

Promising Practices in STEM Education
Washington, D.C.

**THE ROLE OF
UNDERGRADUATE
RESEARCH IN STUDENT
RETENTION AND ACADEMIC
SUCCESS**

What matters in college?

- ž The nature of a student's peer group.
- ž The quality and quantity of interactions with faculty outside the classroom.
- ž Integration of academic and social activities.
- ž Opportunities to make coursework relevant.

What undergraduate research does?

- ž Increases faculty/student interactions outside the classroom.
- ž Increases students' involvement in their learning.
- ž Addresses different learning styles.
- ž Changes their peer group.
- ž Provides opportunities to see the entire academic pipeline.
- ž Makes difficult coursework more relevant.



Student Reported Benefits

- ž Develops self-confidence
- ž Develops relationships with faculty, postdocs, graduate students.
- ž Helps students clarify his/her career path.
- ž Socializes student into a discipline.
- ž Develops leadership skills.
- ž Provides opportunities for students from resource poor high schools, etc. to become familiar with state of the art equipment.

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- Helps student understand the demands of a field.
- Develops a student's ability to solve technical and procedural issues.
- Changes the content of letters of recommendation.

Lopatto/Gregerman et. al

University of Michigan Demographic Profile

- ž 25,000 undergraduate students
- ž 23% underrepresented students
- ž 9% African-American, 4% Latino/a, 10% Asian American
- ž Large public, research intensive university
- ž 40 minutes from Detroit

Program Rationale

- ž Students from diverse backgrounds do not identify with the academic mission of the institution and do not feel welcome.
- ž Close contact with faculty outside the classroom is key to retention for diverse students.
- ž Invitations to participate in faculty research says to students you belong in this field, school, and college.
- ž Undergraduate research is a non-remedial approach to student retention.

Program Rationale....

- ž Development of research skills also develops critical academic skills.
- ž Close faculty contact with diverse students will educate faculty about the value of diversity in the academy and about barriers facing diverse students (specifically those students underrepresented in their fields.)

UROP Program

- ž Focus on first and second year students
- ž Academic Year Program
- ž Involves all schools and colleges.
- ž Peer advising program
- ž Multicultural groups and emphasis on multicultural aspects of research.
- ž Faculty participation in a campus wide retention effort.
- ž Evaluation activities.



UROP Program Components

Research activities

Students spend 6-12 hours per week engaged in research activities

Individual Peer Advising

All students assigned a peer advisor, meet monthly to follow progress of research project, talk about academics, etc.

More

z Research Peer Groups

Students meet twice monthly to share information about research, hear presentations about cutting edge research, discuss research ethics and integrity, participate in skill building workshops.

