Integrating Undergraduate Research Into the Curriculum to Improve Student Learning and Understanding

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Integrating Undergraduate Research

• What is undergraduate research at a teaching institution?

• Why is it important?
  • Impact on Students, Faculty across academic disciplines

• Resources – IRB, URO, OSP

• Discussion:
  • What are the advantages of engaging undergraduate students in research, and what challenges are there to getting faculty and students engaged in research?
  • How is it (or how can it become) part of the curriculum in different disciplines?
  • What resources would you like to have available to initiate and grow a sustainable undergraduate research program?
Definition of Undergraduate Research (from CUR):

“An inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline.”

Students are actively engaged in research projects under the mentorship of a Faculty to explore new areas of the discipline.

Slightly different from what is thought of as ”active learning” in that students are not necessarily learning new foundational concepts through active projects, but are actively engaged in applying those concepts to something new, innovative, creative, or solving complex problems that typically could not be achieved under the restrictions and limitations of a single course.

Innovation and Discovery are often the result!

This does not require DSU to be an R01 institution! DSU will continue to focus on teaching, but research can (and should?) be an integral part of the process.
Undergraduate Research at DSU

• Post-graduate schools in many disciplines require research experience at the undergraduate level as part of their acceptance criteria

• Nearly 80% of the ~2700 primarily undergraduate institutions across the United States submitted proposals to the National Science Foundation (NSF) requesting funding for undergraduate research projects between 2008-2010!

• DSU should develop research opportunities to better prepare students for post-graduate goals, and produce students that are competitive with their peers across the country
  • In 2013, over 600,000 baccalaureate degrees were awarded in the US in Science and Engineering fields only!
  • Approximately 1.8 million bachelors degrees in 2013 (all disciplines)

(CUR Quarterly, Fall 2013, vol. 34, pp 31-40)
UR is a powerful source of benefits to the student

Early engagement in undergraduate research improves the retention and academic success of historically underrepresented students.

- Increases the retention rates for African American students (81% vs. 65%)
- Increases degree completion for African-American males (75.3% vs. 56.2%)
- Increases engineering degree completion rates for African American and Latina women in Engineering (80.9% vs. 59.8%)
- Students who participated in undergraduate research were more likely to pursue medical, law, or Ph.D. programs than students in control group. (78.5% vs. 56.6%)


Learning Outcomes more than half of employers rate as very important (8, 9, or 10 on a 0-10 scale):

- ability to analyze and solve complex problems
- ability to locate, organize, and evaluate information from multiple sources
- ability to innovate and be creative
- ability to work with numbers and understand statistics
- ability to analyze and solve problems with people from different backgrounds and cultures
Learning Outcomes four in five employers rate as very important (8, 9, or 10 on a 0-10 scale):

- Ability to effectively communicate orally
- Ability to work effectively with others in teams
- Ability to effectively communicate in writing
- Ethical judgment and decision-making
- Critical thinking and analytical reasoning skills
- Ability to apply knowledge and skills to real-world settings
UR is a powerful source of benefits to STEM students

Undergraduate research enhances the educational experience of science undergraduates as measured by learning gains and satisfaction.

• Learning gains related to the research process, scientific problems, lab techniques and active learning.
• Personal gains such as tolerance for obstacles and working independently.
• 68% of the 4500 students that participated in NSF programs reported an increase in interest in STEM career, and 83% reported an increase in confidence in their research skills.

Undergraduate research attracts and retains talented students to careers in science.

• Most of the students report a continuation with a plan to go on in science while relatively few students are attracted to begin this plan.
  • Most undergraduate research experiences are undertaken by third- and fourth-year students who have already declared a science major.
  • Classroom Undergraduate Research Experiences
• Early introduction of Research – students who participated in undergraduate research were significantly more likely to go on to graduate and professional school (82% vs. 56%) across all racial and gender groups.

