NSF EHR CORE Research (ECR) Program and CSU Grantees Webcast

Moderated by:
Dr. Frank A. Gomez
Executive Director, STEM-NET
Office of the Chancellor

https://www2.calstate.edu/impact-of-the-csu/research/stem-net
Speakers

Earnestine Easter, National Science Foundation
NSF EHR Core Research (ECR) Program

Philip Vieira, Cal State Dominguez Hills
Supporting Student Success through a Combination of High Impact Educational Practices and Asset-Based Training

Dustin Thoman, San Diego State University
Diversity Interventions in the Classroom: From Resistance to Action

Melo-Jean Yap, San Diego State University
San Diego State University, Influential Networks for Women of Color in STEM Community College Pathways

P. Wesley Schultz, Cal State San Marcos
Becoming a Scientist: Identity Balance Among Underrepresented Students in STEM
STEM Education Research: Opportunities for Innovation and Transformation

Earnestine Easter
Program Director
Division of Graduate Education

National Science Foundation
Presentation Outline

• Overview of STEM Education Research Investments
• STEM Education Research Infrastructure
• Funding Opportunities
• Fundamental Research Guidelines
• Attributes of Competitive Proposals
• NSF Merit Review Criteria
• Helpful Resources
### STEM Education Research Infrastructure

#### PROGRAMS
- STEM Ed PRF
- ECR: BCSER
- ECR

#### INSTITUTES
- Design
- Methods
- Practices

#### RESOURCE HUBS
- Data Resource
- Resource Coordination
National Science Foundation

STEM Postdoctoral Research Fellowships (STEM ED PRF) NSF 22-531

Next Deadline TBD

Goal: To enhance the research knowledge, skills, and practices of recent doctorates in STEM, STEM Education, Education, and related disciplines to advance their preparation to engage in fundamental and applied research in STEM education that advances knowledge within the field.

Program Tracks:
Individual Postdoctoral Fellowships
$300,000 for 24 months

Institutional Cohort Postdoctoral Fellowships
$1,250,000 for single institutions for 36 months
$2,500,000 for collaboratives 36 months

https://beta.nsf.gov/funding/opportunities/science-technology-engineering-and-mathematics-education-
ECR: Building Capacity in STEM Education Research (ECR: BCSER)  

**NSF 22-548**

**Goal:** To build investigators’ capacity to conduct high-quality STEM education research and broaden the pool of researchers who can advance knowledge in STEM learning and learning environments, broadening participation in STEM fields, and STEM workforce development.

**Program Tracks**
- Individual Investigator Development (new and experienced)
- Institutes for Methods and Practices in STEM Education Research

**Next Deadline: February 24, 2023**
EHR Core Research (ECR)  NSF 21- 588

Goal: To support fundamental research (curiosity-driven basic research and use-inspired basic research) that contributes to the general explanatory knowledge that underlies STEM education.

Proposal Types
- Pilot Studies
- Level I, II, or III Projects
- Synthesis Proposals

Next Deadline: October 6, 2022
Is grounded in theoretical or empirical frameworks that inform research questions;

Identifies and explores important new constructs in STEM learning/learning environments, broadening participation in STEM fields, or STEM workforce development;

Extends understanding of current constructs;

Increases understanding of relationships among the constructs under investigation;

Extends research or evaluation methodologies for advancing the evidence base to support improved policy or practice.

National Science Foundation
Attributes of Competitive STEM Education Research Proposals

• Create and study **new** models and innovations in STEM teaching and learning, broadening participation, and workforce development.

• Be **grounded** in current literature (conceptually and theoretically.

• Incorporate current research designs, methodologies, and conceptual frameworks.

• Inform STEM education policy and practices.
Attributes of Competitive STEM Education Research Proposals

• Demonstrate a coherent linkage among the conceptual framework, research design, and research outcomes.

• Demonstrate how the project will result in rigorous, cumulative, reproducible, and usable findings to merit peer review and publication.

• As appropriate, describe mechanisms to facilitate the translation of research findings into practice for use by practitioners, other researchers and policymakers.
Merit Review
Merit Review Criteria

All NSF proposals are evaluated through two merit review criteria:

• **Intellectual Merit** – the potential to advance the knowledge

• **Broader Impacts** – the potential to benefit society and contribute to the achievements of specific, desired societal outcomes
Merit Review Elements

The following **five elements** are considered in the review of both intellectual merit **and** broader impacts.

