

# **Engaging Community College Students in Authentic Scientific Research**

Thomas Higgins, Harold Washington College

David Brown, Southwestern College

Kelly McConnaughay, Bradley University

# Overview

- I. Introductions – 5 minutes
- II. Three Programs that Work – 35 minutes
- III. Discussion in Groups – 25 minutes
- IV. Debrief and Wrap-Up – 10 minutes

# Introductions

- Who are you?
- Where are you from?
- What do you hope to take away from this session?

# Vital Statistics of 2YCs

- 73% of all undergraduates attend a 2YC
- 2YCs enroll 46% of all undergraduates
  - 47% of all Blacks
  - 56% of all Latinos
  - 48% of all Asian/Pacific Islanders
  - 57% of all Native Americans
- 40% of all recent STEM graduates
- 40% of all future K-12 teachers

# Common Themes

2YC UGR Must be:

- Student Centered
- Linked to Institutional Mission
- Collaborative

**Undergraduate Research at  
Harold Washington College  
and the  
City Colleges of Chicago**

Thomas Higgins

Associate Professor of Chemistry

# Harold Washington College

## Enrollment (2002)

- Headcount: 11,831
  - Black: 44%
  - Hispanic: 21%
  - Asian: 12%
  - White: 22%
  - Other: 1%
- FTE: 4,418



One of the  
City Colleges of  
Chicago

# Structured by Student Needs

## UNDER-PREPARED

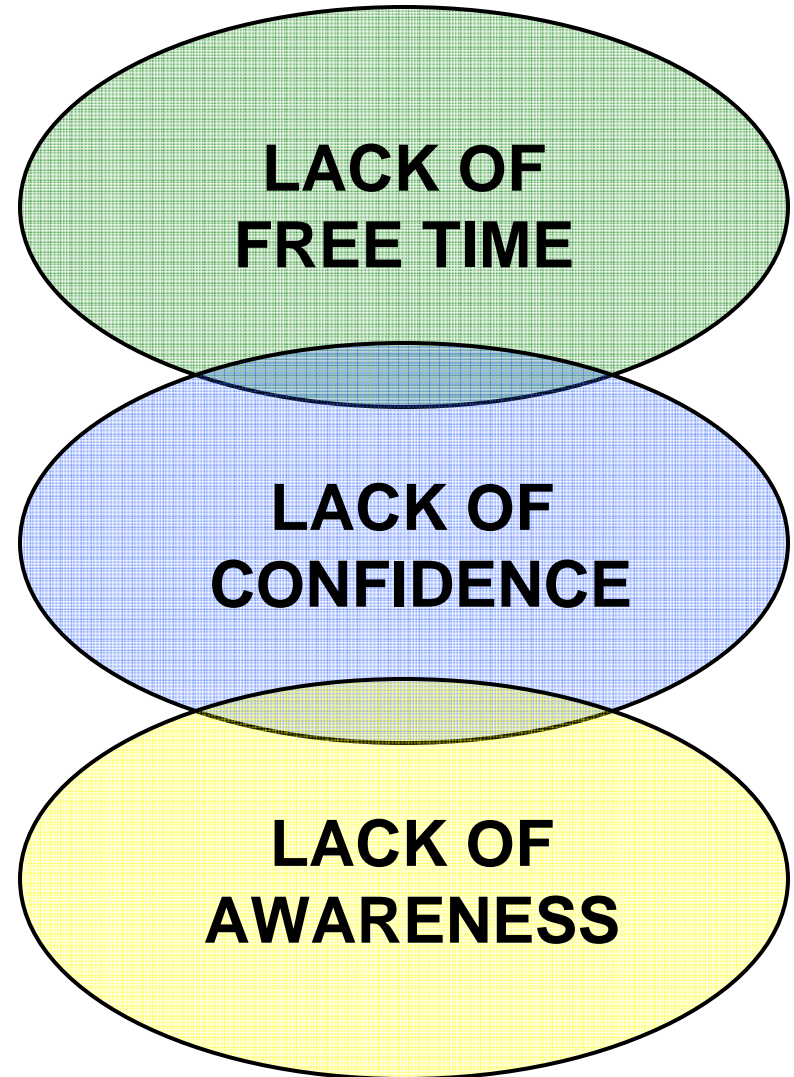
- First Generation (45%)
- Open Enrollment

