Excellence, Opportunity, and the Future of STEM Research and Education

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Affiliated Appointments: Applied Mathematics and Statistics, and Computer Science

Presentation to:

Tri-State Consortium of Opportunity Programs in Higher Education

Educational Opportunity Program – Advancement on Individual Merit

Cheryl Hamilton

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Educational Opportunity Program – Advancement on Individual Merit

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SUNY LSAMP

State University of New York Louis Stokes Alliance for Minority Participation

Principal Investigator

Samuel Stanley, President, Stony Brook University

Project Director, SUNY LSAMP

David Ferguson

Associate Directors

Candice Foley, Suffolk Community College

Community college activities, 2 to 4 Year transitions, liaison to NSF

Shanise Kent, Binghamton University

PR and dissemination, Alliance-wide activities

Stacie Nunes, SUNY New Paltz

STEM curricular and pedagogical reform, undergraduate domestic and international research

External Project Evaluator

Leo Gafney

Project Researcher

Bonita London

Funded by the National Science Foundation, Division of Human Resource Development

University Centers (Doctoral Degree Granting Institutions)

*Stony Brook University (lead) *SUNY Albany *Binghamton University *University at Buffalo

Four Year Institutions

*College at Buffalo *SUNY Farmingdale *College at Old Westbury *SUNY New Paltz

Community Colleges

*Dutchess *Nassau *Orange *Schenectady *Suffolk *Westchester

NSF Partners

SUNY AGEP- Transformation

New York State Partnerships

Science and Technology Entry Programs (CSTEP, STEP)

Industry and Research

Brookhaven National Laboratory

PROJECT GOALS

- **GOAL 1: To meet the grand challenge of preparing UREP students for successful transition into STEM majors**

- **GOAL 2: To focus on providing experiential activities that lead to socialization into science**

- **GOAL 3: To promote significant systemic changes**

- **GOAL 4: To conduct research about improving success of UREP STEM undergraduates**

SUNY LSAMP Accomplishments

- SUNY LSAMP has increased UREP STEM bachelor's degrees by 291% and enrollment by 684% since inception
- It has increased first time transfers by 379% and increased SUNY LSAMP students in international research and study by 333% from project 4 baseline
- It has taken a key role in curricular and pedagogical innovations in STEM education
- It has taken a leadership role in dissemination of best practices and advocacy about UREP issues on the local, state and national level
- It has developed an innovative and evidence based cognitive and social support network
- It has developed experiential learning that leads to research and practice in upper division and graduate students
- It has added to scholarship and research about UREP STEM education

SUNY LSAMP Research Project: Multi-Institution Educational Transitions (MET) Project

Research Aim: To explore the mechanisms that serve as either barriers or bridges to STEM success among UREP students (relative to non-UREP students) at three stages:

- **[1]** transition into college: Community College (CC) and four year-institution
- **[2]** transition from community college to four year institution
- **[3]** transition from community college into the workforce

SUNY LSAMP has used collaboration to improve program operation through the Alliance approach

Improving campus operations

Sharing resources to help students

Planning key events across the Alliance

Placement of SUNY LSAMP graduates

Advocacy on key issues across the Alliance

What types of assessment/evaluation activities have been done?

AREAS ADDRESSED

- Developed matrix of key indicators
- Tutoring
- Switching majors
- Transfer survey
- Graduate study and the professoriate (with SUNY AGEP)
- Component evaluations
- Intensive site visits (broad analysis)

METHODS USED

- Cost effective operation by developing a collaboration between program and evaluator (quantitative data from program, qualitative analysis from evaluator) .
- Phone and face to face interviews
- Visits to classes and activities
- Phone surveys of faculty and administrators
- Focus groups
- Pre and post surveys (paper and on line)

What types of assessment/evaluation activities have been done?

LESSONS LEARNED

Adapting of successful practices across the Alliance.

- Sharing papers and research, replicating successful components (success course on three campuses)

Identification of key issues for further study

- Looking at the relationship of SAT scores to student performance for UREP students.

Identification of problems in specific areas or on specific campuses

- Development of early warning system to help students overcome reluctance to join tutoring groups

Development of effective strategies

- Enrichment modules directly connected to gatekeeper courses.

Contemporary Issues in Science and Technology: Knowledge and Action Sharing Between Universities and the Broader Science and Technology Parks

1. Problem Solving (grand challenges) (e.g. grand challenges of the National Academy of Engineering)
2. Interdisciplinary (STEM, and the arts and humanities)
3. Global Activities
4. Holistic (e.g., holistic engineering)
5. Innovation, Entrepreneurship, and Social Good
6. Cross-sectoral (academia, industry, science and technology parks, government, NGO's, etc.)
7. Discovery
8. Tools to Enable Processes
9. Public Understanding of and Engagement with STEM
10. AI, Smart Systems, Autonomous Devices, and Data Science: Understanding Humanity in the Context of an Explosion in Intelligent Systems
11. Human Resource Development for Science and Technology Parks
12. Science and Technology Management and Policy

Industrial Revolutions

First Industrial Revolution (18th to 19th centuries) – iron and textiles industries, steam engine

Second Industrial Revolution (1870 to 1914) – electric power to create mass production

Third Industrial Revolution (1980s until present) -- digital revolution (personal computers, the internet, and information and communications technology (ICT)

Fourth Industrial Revolution – robotics, artificial intelligence, nanotechnology, biotechnology, The Internet of Things, 3D printing, data science, and autonomous vehicles

Transforming Education, Work, and Leisure: Rethinking Opportunity in the Context of "Technology-Driven" Environments

1. Rethinking Schools and Higher Education (courses, curricula, and learning environments)

2. Community STEM and Community Development

   STEM + Arts + Humanities

3. Education and Careers for the 4th Industrial Revolution

4. Value-Sensitive Education, Work, and Leisure

Thank You!

Questions?

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