1. What is the potential for the proposed activity to
   a) **Advance knowledge** and understanding within its own field or across different fields (Intellectual Merit); and
   b) **Benefit society** or advance desired societal outcomes (Broader Impacts)?

2. To what extent do the proposed activities suggest and explore creative, original, or **potentially transformative** concepts?

*National Science Foundation*
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?

4. How well qualified is the individual, team, or organization to conduct the potential activities?

5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?
Proposal Review Process and Timeline

Organization submits via Research.gov

Proposal Receipt at NSF

6 Months

DD Concur

30 Days

National Science Foundation
Helpful Resources

- Science, Technology, Engineering and Mathematics (STEM) Education Postdoctoral Research Fellowships (STEM Ed PRF) (nsf22531) | NSF - National Science Foundation

- EHR Core Research: Building Capacity in STEM Education Research | Beta site for NSF - National Science Foundation

- EHR Core Research (ECR:Core) | Beta site for NSF - National Science Foundation

- Merit Review | NSF - National Science Foundation

- PAPPG (NSF 22-1) dated October 4, 2021
Supporting Student Success Through a Combination of High Impact Educational Practices and Asset-Based Training

Philip A. Vieira (PI) – CSU Dominguez Hills

Collaborators: Alexander Camarillo (Teaching Assistant)

Philip A. Vieira, Associate Professor
CSU Dominguez Hills, Department of Psychology
pvieira@csudh.edu
Project Overview

• Broadening Capacity in STEM Education Research (BCSER): "supports activities that enable researchers to expand their areas of expertise and acquire the requisite knowledge and skills to conduct rigorous research in STEM education"

• Persistence and retention of STEM majors nationally does not meet the demand for STEM workforce

• URM students are more likely to leave STEM majors compared with their white counterparts

• CSUDH an ideal testbed to support URM student success in STEM: most diverse CSU, with highest percentage of students that are first generation, URM, Pell Grant recipients.

Table 1. Undergraduate student demographic data from Fall 2018

<table>
<thead>
<tr>
<th>Demographic</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hispanic</td>
<td>64%</td>
</tr>
<tr>
<td>African American</td>
<td>11%</td>
</tr>
<tr>
<td>Asian American</td>
<td>8%</td>
</tr>
<tr>
<td>White</td>
<td>7%</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>1%</td>
</tr>
<tr>
<td>American Indian</td>
<td>1%</td>
</tr>
<tr>
<td>Two or more</td>
<td>3%</td>
</tr>
<tr>
<td>Unknown/decline to state</td>
<td>3%</td>
</tr>
<tr>
<td>Nonresident alien</td>
<td>5%</td>
</tr>
<tr>
<td>Pell Eligible</td>
<td>64%</td>
</tr>
<tr>
<td>First generation</td>
<td>56%</td>
</tr>
<tr>
<td>First in family to earn a degree</td>
<td>80%</td>
</tr>
<tr>
<td>Females</td>
<td>60%</td>
</tr>
</tbody>
</table>
Activities

- Project implemented in a Fall 2021 First Year Seminar (FYS) course entitled *Sex, Drugs, Rock-n-Roll: The Neuroscience of Hedonism*
- Sample size=17 students
- Control groups: Fall 2020 FYS course (offered online only); Fall 2021 FYS course with similar sample size/demographics
- Pre/post design with survey data, facilitation logs, interviews, and supplemental data (IR, course materials, PTEs)

Supporting Student Success Through a Combination of High Impact Educational Practices and Asset-Based Training

<table>
<thead>
<tr>
<th>Fall 2021 Student Demographics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latinx/Hispanic</td>
</tr>
<tr>
<td>Black/African American</td>
</tr>
<tr>
<td>Other ethnicity/nationality</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>First generation</td>
</tr>
</tbody>
</table>
Activities