## FINANCES (39% on aid)

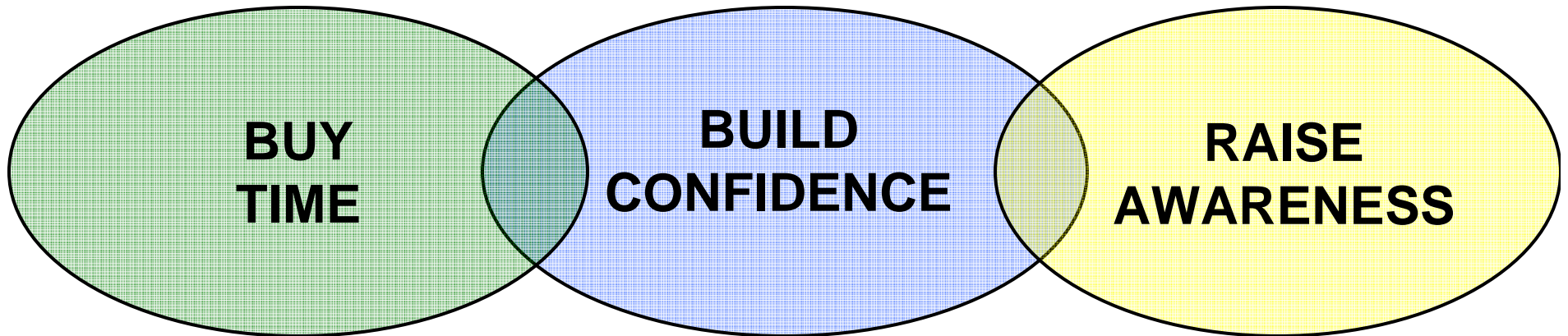
- Part-time Students (62%)
- Work Outside Jobs (58%)

## FAMILY

- Non-Traditional
- Parents and Parenting

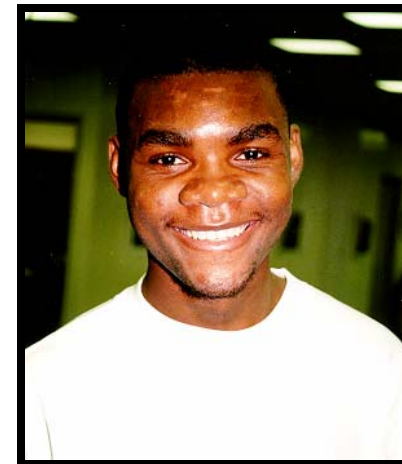


# Structured by Student Needs



- Enroll Students in Research Course (2-3 hrs)
- Pay Stipends (\$10-\$15/hour)
- Individual Research Projects
- Use “Research-Rich” Instructional Methods
- Hold Research Seminars
- Travel Off-Campus for “Working Weekends”