Research Symposia



ž Research Peer Groups

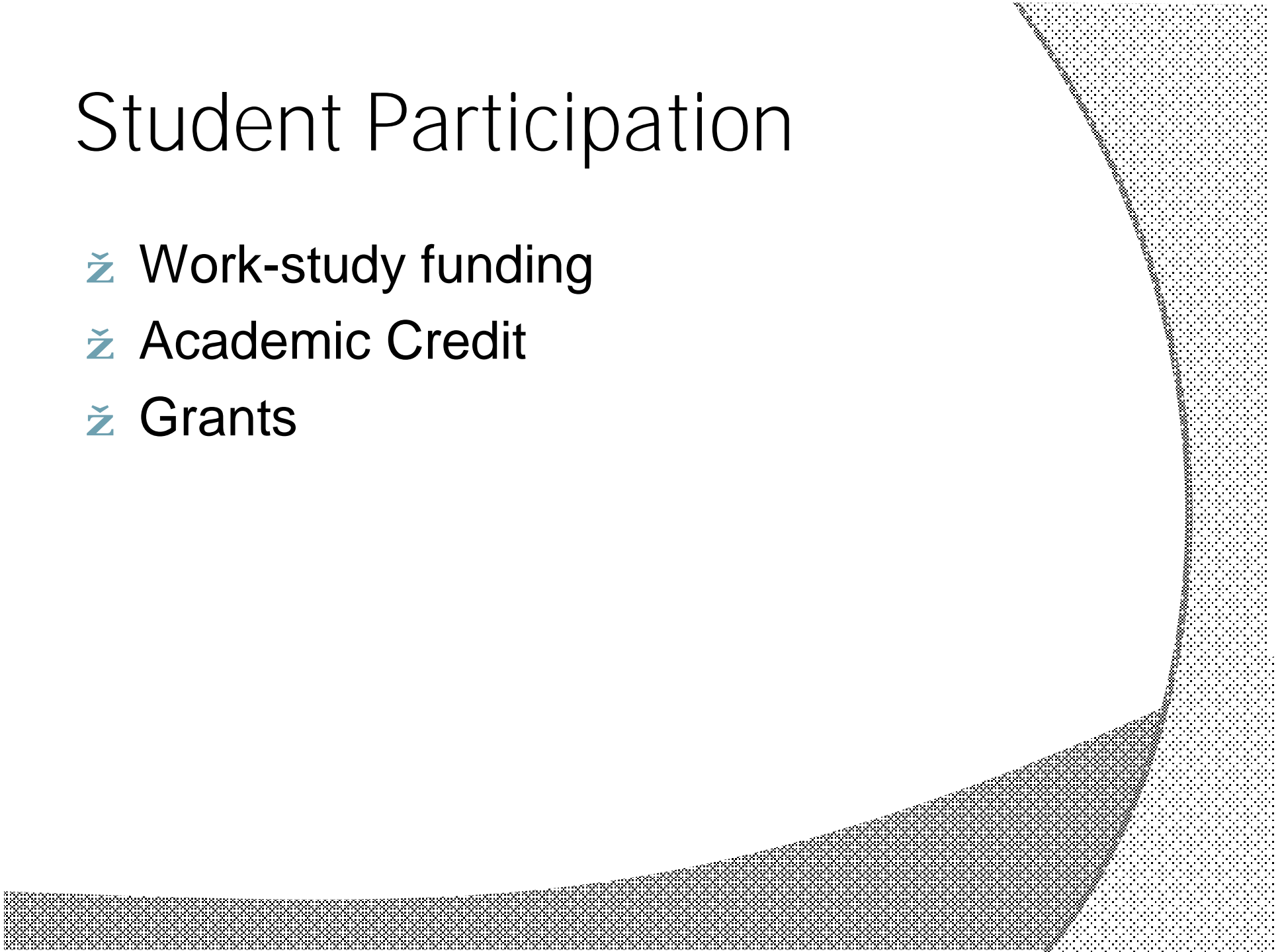
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ž Research Symposia



Student Participation

- ž Work-study funding
- ž Academic Credit
- ž Grants



Skill Building Workshops

- ž Library and Web Research
- ž EndNote
- ž SPSS Workshops
- ž Web page design
- ž PowerPoint Presentations
- ž Computer Workshops (html,programming)
- ž GIS
- ž Matlab



Examples of Research Projects

- ž **Investigating the Sources, Chemistry, Transport, and deposition of mercury in the Great Lakes (Public Health)**
- ž **Test Methods for Characterization of Asphatene Precipitation (Chemical Engineering)**
- ž **Gene Therapy Development Using Transgenic Mouse Models (Medical School)**
- ž **Parameter Space Analysis of Particle Physics Models Derived from String Theory (Physics)**
- ž **Theoretical Analysis of Ultrafast Photochemical Ring-Opening Reaction (Physics)**
- ž **A Study of the Relationship Between Tropospheric Ozone and Other Pollutants and Atmospheric Temperature (AOSS)**
- ž **Capillary Electrophoresis of Proteins (Chemistry)**
- ž **Structure Property Relations in Magnetic Oxides (Chemistry)**



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 Approach to Assessment and Evaluation

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

Original Retention Study

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

- ž Series of group interviews with students in your program and not in your program
- ž Develop set of questions that will lead to discussions about significant academic experiences on campus that are or did influence academic decisions
- ž Ask more specific questions about your program

Methods Used

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

Focus Group Findings

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



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

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

Beeper Study

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

Findings

- UROP students spend significantly more time talking with professors, participating in academic discussions, working, and studying.
- African-American UROP students spend more time in class than non-UROP African-American students.
- Non-UROP students spend more time socializing and performing personal maintenance (sleeping, chores, exercise)