• Combined High Impact Educational Practices (HIPs) with Design Thinking (DT) and asset-based (Strengths) training in a First Year Seminar
  • HIPs: research experiences, collaborative projects, writing intensive assignments
  • DT: creative problem solving following an engineering-based framework that includes ideation, prototyping, testing, refining strategies to solve the problem. Activities included aspirational resume, Strength's coaching, career exploration, Odyssey Plan, Informational Interviews
Activities

- CUREs: low-cost neuroscience research/education tools (Backyard Brains)
  - Sympathetic nervous system activation
  - Electroencephalography (EEG)
  - Neuronal conduction in earthworm model
- Student group projects:
  - Does ethanol affect conduction velocity?
  - What affect does phone usage have on brain activity?
  - How does body temperature affect muscle activity?
  - How does body temperature affect brain activity?
  - How does anemia affect the sympathetic nervous system?
Activities

- Strength’s training: asset-based approach to problem solving and goal achievement

Supporting Student Success Through a Combination of High Impact Educational Practices and Asset-Based Training

<table>
<thead>
<tr>
<th>CliftonStrengths'</th>
<th>Achieve</th>
<th>Arranger</th>
<th>Creator</th>
<th>Deliberative</th>
<th>Disciplined</th>
<th>Team Player</th>
<th>Self-Assurer</th>
<th>Leader</th>
<th>Innovator</th>
<th>Organizer</th>
<th>Relator</th>
<th>Strategic Thinker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>Leadership</td>
<td>Problem solving</td>
<td>Self-directed</td>
<td>Analytical</td>
<td>Conceptual</td>
<td>Inspiring</td>
<td>Consistent</td>
<td>Communicating</td>
<td>Committed</td>
<td>Composed</td>
<td>Empowering</td>
<td>Relating</td>
</tr>
<tr>
<td>Executing</td>
<td>Leaders with dominant strength in the Executing domain know how to make things happen. When you need someone to implement a solution, these are the people who will work tirelessly to get it done. Leaders with a strength in executing.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influencing</td>
<td>Those who lead by Influencing help their team reach a much broader audience. People with strength in this domain are always selling the team’s ideas inside and outside the organization. When you need</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influencing</td>
<td></td>
<td>Activator</td>
<td>Communication</td>
<td>Competition</td>
<td>Maximizer</td>
<td>Self-Assurance</td>
<td>Woo</td>
<td>Actuality</td>
<td>Connectedness</td>
<td>Developer</td>
<td>Empathy</td>
<td>Harmony</td>
</tr>
<tr>
<td>Relationship Building</td>
<td>Those who lead through Relationship Building are the essential glue that holds a team together. Without these strengths on a team, in many cases, the group is simply a composite of individuals. In contrast, leaders with exceptional</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic Thinking</td>
<td>Leaders with great Strategic Thinking strengths are the ones who keep us all focused on what could be. They are constantly absorbing and analyzing information and helping the team make better decisions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Results**

- **Increased interest in STEM major/career:**
  - 28% increase in students pursuing STEM major
  - 12% increase in student interest in STEM careers

- **Increased confidence in research:**
  - research process/literature/scientific thought
  - generate a research question
  - analyze data/interpret results
  - ethical conduct in research
  - write scientifically/give an oral presentation related to research

- **Science identity maintained:** However, there was an increase in students that Strongly Agree with:
  - “I have a strong sense of belonging to the community of scientists”
  - “I have come to think of myself as a ‘scientist”
  - “The daily work of a scientist is appealing to me”

---

### Campus Logo

**Supporting Student Success Through a Combination of High Impact Educational Practices and Asset-Based Training**

<table>
<thead>
<tr>
<th>Interest in STEM</th>
<th>Considering a STEM major</th>
<th>Pursue STEM career</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Research Process</td>
<td>2.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Scientific Thought</td>
<td>2.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Research Lit</td>
<td>2.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Research Question</td>
<td>2.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Analyze Data</td>
<td>2.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Interpret Results</td>
<td>2.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Oral Present</td>
<td>2.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Write Science</td>
<td>2.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Ethical Conduct</td>
<td>2.6</td>
<td>3.2</td>
</tr>
</tbody>
</table>
Results

**Increased Student Success:**
- 54% increase in course completion
- 55% increase in average course grade
- 19% increase enrollment in subsequent semester