# Core Features



**Scientifically Proficient**



**Scientifically Literate**

Research Rich Instruction

- Imbedded Research
- Training Research
- Individual Projects



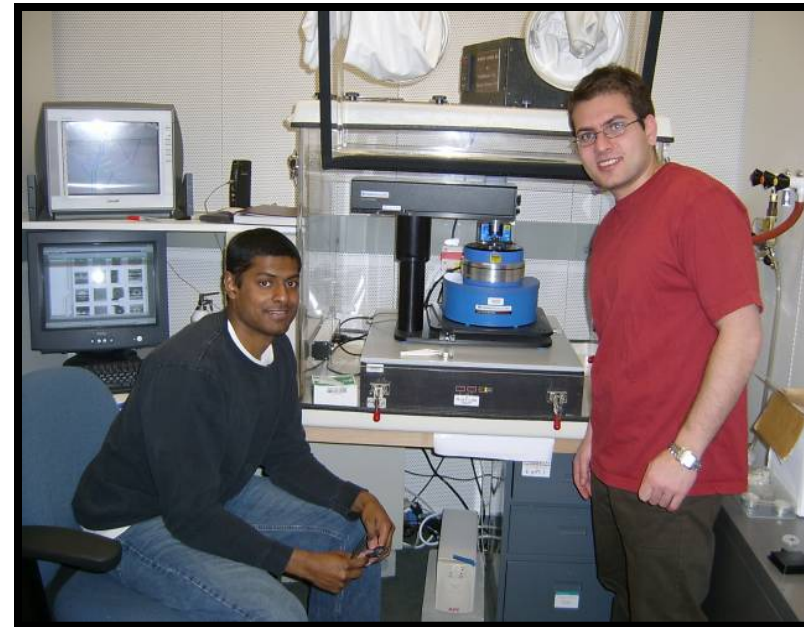
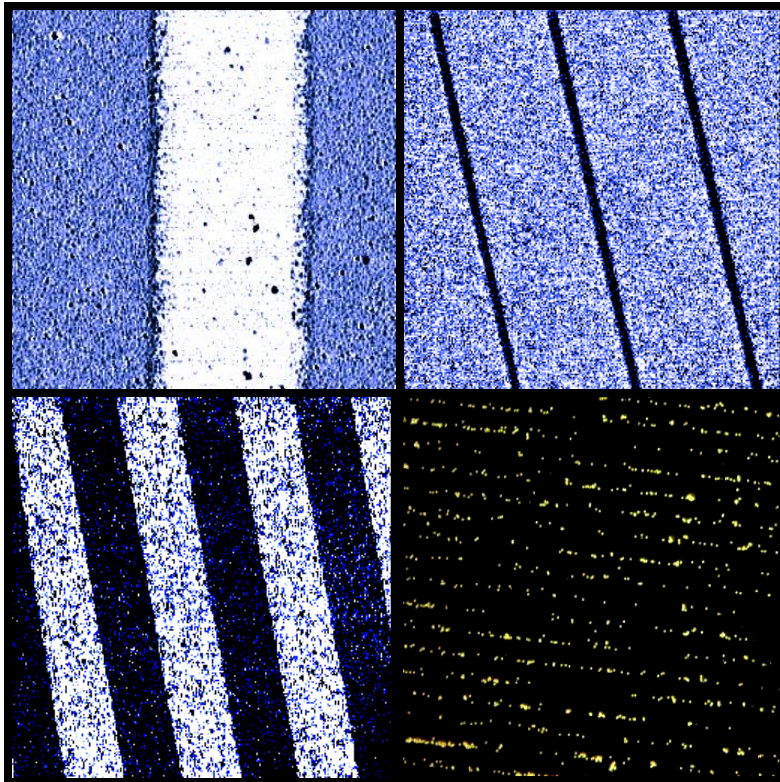
**Scientifically Naive**

Inquiry-Based Instruction

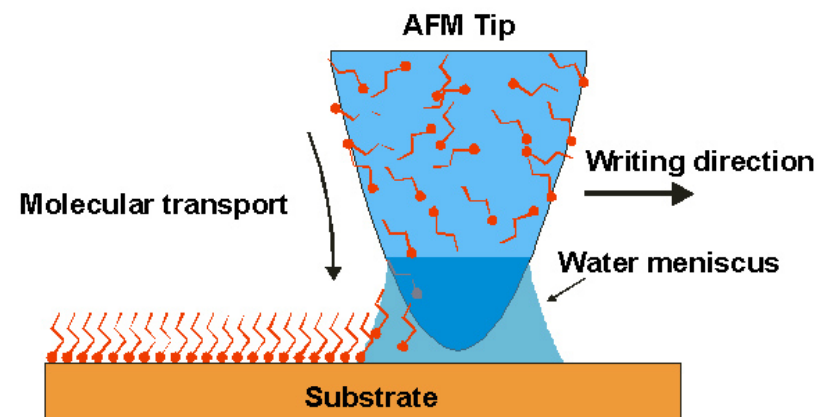
- Modules
- POGIL
- Case Studies

# Research is Authentic

## Nanoscale Phase Separation



*J. Am. Chem. Soc.* **2005**,  
127, 11283-11287.



