APPROACHES TO ENGAGING DIVERSE STUDENTS IN RESEARCH

Council on Undergraduate Research
The College of New Jersey
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WHAT MATTERS IN COLLEGE?

- The nature of a student's peer group.
- The quantity and quality of interactions with faculty outside the classroom.
- Integration of students' social and academic lives.
- Opportunities to make challenging coursework applicable and relevant.
- Engagement and understanding of the intellectual life and demands of a field or discipline beyond the classroom setting.
- The ability to see future selves.

(Astin, Terenzini, Kuh, and others)

WHAT UNDERGRADUATE RESEARCH DOES

- Integrates students' academic and social lives.
- Increases faculty/student interactions outside the classroom but through a common intellectual activity.
- Makes coursework more relevant and difficult coursework more understandable by providing a context.
- Integrates students academic and social lives.
- Develops a students' critical thinking and problem solving skills for other courses and situations.
- Socializes a student about the demands and rigor of a disciplines and increases a student's ability see oneself in a field or discipline.

CONTINUED

- Helps students understand the demands and rigor of a field.
- Enables students from resource poor high schools to develop skills, tools and experiences with state- of –the- art equipment and the vocabulary of a field.
- Increases the likelihood that students will pursue graduate and/or professional degrees.
- Improves the retention and academic success of diverse students (first gen, women in science, historically underrepresented students, community college transfers,etc.

STUDENT REPORTED BENEFITS

- Develops self-confidence.
- Develops relationships with faculty, graduate students and postdocs.
- Helps students clarify career pathways.
- Develops leadership skills.
- Develops public speaking skills.
- Helps students network.
- Facilitates finding internships and jobs.
- Helps students understand the demands of a field and if it is a good match.
- Changes the content of letters of recommendation.
- (Lopatto, Gregerman)

BENEFITS TO FACULTY AND INSTITUTIONS

- Integrates research and teaching missions.
- Facilitates student recruitment.
- Increases faculty productivity.
- Enables institutions/faculty to secure funding for research, e.g instrumentation and curriculum reform.
- Informs teaching and mentoring of diverse students.
- Enhances the curriculum in all fields with a special impact in STEM fields.

ENGAGING DIVERSE STUDENTS

- Why?
  - Benefits should accrue to all.
  - Need to fill the pipeline – especially in STEM.
  - Need for future mentors.
  - Diversity of perspectives benefits the group.

ENGAGING DIVERSE STUDENTS

- Who ?
  - First generation in college.
  - Historically underrepresented.
  - Lower income.
  - Community college students.
- Barriers
  - Few role models.
  - Need for support from the family.
  - Academic preparedness.
  - Time
    - Job to earn money.
    - Family commitments.
    - Studying.
  - CC: time for faculty mentoring.

THE COLLEGE OF NEW JERSEY

- Residential, primarily undergraduate institution (PUI) with research-active faculty.
- 6500 well-prepared students (most aged 18-22).
  - e.g. Avg. verbal + math SAT = 1250
- 26% non-white students.
  - 7% African-American, 10% Latino/a, 8% Asian, 1% Native American & other.
- Suburban setting in central New Jersey, near Trenton and Princeton.

NATIONAL SCIENCE FOUNDATION

- Biology Directorate.
- URM Program: Undergraduate Research and Mentoring in Biology.
- Formerly UMEB.
- Purpose: to increase the number of students who earn a Ph.D. in Biology, particularly those from underrepresented groups:
  - African-American, Hispanic-American, Native Americans, Native Alaskans, Native Pacific Islanders, persons with disabilities.