**Classroom Community:**
- connected to other students in the course
- encouraged to ask questions/know how to get help
- given ample opportunities to learn
- increased attendance in the course

**Student Well-Being:**
- personally invested in school/belonging/respected at school
- understood academic support and emotional support
- familiarity and use of healthy coping strategies to deal with stress
Lessons Learned

- Pandemic challenges
  - Absenteeism
  - Confusion regarding restrictions
  - General anxiety/lack of motivation
- Not enough time to cover all elements in depth
- Integrate more scaffolding to ensure timely progress and completion
- Intentional integration of individual course elements to be complimentary
- Include more control groups to provide complete data
Next Steps/Long-Term Plans

- Continue collecting institutional research data on cohort (to measure persistence/retention in STEM)
- Implement lessons to next offering of the course (Fall 2022)
- Share results with broader STEM education research community
- Expand approach to other courses targeting first year and transfer students
- Broaden institutional STEM education research
Summary

- Positive experience for students, teaching assistant, and instructor
- Pilot combinatorial strategy to improve STEM student success
- Foundation for future research opportunities in STEM education
Contact Information:
Name: Philip A. Vieira
Campus/Department: CSUDH/Psychology
Phone #: 310-243-3271
Email: pvieira@csudh.edu

Supporting Student Success Through a Combination of High Impact Educational Practices and Asset-Based Training

Questions?
Diversity Interventions in the Classroom: From Resistance to Action

Dr. Dustin Thoman, San Diego State University

Collaborators:
Dr. Felisha Herrera Villarreal, SDSU
Dr. Melo Jean Yap, SDSU
Dr. Jessi Smith, University of Colorado, Colorado Springs

Dustin Thoman, Associate Professor
San Diego State University, Department of Psychology
dthoman@sdsu.edu
Project Overview

• Defining the Problem
  • Researchers have created many evidence-based interventions that improve equity in STEM classrooms
  • But moving interventions to scale in college classrooms is slow
  • Can we improve implementation science by taking the perspective of decision makers (faculty)?

• “There’s nothing so practical as a good theory”
  • Thomas & Plaut (2008) Diversity resistance in the workplace
  • Latane & Darley (1978) Bystander helping model

• Decision making inputs: Deciding when to “help”
  1. Notice that underrepresentation is a problem
  2. Interpret underrepresentation as needing immediate action
  3. Assume responsibility
  4. Know how to help
Activities

- Recruited a nationally representative sample of biology instructors
  - N = 40 in depth interviews and survey
  - N = 604 surveys after learning about the Utility Value Intervention (UVI)
Results

Diversity Interventions in the Classroom: From Resistance to Action

Path to Action: Providing Help

Input 1: Notice that underrepresentation is a problem
Faculty instructors must notice that diversity and inclusion is lacking within biology

Input 2: Interpret underrepresentation as needing immediate action
Faculty instructors must believe that others are concerned that underrepresentation within biology is a widespread problem that must be addressed with immediate action

Input 3: Assume responsibility
Faculty instructors must decide it is their personal responsibility and duty to get involved

Input 4: Know how to help
Faculty instructors must feel competent in implementing intervention strategies and be able to overcome logistical concerns

ACTION: Provide Help
Implement Intervention

Obstacles to Helping

Paths to Inaction at each Step

PROBLEM: Underrepresentation in Biology
Diversity Interventions in the Classroom: From Resistance to Action

**Input 1**
Notice that underrepresentation is a problem
Faculty instructors must notice that diversity and inclusion is lacking within biology

**Input 2**
Interpret underrepresentation as needing immediate action
Faculty instructors must believe that others are concerned that underrepresentation within biology is a widespread problem that must be addressed with immediate action

**Input 3**
Assume responsibility
Faculty instructors must decide it is their personal responsibility and duty to get involved

**Input 4**
Know how to help
Faculty instructors must feel competent in implementing intervention strategies and be able to overcome logistical concerns

**ACTION: Provide Help Implement Intervention**

**Obstacles to Helping**
- Costs of action (e.g., time taken from other activities)
- Blame lack of institutional resources for inaction
- Diffusion of responsibility
- Deflection to external entities
- Pluralistic ignorance
- Focusing on general pedagogical innovations
- “Colorblind” worldview
- Skepticism about the value of diversity
- Normalize underrepresentation