# Collaborations Broaden Horizons



# Research is Transformative

## ACADEMIC (Seymour & Lapatto)

- Increased Confidence in General
- Gains in Problem Solving Ability
- Greater Understanding of Scientific Process

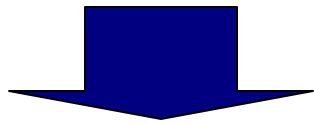
## SOCIAL/PERSONAL (Cheda and others)

- Measure Success in Terms of Personal Growth
- Choose to Spend Time Doing Science!!!
- Project Impacts Life Outside Classroom

# Research is Transformative

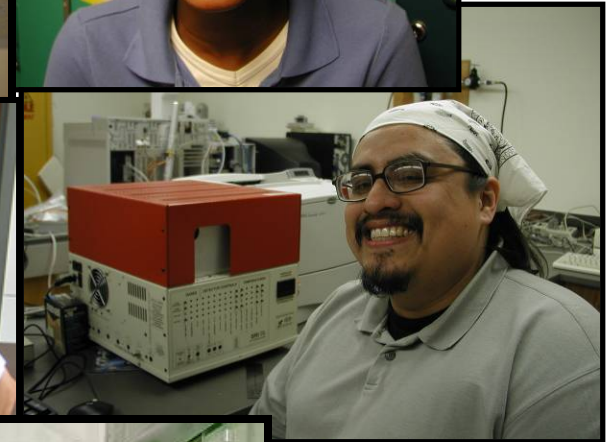
18 students

- 9 Female
- 6 Black
- 7 Hispanic



18 students

- 6 STEM major
- 2 STEM workforce
- 2 Health sciences
- 5 Still at HWC
- 3 MIA???



# Successes Breed Success

## NSF – Undergraduate Research Collaborative

- 1 of 5 in the country
- 10 Chicago-area Community Colleges
- 3 Baccalaureate-Granting Institutions
- Support for over 300 students!!!  
(Now over 400 with institutional support!)
- *Potential to become a national model*

# Thank You

[tbhiggins@ccc.edu](mailto:tbhiggins@ccc.edu)

# Creating a Research Environment for Students at a Community College



**David R. Brown, Ph.D.**  
**Southwestern College Department of Chemistry**  
**Chula Vista, California**

**AAC&U Conference**  
**Long Beach, CA April 21, 2007**

# Outline

- **Overview of Southwestern College and the Chemistry Department**
- **Why do Research at a Community College?**
- **Institutional Challenges**
- **Establishing Collaborations**

# The College and the Department of Chemistry



## The College

Located in southern San Diego County, CA (8 miles from US-Mexico border)

Enrollment of ~18,000 students; Average age = 26; 57% Female; 43% Male

58% Hispanic; 17% Asian/Filipino/Pacific Islander; 5% African-American

## The Department

Four full-time faculty members

Typically 6-9 part-time faculty members in a given semester

Serves ~500 students each semester

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# Why Perform Research?

- **Inherent pedagogical value to the student.**
  - **Provide a deeper understanding of scientific principles and the scientific method.**
  - **Development of critical thinking skills.**
  - **Instill an enthusiasm and excitement to explore science.**
  - **Offer a glimpse of the “big picture.”**
- **Allows faculty to keep current in field.**
- **Potential of making a contribution to knowledge base of science and technology.**

# Recent Reports about Research at Two-Year Colleges

## Association Report: 2YC<sub>3</sub>

### Underground Existence of Research in Chemistry in Two-Year College Programs

by Onofrio G. Gaglione

www.JCE.DivCHED.org • Vol. 82 No. 11 November 2005 • Journal of Chemical Education **1613**

edited by  
John Kenkel

Southeast Community College  
Lincoln, NE 68520-1227

## Chemical Education Today

## Association Report: 2YC<sub>3</sub>

### Undertaking Chemical Research at a Community College

by David R. Brown

**970** Journal of Chemical Education • Vol. 83 No. 7 July 2006 • www.JCE.DivCHED.org

edited by  
John Kenkel


Southeast Community College  
Lincoln, NE 68520-1227

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# Institutional Challenges

- **Financing research activities**
- **Acquiring the tools to undertake research**
- **Gaining the support of administrators**
- **Recruiting qualified student assistants**