NEEDS

BELONGING AND CONNECTION

STRONG PEER GROUP

ROLE MODELS

FAMILY SUPPORT

FINANCIAL SUPPORT

DEVELOPMENTAL, PERSONALIZED MENTORING

GATEWAY TO GRADUATE SCHOOL

in

BIOLOGY

Merit scholarships
Four years of research and mentoring
Preparation for graduate school

The Gateway Scholars

GGSB PROGRAM ELEMENTS

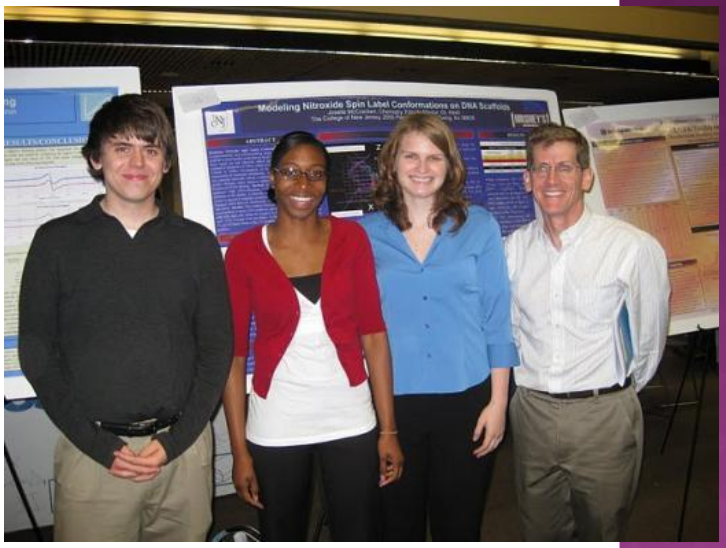
- Freshman year mini-rotations
  - Research readiness.
  - Half-day/week shadowing.
  - Peer mentored.
  - Attend lab meetings.
  - Monthly group meetings (pizza!) and personal advising sessions with Director/Advisor.
  - Monthly assessments by faculty mentor.
  - ¼ course unit per semester.
  - Lab matching in May.

GGSB PROGRAM ELEMENTS cont.

- 6 semesters developmentally mentored research + one summer . . . . . and **$$$**
  - Sophomores : Join a lab as a junior researcher with peer mentor; Develop proposal (1/2 course credit per semester).
  - Summer : TCNJ's MUSE or REU
  - Juniors : Stipend; Research for full course credit per semester; Act as peer mentor; Present at regional meeting.
  - Summer : REU or TCNJ's MUSE
  - Seniors : Stipend; Research for full course credit first semester, ½ course second semester; Act as peer mentor; Present at national meeting; Prepare manuscript.

GGSB PROGRAM ELEMENTS cont.

- Identify as scientists
  - Collaborative research with faculty mentor and lab team.
  - Develop into peer mentors in their labs.
  - Public speaking as a Gateway Scholar.
    - Recruitment at high schools and at TCNJ events.
    - Present at student research. conferences on and off campus.
    - Present at regional and national professional conferences.



GGSB PROGRAM ELEMENTS cont.

- Grad School Application Support.
  - Workshops: identifying programs, contacting mentors, applications, interviewing.
  - GRE prep course.
- Exposure to the research university setting and role models.
  - Site visits: UPenn, Princeton, Rutgers.
  - Invited URM speakers, with dinner.
  - Summer REU at R1 University.

2012: Friday Harbor Labs, Univ. N. Oklahoma/Turkey, Univ. of Kentucky

GGSB PROGRAM ELEMENTS cont.

- Family connection
  - The medical school “problem.”
  - Including parents during part of the GGSB interview.
  - Annual research symposium and banquet with the parents.
  - Mentoring about family-college balance.

http://www.tcnj.edu/~gateway

UNIVERSITY OF MICHIGAN

- 30,000 undergraduate students
- 14,000 graduate students
- 13% underrepresented students (8% African-American, 4% Latino/a, 1% Native American)
- Large public research intensive university.
- 40 minutes from Detroit

UROP PROGRAM

- Focus on first and second year students and community college transfers.
- Academic Year Program
- Involves all schools and colleges.
- Peer advising program
- Diverse students engaged in program.
- Faculty participation in a major undergraduate initiative that has multiple goals including student success and retention.
- Evaluation activities.