**Paths to Inaction at each Step**

**Results**

**PROBLEM: Underrepresentation in Biology**
Lessons Learned

• Faculty are gatekeepers for the implementation of classroom interventions that have been shown to reduce equity gaps
  • Getting information on interventions into their hands is not enough
  • We must understand their social psychological perspectives and systematically study decision making and behavior change

• When designing implementation supports (e.g., policies) we must consider building value and reducing implementation costs/barriers as equally important but separate goals

Next Steps/Long-Term Plans

• Advancing Knowledge: Implementation Science
  • Model refinement & testing
  • How do broader beliefs influence specific implementation decisions?

• Broader Impacts: Advocating for evidence-based strategies
  • Working with professional societies
  • Sharing our strategies
Summary

• NSF EHR Core Research supports theory driven and use inspired research across the STEM education system
  • Most research is student-focused
  • We must study other perspectives within the system, including gatekeepers of the system
  • Proposals must clarify how the work will advance knowledge in the field (not just solve a practical problem)
Questions?

Contact Information:

Name: Dustin Thoman
Campus/Department: San Diego State, Psychology
Website: https://psychology.sdsu.edu/people/dustin-thoman/
Email: dthoman@sdsu.edu
Influential Networks for Women of Color STEM Community College Pathways

Melo-Jean Yap, Ph.D – San Diego State University

Collaborators: Dr. Felisha Herrera Villarreal (Research and Equity Scholarship Institute on Student Trajectories in Education @ SDSU)

NSF DUE-1937777
Community College (CC)

The Potential

- “Critical access point in the STEM pipeline for BIPOC” (Herrera et al., 2018)
- 48% of UC STEM bachelor’s degree holders are CC transfers
- ¼ of all Chicanx doctorate degree holders attended CC

The Challenge

Lack of enhancing equity & diversity in community college Biology Education Research (Schinske et al., 2017)
Project Overview

MIXED METHODS RESEARCH

Visualize:

- *pathways* of first-generation women of color STEM majors in community colleges
- how community *networks influence* how they navigate & negotiate their paths in higher education

PROFESSIONAL DEVELOPMENT (PD)

Train an early-career investigator with an interdisciplinary background in Education, Biology, and Black Studies (now Africana Studies) from CSU system & UCLA
Theoretical Framework

STANDPOINT THEORY

- Recognizes the power of the oppressed & their potential in using their knowledge for liberation
- Turn struggle into an epistemological advantage (a form of self-agency) for observing & analyzing the world at large
Social Network Analysis

Location & Knowledge Production

- SNA = tool for exploring how concept of (marginal) location may influence an individual’s standpoint, and hence, knowledge production
- Location Matters! Potential site for diffusion of ideas & influence
Activities

**QUANTITATIVE:**
i. Identify student mobility patterns & institutional contexts
ii. Identify influential networks that impact women of color STEM majors in the community college

**QUALITATIVE:**
i. Obtain localized knowledge about the influences to the scientific thinking and navigational capital of participants
ii. Contextualize the influential networks

**PD:**
i. Analytical training in quant (R, NVivo, & Python) & qual
ii. Disseminate findings
iii. Networking
iv. Mentoring
Longitudinal Data

BPS & IPEDS datasets
Identified students who:
- started at a community college in 2011
- women of color
- STEM major at any point
- transferred at least once

n = 180 students

Institutions
335 number of transfers = edges
324 unique institutions
Low network density of 0.0023, which indicates a lack of connectivity between the 372 institutions with 324 unique edges or transfer pathway
Results: Schools 2011-2017

Sending

- Biggest nodes are green (4-years) which shows that many WOC STEM majors are leaving four-year institutions after transferring there.

Receiving

- Biggest nodes are blue which means WOC STEM majors transfer to 2-years. There are some big 4-year nodes too (green), but it shows that many do lateral transfers.
One-Site Focus

Social Network data

i. Who influences the scientific thinking & navigational capital of participants?

ii. How do nominees influence the participants?