# NSF Grant DUE 9850951

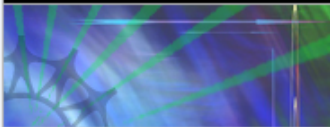
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**Award Abstract #9850951**  
**Instrumentation to Enhance the Chemistry Curriculum at Southwestern College**

|                                |   |
|--------------------------------|---|
| <b>NSF Org:</b>                | DUE   |
| <b>Initial Amendment Date:</b> | June 18, 1998   |
| <b>Latest Amendment Date:</b>  | June 18, 1998   |
| <b>Award Number:</b>           | 9850951   |
| <b>Award Instrument:</b>       | Standard Grant  |
| <b>Program Manager:</b>        | Myles G. Boylan<br>DUE Division of Undergraduate Education<br>EHR Directorate for Education & Human Resources |
| <b>Start Date:</b>             | July 1, 1998  |
| <b>Expires:</b>                | June 30, 2001 (Estimated)   |
| <b>Awarded Amount to Date:</b> | \$73426   |
| <b>Investigator(s):</b>        | David Brown dbrown@swccd.edu(Principal Investigator)  |

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# NSF Grant DUE 0101729



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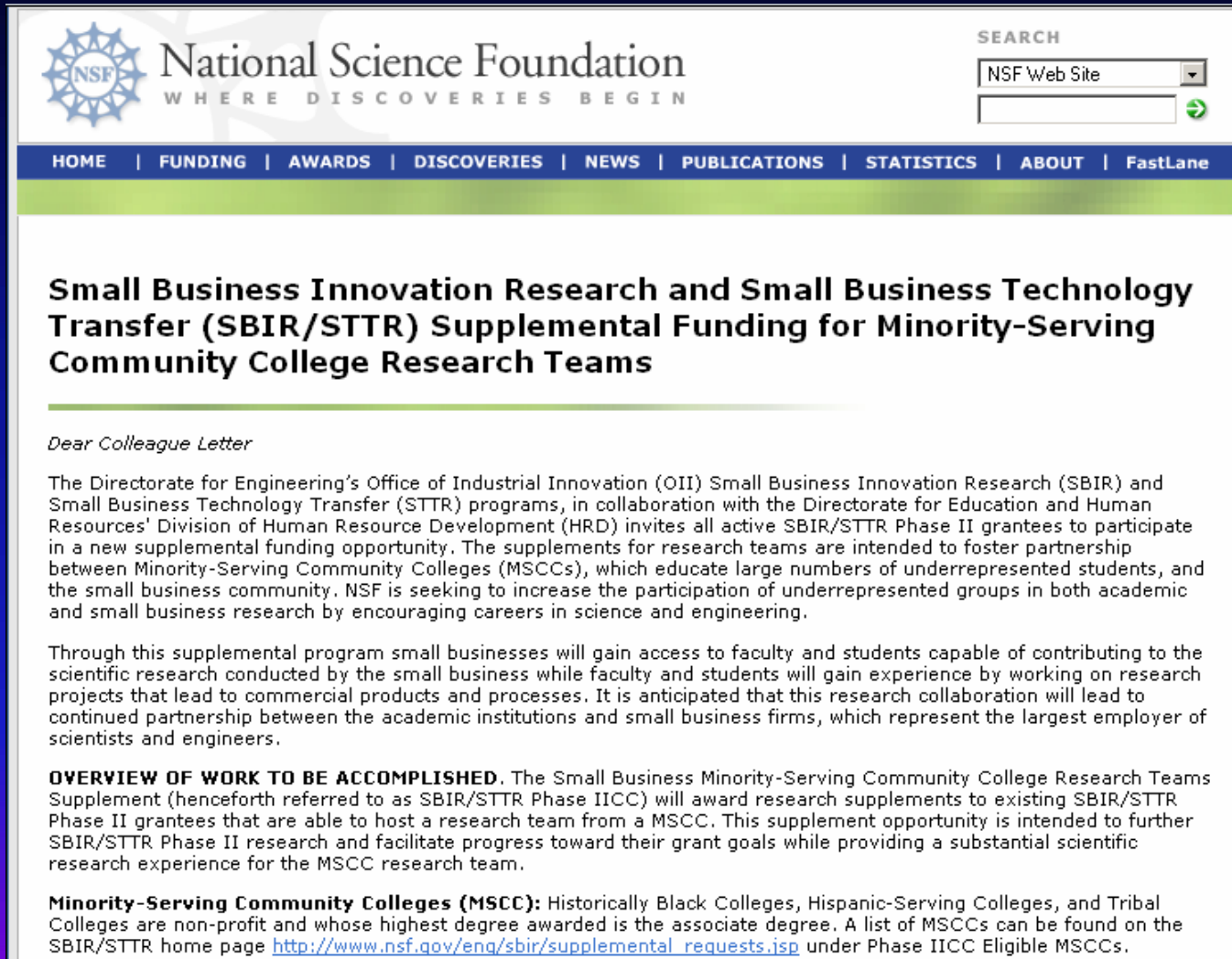
### Award Abstract #0101729

