rather as a symbiotic, reinforcing relationship.

An active faculty scholarship and research agenda fosters innovative teaching and, in return, research projects are often conceptualized or refined as a result of the intellectual exchange found in the classroom. In an academic setting, where so much of the faculty's research directly involves students,

(Continued on page 6)



Integrating Teaching and Research: A Worthwhile Partnership Between Faculty and Students

Dr. Alexa Serfis & Julia Lutovich, Department of Chemistry

Undergraduate research has long been an important component in the chemistry curriculum. The department offers a course entitled “Undergraduate Research” in which the students can enroll for 0-3 credits per semester. This course is required for the Bachelor of Science (BS) majors and is an elective for the Bachelor of Arts (BA) students. The students work on a research project in the laboratory under the direction of a chemistry faculty member. The purpose of this article is to describe the program and discuss the benefits and outcomes for both the department and undergraduate students.

Student Interest

There is large student interest in undergraduate research, and there are typically between 30-40 students enrolled each year. While only a small number of these students are required to take research, the majority choose this as an elective. There are many reasons why students wish to work in a research setting. Some students want the experience of working on an independent research project to help in their applications to post-baccalaureate programs; having worked on a research project looks good to both medical and graduate schools, as it shows the student has explored a topic in detail. Students also find that research is a natural extension of coursework; while chemical principles are discussed in courses, there is not time to discuss current topics and applications in research. By pursuing a research project, the student gets to explore an application of a topic in much more detail. The

students also find that immersing themselves in a specific area is exciting, since they are doing work that has never been done before.

Outcomes

There are numerous benefits to the student and outcomes of the work. One of the greatest benefits to the student is that they work closely with the faculty member and receive individual attention. The student has an opportunity to become trained on specialized and modern instrumentation they would not otherwise be exposed to in their regular course work. The student learns the process of research, including how to form a hypothesis, design experiments to test the hypothesis, collect data, and interpret the results. This process is not something the students are familiar with, as their laboratory courses tend to be more “cookbook” style, where the experiments have been designed and worked out beforehand. The student runs through the experiments and they typically run smoothly with results that are expected. In the research setting, the results one gets are not always what is expected. The student researcher learns to evaluate results and suggest new directions for the research based on their outcomes.

In addition to carrying out experiments, another important part of research is telling others about your work. If students make significant progress on their projects, they have many opportunities to present their work at local, regional, and national venues. For example, many of our students participate in the annual

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(Continued from page 2)

Undergraduate Research Symposium which is sponsored by the St. Louis local section of the American Chemical Society. This symposium is held at a different college or university in the St. Louis metropolitan area each spring, and is open to all students to present their research on chemistry-related topics in either oral or poster format. The American Chemical Society holds regional and national meetings, and the students can attend those and give poster presentations on their work. Funding is typically provided by the College of Arts and Sciences, the Chemistry Club/ACS Student Affiliates Chapter, the department of chemistry, and the American Chemical Society. Not only do these trips give the students an opportunity to tell others about their work, but there are other activities at the ACS regional and national meetings that are geared specifically toward the students including guest lecturers, graduate school fairs, and workshops on interviewing and resume preparation.

The students are also required to write up their work in the form of a senior thesis. Writing a scientific paper is yet another way that scientists inform others about their work. There is also the possibility that the students' work can be published in a peer-reviewed scientific journal. In fact, most of the chemistry faculty have undergraduate student co-authors on their publications.

Logistics

A student selects their faculty mentor with a procedure implemented by the department many years ago. The student obtains the departmental booklet describing the faculty and their research interests. The student then selects at least three different faculty to interview. The student sets up a thirty or so minute appointment with each faculty member, and the faculty describe in more detail their research interests and available projects. Upon conclusion of the meeting, the

faculty member signs off on the faculty selection form. After speaking with at least three faculty members, the student lists on the form their preference (first choice, second choice, etc.) for a research advisor. Typically this process is carried out during the pre-registration period, and the student plans to begin research the next semester. There are deadlines for submission of the faculty selection forms in early December and mid-April. The departmental Chair collects the forms, then the faculty meet to make assignments of students to their research groups. The department tries to assign each student to their first choice faculty member. The student can then register for the course, which is graded. For one hour of credit the student is expected to work four-five hours per week in the lab, eight hours for two credits, and 11 hours for three credits.