Race/Ethnicity of Participants: Latina = 19, Black/African American = 6, Asian Pacific Islander = 6, and Mixed = 5.

STEM Majors: Biology = 15, Chemistry/Biochemistry = 9, Engineering = 6, Physics/Astronomy = 2, Nutritional Science = 3, and Computer Science = 1.
Results: Family Matters

Proportion of Participants Nominating Relationship Groups as Influences to Scientific Thinking

Proportion of Participants Nominating Relationship Groups as Influences to Navigational Capital
Results

ST Snapshot: Callisto
26, Latina, Physics major

Mother "always told [her] to question things" which "[gave her] the scientific aspect" of observing things in detail.
Father & uncle "always encouraging [her] to look at 'the big picture'"
Results

Navigational Capital: Notions of Diversity

Schoolmates are the most impactful group on notions of diversity of ideas and people in the STEM fields.

Rikki [24, Black, Civil Engineering major] nominated schoolmates who tutor her at the campus STEM center a few times a week.

Medusa [24, Multicultural, Biochemistry major] & Aurora [23, Latina, Neuroscience major] both nominated schoolmates who lead their campus' STEM club that caters and promotes diversity and inclusion of students of color in the STEM fields.
Lessons Learned

Centering the standpoint of women of color STEM majors is an asset-based and anti-deficit way of honoring them and their lived experiences as full human beings.

This acknowledgement of their humanity as full human beings has the potential to induce self-joy and profound motivation to contribute to innovation in the STEM fields.

The holistic frameworks used by this study also acknowledge their communities and can help broaden participation of those historically excluded individuals, groups, and communities in the STEM fields.
Next Steps/Long-Term Plans

- Disseminate findings & collaborate with CC researchers & practitioners (GitHub resource page for codes)
- Open to exploring institutional pathways analyses further
- Continue working with CC students in STEM pathways
Summary

- The impact of this work on STEM education is using multiple sources of data to provide a macro, meso, and micro perspective of women of color STEM majors in the community college.
- From looking at longitudinal data of this population’s educational transfer pathways to analyzing their personal networks and the impacts of these networks on the way they think as scientists and navigate community college, this study has carried out a comprehensive approach to look at broad and contextual patterns of this historically excluded group not just in the STEM fields but in the education literature in general.
- The lack of formalized pathways for this group also can inform educational policymakers and institutional leaders the value of establishing and strengthening such connections to solidify this pathway.
Questions?

Contact Information:
Name: Melo-Jean Yap, Ph.D
Campus/Department: SDSU/Postsecondary Education
Website: https://res-iste.sdsu.edu/index.php/women-of-color-in-stem/
Email: drmelyap@yahoo.com
Github: https://github.com/1melomelo/Women-of-Color-STEM-influential-networks
Becoming a Scientist: Identity Balance Among Underrepresented Students in STEM

Wesley Schultz – California State University San Marcos

Co-PI: Anna Woodcock (CSUSM),

Senior Personnel: Paul Hernandez (Texas A&M)
Becoming a Scientist: Identity Balance Among Underrepresented Students in STEM

Scientific Advisory Board

Dr. David Sherman
Professor
Department of Psychological and Brain Sciences
UC Santa Barbara

Dr. Mesmin Destin
Associate Professor
Department of Psychology
Northwestern University

Dr. Thiery Devos
Professor
Department of Psychology
San Diego State University
Dr. Ganesh Raman
Assistant Vice Chancellor, Research, California State University System

Dr. Victor Rocha
Professor (Emeritus), Founding Director, Office of Training, Research, and Education in the Sciences (OTRES)

Dr. Katherine Kantardjieff
Provost and Vice President for Academic Affairs, CSUMB

Becoming a Scientist: Identity Balance Among Underrepresented Students in STEM
NSF Award

• Research team has long history of collaboration
• 12-years of NIH R01 funding to study the role of “identity” in success and persistence of underrepresented students in biomedical science (only included data on underrepresented students)
• Large-scale expansion submitted to NSF (scored well, but no funding)
• 2-year NSF EAGER award (2016-2018) to study “identity balance” among Hispanic/LatinX and White students.
• Full NSF proposal funded in 2019
Broader Impacts