#### Establishing a Program in Chemical Technology at Southwestern College

|                                |   |
|--------------------------------|---|
| <b>NSF Org:</b>                | DUE   |
| <b>Initial Amendment Date:</b> | May 2, 2001   |
| <b>Latest Amendment Date:</b>  | March 14, 2005  |
| <b>Award Number:</b>           | 0101729   |
| <b>Award Instrument:</b>       | Standard Grant  |
| <b>Program Manager:</b>        | Harry Ungar<br>DUE Division of Undergraduate Education<br>EHR Directorate for Education & Human Resources |
| <b>Start Date:</b>             | May 15, 2001  |
| <b>Expires:</b>                | July 31, 2005 (Estimated)   |
| <b>Awarded Amount to Date:</b> | \$211615  |
| <b>Investigator(s):</b>        | David Brown dbrown@swccd.edu(Principal Investigator)  |

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<http://www.nsf.gov/pubs/2006/nsf06008/nsf06008.jsp>



The screenshot shows the NSF website header with the logo and tagline "National Science Foundation WHERE DISCOVERIES BEGIN". A search bar is visible with "NSF Web Site" selected. A navigation menu includes links for HOME, FUNDING, AWARDS, DISCOVERIES, NEWS, PUBLICATIONS, STATISTICS, ABOUT, and FastLane. The main content area features the title "Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) Supplemental Funding for Minority-Serving Community College Research Teams" and a "Dear Colleague Letter" section. The letter text describes a funding opportunity for research teams involving Minority-Serving Community Colleges (MSCCs) and small businesses. It includes an overview of the work to be accomplished and a definition of MSCCs.

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## Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) Supplemental Funding for Minority-Serving Community College Research Teams

*Dear Colleague Letter*

The Directorate for Engineering's Office of Industrial Innovation (OII) Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs, in collaboration with the Directorate for Education and Human Resources' Division of Human Resource Development (HRD) invites all active SBIR/STTR Phase II grantees to participate in a new supplemental funding opportunity. The supplements for research teams are intended to foster partnership between Minority-Serving Community Colleges (MSCCs), which educate large numbers of underrepresented students, and the small business community. NSF is seeking to increase the participation of underrepresented groups in both academic and small business research by encouraging careers in science and engineering.

Through this supplemental program small businesses will gain access to faculty and students capable of contributing to the scientific research conducted by the small business while faculty and students will gain experience by working on research projects that lead to commercial products and processes. It is anticipated that this research collaboration will lead to continued partnership between the academic institutions and small business firms, which represent the largest employer of scientists and engineers.

**OVERVIEW OF WORK TO BE ACCOMPLISHED.** The Small Business Minority-Serving Community College Research Teams Supplement (henceforth referred to as SBIR/STTR Phase IICC) will award research supplements to existing SBIR/STTR Phase II grantees that are able to host a research team from a MSCC. This supplement opportunity is intended to further SBIR/STTR Phase II research and facilitate progress toward their grant goals while providing a substantial scientific research experience for the MSCC research team.

**Minority-Serving Community Colleges (MSCC):** Historically Black Colleges, Hispanic-Serving Colleges, and Tribal Colleges are non-profit and whose highest degree awarded is the associate degree. A list of MSCCs can be found on the SBIR/STTR home page [http://www.nsf.gov/eng/sbir/supplemental\\_requests.jsp](http://www.nsf.gov/eng/sbir/supplemental_requests.jsp) under Phase IICC Eligible MSCCs.