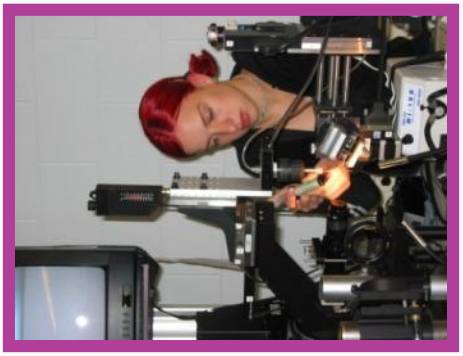
HISTORY OF UROP

- Started in 1989 as a retention program for historically underrepresented students.
- Part of the Michigan Mandate a blueprint for increasing diversity of students, faculty, staff.
- Program started with 15 students and 15 brave faculty members.
- In 1992 opened up to all first and second year students.
- In 2011 we had 1300 program participants.

WHY RESEARCH?

- Literature shows that students from diverse backgrounds do not identify with the academic mission of the institution and/or are not made to feel welcome in the same way that “majority students do.
- Close contact with faculty outside the classroom is key to retention of diverse students.
- Invitations to participate in faculty research is a non-remedial approach to student retention with high expectations for student academic success.
- Development of research skills also develops critical academic skills.
- Invitations to participate in research sends a message to students you belong in this field or discipline.
- Close contact with diverse students outside the classroom provides an important education to faculty about the value of diversity and unique barriers that affect students from different backgrounds.

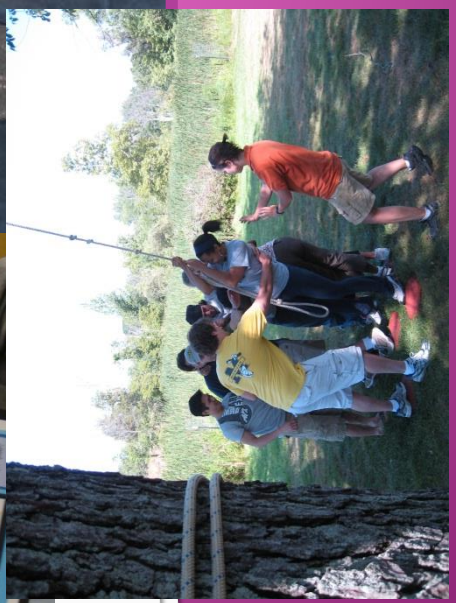
UROP PROGRAM COMPONENTS



RESEARCH ACTIVITIES

- Students spend 6-12 hours per week engaged in research activities with faculty working on new or ongoing faculty research projects. Program uses the apprenticeship model.

INDIVIDUAL PEER ADVISING



PEER ADVISING

- All students are assigned a peer advisor, a UROP alum who meets monthly with students to help them find projects, monitor progress, handle research related issues.
- Serve as liaison to research sponsors.
- Talk about academics from a peer perspective.
- Work with students on time management, communication, etc.

RESEARCH PEER GROUPS

- Students meet twice monthly to share information about research, hear presentations by faculty, postdocs, graduate students and others about research methods, cutting edge research, discuss research ethics and integrity, participate in skill building workshops, etc.

RESEARCH SYMPOSIUM

SKILL BUILDING WORKSHOPS

- Introduction to Scholarly Resources in the Library (humanities, social sciences, engineering, physical sciences, biomedical and life sciences, etc.)
- Endnote/RefWorks
- GIS
- Matlab
- Excel
- SPSS
- STATA
- NVIVO
- Keeping a Laboratory Notebook
- Animal Handling
- OSEH Laboratory and Radiation Safety