Summary

Overall, collaboration between students and faculty on research projects is a very rewarding and worthwhile activity. There are clearly many benefits for the students who participate, but the faculty also find this collaboration extremely rewarding. To see young and inexperienced students develop into scientists and develop self-confidence is very rewarding. The research setting also allows faculty and students to get to know each other in a more informal setting outside of the classroom.

Dr. Alexa Serfis—Associate Professor, Chemistry

Julia Lutovich—Undergraduate Senior, Chemistry

Teaching Renewal Conference February 24-26

Sponsored by the Program for Excellence in Teaching at the University of Missouri-Columbia

For information:
<http://pet.missouri.edu/>
or 573-882-6260



Reasons and Resources for Integrating Research and Teaching

***Carole Knight
Associate Dean and Director, Office of Research Services***

Every faculty member knows that research is vital to scholarship and teaching. Almost every discipline at every academic institution involves research of some kind, whether it be scientific, social, humanistic, or medical. Involving college students in these areas of research can add a fuller dimension to their educational experience and broaden their scope of understanding.

Faculty and graduate students seem to be the most frequent beneficiaries of research experiences at universities, but for about twenty years, faculty mentored undergraduate research and creative work has been increasing. Both the Carnegie Foundation for the Advancement of Teaching and the American Association of Colleges and Universities have issued documents highlighting the importance of undergraduate involvement in research.

Why should undergraduates have the opportunity to participate in research in their chosen fields?

- It prepares them for the research requirements of graduate school.
- It prepares them for a career in their chosen field, whether in academia, working in commercial labs, or in other areas requiring research and analytical skills.
- The best students are attracted to departments offering research opportunities.
- Undergraduate students can provide assistance to faculty members' research agendas.
- Research teaches students discipline, responsibility, and ways to look at the world that "book learning" cannot provide.
- It can provide an avenue of knowledge for students that goes beyond a GPA.

Both private and federal funding agencies consider undergraduate research to be a vital part of the educational experience of students. Private fellowships and scholarships for undergraduate students are plentiful, and funding for faculty who use undergraduate students in their research is available from many sources. A quick search of the funding databases available through SLU's Research at SLU website (www.slu.edu/research) revealed nearly fifty opportunities. Among them were programs from the National Science Foundation (www.nsf.gov), National Institutes of Health (www.nih.gov), American Society for Microbiology (www.asm.org), National Institute of Standards and Technology (www.bfml.nist.gov), and the Council on Undergraduate Research (www.cur.org).

A tip for searching for funding including undergraduate research: Don't look only to the traditional agencies. For example, the National Science Foundation has a program that supports "research and related activities that contribute to systematic understanding of the character and development of science and technology, including their cultural, intellectual, material, and social dimensions." Research in this area can have many dimensions, and could include projects in fields other than the traditional science disciplines.

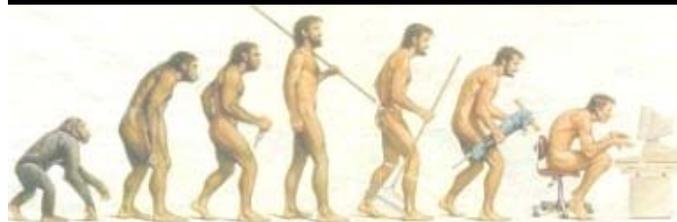
The best tip for searching for funding for undergraduate research – contact the Office of Research Services Administration at 314-977-2241 (Frost campus) or 314-977-7733 (Health Sciences Center Campus). We can help.