UR is a powerful source of benefits to SBS students

Benefits for students in SBS:

• Better understanding of the scientific method and published articles
  ◦ Helps make science accessible to a wide variety of people, including those who are underrepresented
  ◦ Provides a better education

• Practical research skills such as data analysis and program evaluation

• Exposure to professional conferences
  ◦ Presentation skills (oral and written communication)
  ◦ Meet luminaries in the field
  ◦ Learn about graduate school opportunities, career exploration

• Mentoring relationship with faculty, collaboration and mentoring other students
  ◦ Balance between independent work and collaboration
  ◦ Increases confidence
  ◦ Feeling more integrated in the program
UR is a powerful source of benefits to Faculty, DSU

Benefits for faculty:
• Mentoring relationship is rewarding
• Development of leadership skills
• Ability to develop large projects
• Attend conferences with students
• Students who have a better understanding of the scientific method

Benefits for DSU:
• Students are more likely to go to graduate school and improve the reputation of DSU
• Recognition of DSU and regional, national and international conferences
• Media exposure for research conducted through DSU
• Trains students to work as tutors in research methods and APA writing
• Better retention of students
UR is a powerful source of benefits to Humanities students

Benefits For Students:

Undergraduate Research: The Humanities Problem (Telos vs Techne)
- Acquisition of key core skills that will prove necessary for subsequent research (grad school)
- Breaking stereotype of the cloistered Archivist (Communication skills)
- Understanding the process of ‘simply reading’

Research “Apprenticeships”

Understanding/Developing Their Voice
- Becoming aware of “Silences in the Discipline”
- Provided opportunity to “Speak the Silence”

Make Interdisciplinary Connections
UR is a powerful source of benefits to Humanities Faculty

Benefits for Instructors:
• Encounter Questions that Lead to Larger Research Projects
• Make Interdisciplinary Connections
• Research “Apprenticeships” Provide Possible Collaborative Work.
• Mentoring Students for Work Beyond the Field
Undergraduate Research Office (URO)

academics.dixie.edu/uro/

Conferences – UCUR and Student Research Day
Undergraduate Research Committee information
Mentoring Guidelines
Research Opportunities with Faculty
Guidelines for Abstracts and Presentations
Human Subjects Research
Give to Undergraduate Research
Institutional Review Board (IRB)
dixie.edu/irb

Welcome to the Institutional Review Board (IRB) for Human Subjects Research

The primary mission of the IRB is to ensure the protection of the rights and welfare of all human participants in research conducted by university faculty, staff and students. The IRB review process is guided by federal and state regulations, university policy, and the Belmont Report.
Office of Sponsored Programs (OSP)

academics.dixie.edu/sponsored-programs/

**Mission:** The Office of Sponsored Programs (OSP) supports the Dixie State University mission by advocating externally funded programs that empower faculty, staff, students, and the community by enhancing experiential **learning**, increasing community **engagement**, and navigating unpaved **opportunities**.

- Check out our website: [http://academics.dixie.edu/sponsored-programs/](http://academics.dixie.edu/sponsored-programs/) *(Located under “Academics”, scroll down the menu on the right side.)*

- LOTS of information regarding the “Life Cycle of a Grant”, how to find funding, compliance, forms, FAQs, and so much more

- **GRANTS RESOURCE CENTER** – Faculty Email Alerts (Guidance included in conference app)
“Research is formalized curiosity. It is poking and prying with a purpose.” - Zora Neale Hurston

What are the Benefits of Undergraduate Research?

- Enhances student learning through mentoring relationships with faculty
- Increases retention
- Increases enrollment in graduate education and provides effective career preparation
- Develops critical thinking, creativity, problem solving and intellectual independence
- Develops an understanding of research methodology
- Promotes an innovation-oriented culture
Undergraduate Research as part of the DSU Education

Common themes across disciplines

- Retention and recruitment of students, higher degree completion
- Allows students to apply knowledge to innovative ideas
- Students are more prepared for post-graduate efforts
- Collaboration amongst departments, students, faculty, external
- Student-Faculty interactions that are unlike any experienced during formal classes
- Incorporation into the teaching mission through capstone courses or independent research courses
• What are the advantages of engaging undergraduate students in research, and what challenges are there to getting faculty and students engaged in research?

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• What resources would you like to have available to initiate and grow a sustainable undergraduate research program?