FALL SYLLABUS

Project Search

- Research Sponsor Expectations
- Classroom vs. the lab or research setting

Designing a Research Project

Reading the Peer Reviewed Literature in the Field

Research Methods in Your Discipline

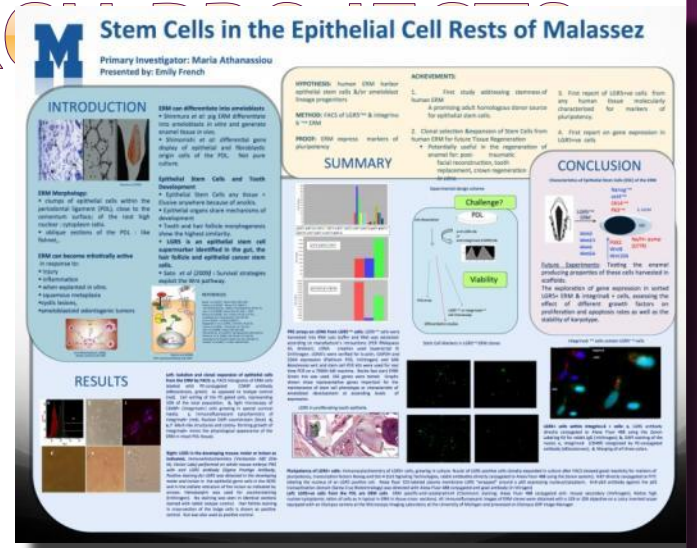
Part I and Part II (survey, experimental design, case studies, community based research, simulations, field research)

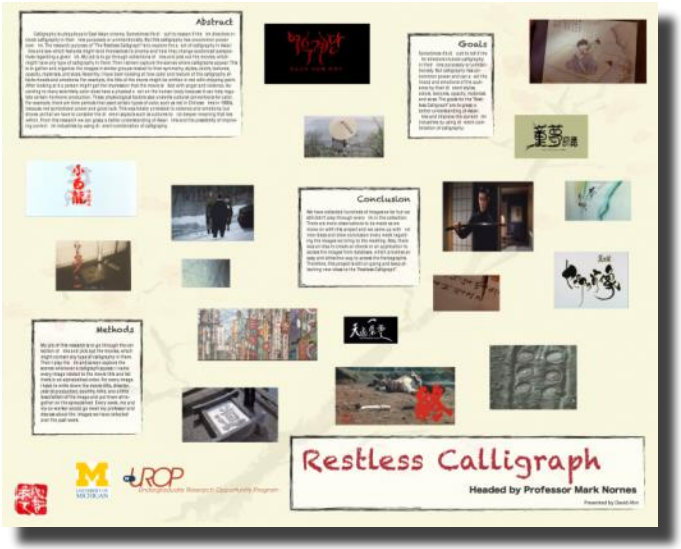
Research Integrity and Responsibility

WINTER SYLLABUS

- MLK Symposium
- Multicultural Issues in Research
- Research Fieldtrips
- Interdisciplinary Research
- Career Fair
- Research Symposium

EXAMPLES OF RESEARCH PROJECTS





RESEARCH ACTIVITIES

- Computer-aided Design, Modeling and Programming
- Literature Reviews and other library research
- Laboratory experiments
- Website design and development
- Transcription and coding
- Conducting simulations and experiments
- Cataloging, coding, and analysis
- Survey design and administration
- Conducting interviews
- Materials collection and analysis

- Computer Programming
- Field Testing
- Conducting simulations and experiments
- Data cataloging, coding, and analysis

STUDENT RECRUITMENT

- Mailings
- Presentations at campus visitation days
- Information Sessions
- Student Organizations
- Word of mouth
- Social Media
- Academic Advisor referrals

FACULTY RECRUITMENT

- Mailings
- Emails
- Presentations at Faculty Meetings
- Colleague referrals
- Word of mouth
- Letters to new faculty
- Table at new faculty orientation