20 Ways to Incorporate Research into Undergraduate Education

Helen Lach—School of Nursing

1. Encourage statistics and research methods courses
2. Introduce issues in research design and include research articles in reading lists whenever possible
3. Have students critique research articles
4. Have students conduct a scavenger hunt to find studies with different research designs
5. Have students interview researchers and write about their programs of research
6. Provide credit or “extra-credit” for students who complete the Institutional Review Board educational module to learn about issues related to use of human subjects in research
7. Hold a research “club”
8. Provide research practicum
9. Assign group project where students conduct small study
10. Encourage attendance at research seminars and meetings
11. Hire students as research assistants to assist with interviews, data collection, data entry, data cleaning and analysis
12. Have students attend research team meetings
13. Discuss evidence based-practice and include evidence based reviews in reading lists
14. Critique an evidence-based protocol or review
15. Examine evidence base for a common practice
16. Assign student group to develop an evidence-based protocol
17. Have students implement an evidence-based practice in the clinical setting and evaluate the results
18. Explore funding options to support student projects
19. Encourage students to present projects and studies at school, university and national meetings
20. Discuss *your* research with them!

Making the Link



Saint Louis University's Office of Research Services and Reinert Center for Teaching Excellence co-sponsored “Making the Link: a Faculty Forum on Undergraduate Teaching and Research” on Friday, January 7, 2005. The information below extends the conversation.

Beth Zeibig Clinical Lab Science

I was amazed at all of the partnering opportunities that came out in the health sciences group discussion on integrating teaching and undergraduate research! There are many opportunities within the university community, such as departments collaborating on and developing interdisciplinary undergraduate research courses as well as collaboration opportunities outside the university, perhaps in the form of a research setting, with vendors. Further, since all of the health sciences programs typically include a fieldwork or internship experience, partnering with clinical instructors and colleagues in these settings may provide the students with “real world” research exposure and experience. I suspect that this would be true in other disciplines such as business. The programs and departments at Saint Louis University have a wealth of knowledge and resources. Given the opportunity to partner with each other, clinical sites and vendors, I believe that amazing undergraduate research opportunities would abound!

**For more faculty comments on
Making the Link, visit our website:
www.slu.edu/centers/cte**

(Continued from page 1)

doing research and thinking about it with students is teaching — in the laboratory, in the clinic, in the community, and in the classroom.

Our recognition as a “research” university not only confirms our traditional commitment to educating graduate and professional students to discover new knowledge, but it also assures undergraduate students that they will be instructed by faculty who are active scholars and whose scholarship enriches the undergraduates’ learning. If either the role of teaching or research is neglected by the institution, the needs of the undergraduate, graduate and professional students will not be met. A quality institution of higher education needs to simultaneously attend to its commitments to research, teaching and service .

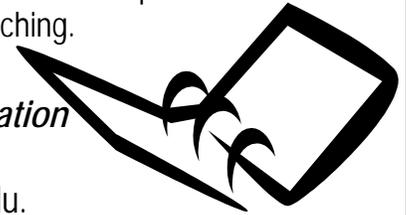
Jules LaPidus, the past president of the Council of Graduate Schools, has written that professors may not always remember that the most important thing they learned in their doctoral education was not necessarily the specifics of their dissertation research, but rather the generalizability of the scholarly process. It is this process of thinking, reading, and listening critically; understanding the ethical responsibilities and conventions of the discipline; defining and analyzing problems; determining what research needs to be done and how best to do it; and, understanding the meaning of the research results – these are the qualities that should be cultivated in laboratories and classrooms alike.

To paraphrase another statement from LaPidus, research is something you do whereas scholarship is how you think about it. As we continue to integrate undergraduate teaching and research, perhaps it would be helpful to broaden and redefine the sometimes rigid categories of teaching and research.

Pre-Tenured Faculty Portfolio Development Retreat April 8-9, 2005

The Center for Teaching Excellence hosts an annual retreat for pre-tenured faculty to come together to analyze, reflect and document evidence of good teaching. Participants leave with a draft of their teaching portfolio that illustrates their professional expertise and efforts to improve their teaching.

For more information
call 977-3944 or
e-mail cte@slu.edu.



Remaining Spring 2005 Effective Teaching Seminars

Please note: unless otherwise indicated, all sessions run from 1:30—3:30 p.m., and are held in Verhaegen 212

February 11 & February 15
Teaching Portfolio Workshop
Jim Korn, Psychology

March 1 & at 11 a.m. March 4
Small Group Strategies
Russell Blyth, Math & Computer Science

**March 15 &
at School of Allied Health March 18 (room 2030)**
Classroom Assessment
Dana Sayre Stanhope, Physician Asst Ed.