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# The Instrument Laboratory



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# 300 MHz NMR Spectrometer



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# Generating Institutional Support

## MEMORANDUM OF UNDERSTANDING BETWEEN SOUTHWESTERN COMMUNITY COLLEGE DISTRICT AND THE SCHOOL OF MATHEMATICS, SCIENCE, AND ENGINEERING

Southwestern Community College District (hereafter referred to as the “SWC”) and the School of Mathematics, Science, and Engineering (hereinafter referred to as the “MSE”) hereby enter into this Memorandum of Understanding and agree as follows:

**Term of Agreement:** The period covered by this Agreement begins on August 11, 2006 and terminates June 30, 2007.

Whereas student research carried out under the supervision of SWC math, science, and engineering faculty is a unique opportunity to enhance student learning, promote critical thinking, and foster an understanding of how ‘real’ science is conducted and;

Whereas SWC students majoring in math, science, and engineering have identified participation in a research internship as one of the top factors contributing to their academic success and;

Whereas the opportunity for students to present and defend their research findings at a national conference allows them to experience the challenge and exhilaration of real science and...

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# Establishing Collaborations

- **Communication with researchers at local four-year institutions, industry, and government agencies.**
- **Interdisciplinary projects within our own institutions.**

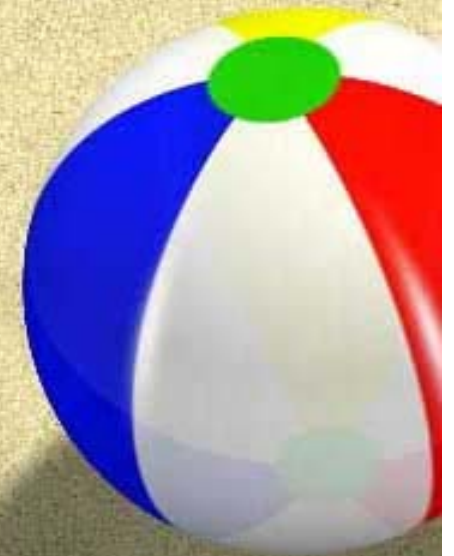
**THANK YOU**

**dbrown@swccd.edu**

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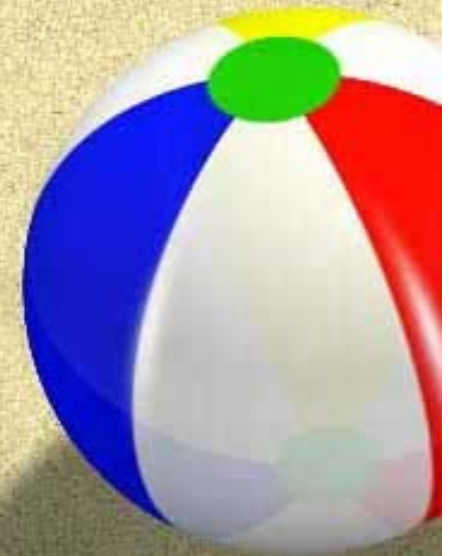
# Undergraduate Research with Community College Students

a 4 year institution's perspective



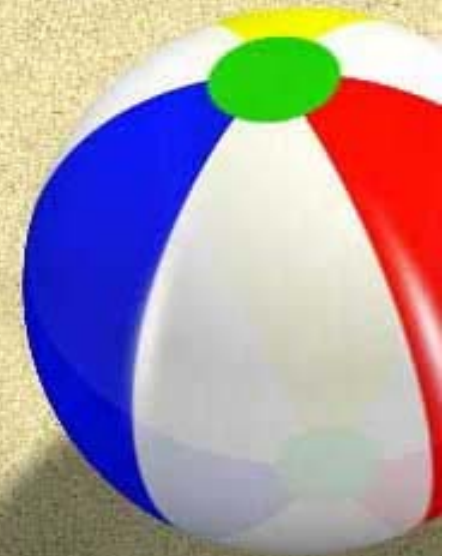
# Bradley University

- Medium-sized, 4-year comprehensive
- Some graduate programs, no PhD programs
- More selective
- Biology program stresses investigative curriculum
- 80% of Biology majors do undergrad research
- Community of Scholars model