STUDENT PARTICIPATION/COMPENSATION

- Work-study funding
- Academic Credit
- Grants

EXAMPLES OF PROJECTS

- Organometallic Chemistry
- Horizontal Gene Transfer of Antibiotic Resistance Genes in Acinetobacter Biofilm
- Nanoparticle Biomedical Sensors and Effectors (Actuators)
- Mechanism of drug release in nanotechnology-based targeted delivery of anticancer drugs
- Economic Decision making
- Fiction Writers Review
- Climate Change and Adaptation
- China in Africa
- Studies of Mobility Assessment and Enhancement in Older Adults
- Religion and Politics
- Argumentation in Foreign Policy

UROP

MICHIGAN COMMUNITY COLLEGE SUMMER FELLOWSHIP PROGRAM

MICHIGAN COMMUNITY COLLEGE SUMMER RESEARCH FELLOWSHIP PROGRAM

- Six years ago received funding from the Jack Kent Cooke Foundation to improve transfer rates and transfer student success
- Recruit students from all Michigan community colleges
- Students can participate up to a year before planning to transfer or the semester before they are to matriculate to UM
- Summer program
- Ten weeks, full time

JACK KENT COOKE FELLOWSHIP PROGRAM FOR COMMUNITY COLLEGE STUDENTS

- Funded by the Jack Kent Cooke Foundation
- Research as transition to University setting
- Michigan Community Colleges
  - Admitted Transfers
  - Prospective
  - Uncommitted
- Any discipline or major
- Varied research disciplines
- Includes some non-tradiotional

PROGRAM COMPONENTS

- 20-40 hrs/wk for 10-12 weeks during summer with UM faculty member
- Biweekly seminars
  - Admissions
  - UM Culture
  - Financial aid
  - Role of research
  - Time management

  Research Skill Building Workshops
- E-portfolio
- Symposium

PROGRAM IMPACT

- 90% of students subsequently transfer
- Transition is still challenging but have faculty champion/mentor and cohort
- 90% of past participants have graduated
- 50% have gone on to graduate or professional school
- 90% continue with same sponsor once they transfer
- Faculty sponsors are requesting community college transfers following summer

M-PORTFOLIO PILOT

HTTP://MPORTFOLIO.UMICH.EDU/SHOWCASE.HTML

UROP is incorporating the use of portfolios to help students reflect on the experiences they are having as undergraduate researchers. The Portfolio Process encourages students to ask questions essential for leadership and developing lifelong learning skills:

- Who am I becoming?
- What am I learning?
- What knowledge, skills and strengths am I developing?
- What can I do?
- How will I make a difference?

The portfolio process helps students approach problems strategically and collaboratively. Students learn to:

- Connect knowledge gained from real-life experiences (research) and from academic courses
- Reflect on learning that has occurred both within and beyond the classroom
- Develop the knowledge, skills and awareness needed for professional competence and leadership
- Connect learning with personal values, a sense of purpose and goals for the future

Faculty Quotes:

•"Kayla exceeded my expectations. She took initiative in her research, finding both people to interview or to help her, and a variety of resources to pursue. She was patient and persistent. She kept careful records of her sources and was able to fulfill every writing and organizational assignment I gave her. She accepted feedback well... Kayla did a great job getting our project started, and laying the groundwork for the next research assistant.“

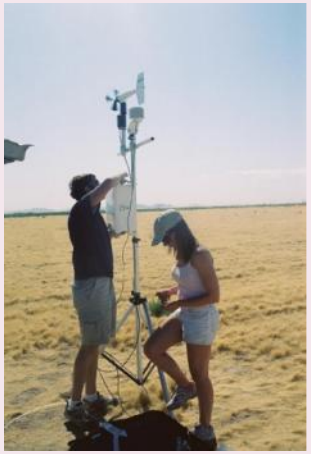
•"Austin came in with some specific skills (microcontroller programming) that we were in great need of. He was able to figure many things out on his own and produced usable output with minimal guidance. Over time, I came to trust him more than any other student (including my grad students) when it comes to directly working with hardware."