March 29 & April 1
Handling Difficult Situations in the Classroom
Jonathan Smith, American Studies

April 12 & April 15
What the Best College Teachers Do
Mary Stephen, Reinert CTE

April 26 & April 29
Service Learning and Classroom Reflection
Christy Finsel, Service Learning Coordinator

May 6 at 3:30 in Verhaegen 119
Certificate Ceremony



The Technology Corner

"An Update on Using WebQuests to Foster Student Research"

*Sandy Gambill, Assistant Director
Reinert Center for Teaching Excellence
and Coordinator of Technology and Learning*

I'd like to twist our theme of integrating teaching and research to present a strategy for helping students develop their own research skills. Dr. Bernie Dodge developed the WebQuest concept in 1995 at San Diego State University. He describes the WebQuest as "an inquiry-oriented activity in which most or all of the information used by learners is drawn from the Web." A WebQuest might run for one class period, a week or two, or an entire course.

A WebQuest typically revolves around an open-ended question that can be approached from multiple perspectives. Students are presented with a task to complete, a process by which to complete the task, and suggested resources for research. According to Dodge, by pre-selecting resources the WebQuest creator is "using learners' time well, to focus on using information rather than looking for it, and to support learners' thinking at the levels of analysis, synthesis and evaluation."

Role-playing is an interesting aspect of the WebQuest process. Students assume roles associated with

the question, and conduct research from the perspective of this identity. Role-playing can make approaching a controversial topic such as Euthanasia or capital punishment easier, because the student is forced to interact with the subject from a fresh perspective. After the research process, students are typically asked to come to a consensus about the question.

During summer 2004, several faculty members participated in a weeklong WebQuest creation project co-sponsored by the Center and Pius Library. Several of these WebQuests are currently being used in SLU courses to help undergraduate students enhance research skills. Please contact the Center at 977-3944 or on the web at www.slu.edu/centers/cte or your department's Library liaison if you are interested in more information on the use of WebQuests in developing students' research skills.

For more information on WebQuest visit:

<http://www.kn.pacbell.com/wired/fil/pages/listwebquestma7.html>

MountainRise

MountainRise is a peer-reviewed, international electronic journal published twice a year as a vehicle for scholarly work about college teaching and learning. Submissions are sought for *MountainRise* as an ejournal having the goal of becoming the main international voice for the scholarship of teaching and learning in higher education today. While primarily publishing scholarly articles, each issue may also include 1 – 2 brief, non-scholarly reflection essays about the art, craft, or spirit of teaching and learning. Original poetry about the teaching and learning experience is also sought for each issue.

Manuscripts for the Spring/Summer, 2005 issue of *MountainRise* may be submitted by April 15, 2005. Submission guidelines are found at <http://mountainrise.wcu.edu>.



"From the Director"

Dr. Mary Stephen
Reinert Center for Teaching Excellence

On January 7, the Office of Research Services, the Graduate School, and Reinert Center for Teaching Excellence co-sponsored "Making the Link: A Faculty Forum on Undergraduate Teaching and Research." This issue of *The Notebook* focuses on the same topic in order to make ideas presented at the forum more broadly available across campus. We are grateful to participants in the forum who have been willing to share their experiences and ideas on involving undergraduates in research for this issue.

At the forum, Dr. Charlotte Royeen, Dean of the College of Health Sciences, described how as an undergraduate, a faculty member encouraged her to do research and the impact this had on her educational experience and choices. I listened with interest, reminded of an experience I had in my sophomore year of college when a faculty member arranged for me to

attend a conference at which undergraduate math and science students presented research. I came back to campus inspired to try my hand at research. With the encouragement of this faculty member I presented my research at the same conference the next year. Without the initial action and continued support of the faculty member, I would never have thought I was capable of conducting research, and most likely would not have considered going on to graduate school after graduation.

I am sure that many of you reading this issue of *The Notebook* could share similar stories of how dedicated faculty members introduced you to the possibility of doing research, and influenced your decisions about what to do after graduation. I hope that reading the comments of colleagues will encourage more faculty members to look for the link between teaching and involving undergraduates in research.

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