# Bradley University

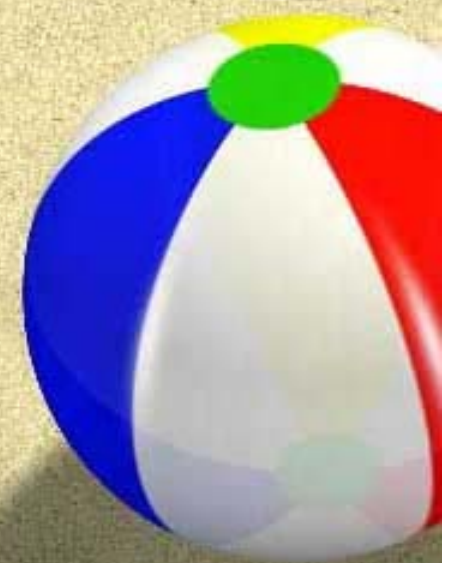
- Medium-sized, 4-year comprehensive
- Some graduate programs, no PhD programs
- More selective
- Biology program stresses investigative curriculum
- 80% of Biology majors do undergrad research
- Community of Scholars model
  
- Currently at 25% transfer students
- Lower retention in transfer population



# NSF's Research Experience for Undergraduates (REU) Site

## Program outline

- 6 students, 10 weeks in summer
- 1 or 2 student per mentor
- students receive stipend, housing, travel
- faculty receive a mentoring opportunity



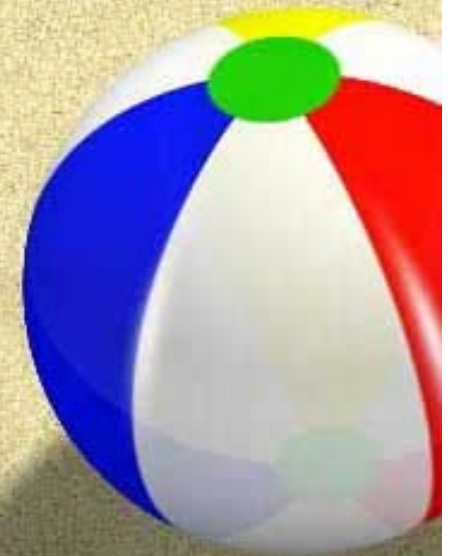
# NSF's Research Experience for Undergraduates (REU) Site

## Program outline

- 6 students, 10 weeks in summer
- 1 or 2 student per mentor
- students receive stipend, housing, travel
- faculty receive a mentoring opportunity

## Student participant composition

- <50% from home institution
- underrepresented groups encouraged
- 2-year college students encouraged



# Did including 2-year college students fit with our overall REU objectives?

- Engage students in meaningful scholarship
- Serve community needs
- Contribute to our own scholarship



# Things to consider

Selecting projects & mentors

Recruiting students

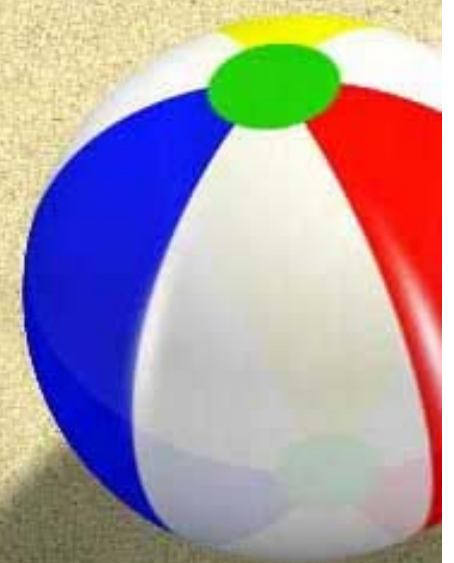
Pairing/prepping students & mentors

The first week

Intellectual engagement

Building community

Follow through & assessment



# QUESTIONS

1. What benefits result from engaging 2YC students and faculty in research?
2. What are some of the barriers to engaging 2YC students and faculty in research?
3. What resources are needed to start a research program for 2YC students?
4. How can collaborations support and sustain research at 2YCs?