•"In only a few weeks Akshay doubled the size and depth of my database on ancient and modern views of ancient Africa by reading books I had read and assigned him to summarize. Akshay also showed initiative in selecting additional materials, mostly books, some of which I had not heard about, but also articles from newspapers, websites, etc., and producing summaries of those as well. Akshay and I began collecting all these summaries into a chapter draft, which will be instrumental in **securing my book a contract with a major press...**

STUDENT RECRUITMENT

- Mailings to community college counselors.
- Presentations to community college counselors.
- Word of mouth from other students.
- E-mail very effective when channeled through advisors, faculty, etc.
- Lots of phone calls and personal meetings.

ASSESSMENT AND EVALUATION



OUR RESEARCH QUESTIONS

1. To what degree does UROP enhance the retention of underrepresented students through to graduation?
2. To what extent does undergraduate research increase student integration and socialization into a field/campus academic life?
3. What role does undergraduate research play in students' decisions to pursue graduate education?
4. Does this differ for different groups by race and gender?

MULTI-METHOD AND APPROACH TO ASSESMENT AND EVALUATION

- Quantitative research: surveys, retention studies using registrar data
- Qualitative Research: focus groups, individual interviews
- Experiential Sampling Studies
- Mixed-methods
- Registrar Data

ORIGINAL RETENTION STUDY

- Established experimental and control groups: UROP participants and UROP applicants matched by gpa, test scores, high school profile, race and gender
- Pre and post surveys using a set of established measures and scales
- Registrar data
- Sample size: 1280 students

FINDINGS

- UROP participation increases retention rates for some students
- Retention rates were strongest for African American students and for sophomore participants
- UROP participation increases degree completion for African-American males (75.3 % UROP vs. 56.2% for non-UROP)

FOCUS GROUP FINDINGS

- Students in the focus groups discuss their experiences in 3 distinct ways: proactive, reactive, and inactive.
- UROP students made 50% of the proactive comments
- UROP students are more likely to discuss anticipating future events such as graduate school.
- UROP students see faculty and graduate students as positive influences and helpful.
- UROP students are more likely to iniatiate/network activity with people than non-UROP students.

METHODS USED

- Created experimental and control group
- Invited students to come talk about their first year experience at UM
- Asked questions such as how did they view faculty and graduate assistants
- How did they handle academic challenges in key SMET courses
- What resources do they use on campus?
- Etc.

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ALUMNI SURVEY

- Longitudinal study of alumni to determine if undergraduate research was an important determinate in students attending graduate school
- Experimental and control groups of UROP and non-UROP students
- Sample size 281 students
- Students were sent surveys asking questions about undergraduate experiences and current activities

ALUMNI SURVEY FINDINGS

- Students who participated in undergraduate research (UROP or other)were significantly more likely to go on to graduate and professional school (82% vs. 56%).
- UROP students more likely to pursue medical, law, or Ph.D. programs than control students.
- There are no differences across race and gender indicating undergraduate research participation equalizes pursuit of graduate education by group.

BEEPER STUDY

- This study was initiated because what you learn from research is that you always have more questions.
- We really wanted to tease out what academic behaviors led to our retention results
- Our evaluation colleagues were psychologists and they liked this experimental design

BEEPER STUDY

- This study was an innovative study designed to assess “real-time” student behavior
- Experimental and control groups
- Beeping watches were triggers to complete diary/survey of what they were doing when the watch beeped.

FUNDING FOR RESEARCH

- Initial funds came from U.S. Department of Education(FIPSE) and the State of Michigan's Office of Equity
- NSF Recognition Award
- Provost's Office currently funding
- New NSF grant leveraged by existing dataset

PUBLICATIONS

- Undergraduate student faculty research partnerships affect student retention; Biren A. Nagda, et al; The Review of Higher Education, Fall 1998; Vol. 22, no. 1, pp 55-72.

- The Relationship of Undergraduate Research Participation to Graduate and Professional Education Pursuit: An Empirical Study; Russel S. Hathaway, et al; Journal of College Student Development; Sept/Oct 2002; Vol. 43 no. 5; pp. 614 – 631.


Eat Local Food