- On guidance from Program Officer, split advisors into two Boards: Scientific Advisory, Broader Impacts Advisory

- Proposed broader impacts
  - Dissemination through the CSU (CRO)
  - Academic publications and conferences
  - Involving URM students in the research process
Theoretical Foundations

Becoming a Scientist: Identity Balance Among Underrepresented Students in STEM
### Theoretical Foundations

#### Balanced Implicit Identities

<table>
<thead>
<tr>
<th>Optimal Balance</th>
<th>Eschew STEM Identity</th>
<th>Eschew Race/Ethnic Identity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self</strong> + +</td>
<td><strong>Self</strong> + -</td>
<td><strong>Self</strong> - +</td>
</tr>
<tr>
<td>Race/Ethnicity + STEM</td>
<td>Race/Ethnicity - STEM</td>
<td>Race/Ethnicity - STEM</td>
</tr>
</tbody>
</table>

#### Imbalanced Implicit Identities

<table>
<thead>
<tr>
<th>Hindered by Stereotypes</th>
<th>Hindered by Ethnic Identity</th>
<th>Hindered by STEM Identity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self</strong> + +</td>
<td><strong>Self</strong> - +</td>
<td><strong>Self</strong> + -</td>
</tr>
<tr>
<td>Race/Ethnicity - STEM</td>
<td>Race/Ethnicity + STEM</td>
<td>Race/Ethnicity + STEM</td>
</tr>
</tbody>
</table>
Research Objectives

- Objective: understand how underrepresented students negotiate and resolve stereotypically incompatible identities across time and how this relates to STEM participation and success.

Figure 4: Model of implicit identity balance to support a strong STEM identity and STEM persistence and performance

- STEM Performance
- STEM Persistence
- Well-being
Research Plan

• Launched in Fall, 2019
• Recruited 1410 undergraduate STEM students
• 12 CSU campuses
• 56% Hispanic/LatinX
• Longitudinal design to track across five years (two waves of data per year)

<table>
<thead>
<tr>
<th>12 CSU Campuses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cal Poly Pomona</td>
</tr>
<tr>
<td>Cal Poly San Luis Obispo</td>
</tr>
<tr>
<td>California State University Bakersfield</td>
</tr>
<tr>
<td>California State University Chico</td>
</tr>
<tr>
<td>California State University Fresno</td>
</tr>
<tr>
<td>California State University Fullerton</td>
</tr>
<tr>
<td>California State University Long Beach</td>
</tr>
<tr>
<td>California State University Northridge</td>
</tr>
<tr>
<td>California State University Sacramento</td>
</tr>
<tr>
<td>California State University San Marcos</td>
</tr>
<tr>
<td>San Francisco State University</td>
</tr>
<tr>
<td>San Jose State University</td>
</tr>
</tbody>
</table>
Becoming a Scientist: Identity Balance Among Underrepresented Students in STEM

Longitudinal Panel

For the current year (2019-2020), what is your academic standing? - Selected Choice

- Freshman: 104
- Sophomore: 207
- Junior: 936
- Senior: 0
- Other: 0

Pie Chart:
- Computer Science: 40.99%
- Engineering: 32.05%
- Math: 15.64%
- Science: 4.42%
Summary

- CSU provides a wonderful testbed for theoretical and applied work focused on issues of underrepresentation
- NSF is an excellent source of funding to support ambitious studies
- Important to balance science and broader impacts
- Think big
Questions?

Contact Information:

Name: Wesley Schultz
Campus/Department: CSU San Marcos, Psychology
Website: faculty.csusm.edu/schultz

Email: wschultz@csusm.edu
Speaker Contacts

Earnestine Easter, National Science Foundation
easter@nsf.gov

Philip Vieira, Cal State Dominguez Hills
pvieira@csudh.edu

Dustin Thoman, San Diego State University
dthoman@sdsu.edu

Melo-Jean Yap, San Diego State University
drmeloyap@yahoo.com

Wesley Schultz, Cal State San Marcos
wschultz@csusm.edu

Frank A. Gomez
CSU Office of the Chancellor
fgomez@calstate.edu
Next Steps/Closing Remarks

Dr. Frank A. Gomez
Executive Director, STEM-NET
Office of the Chancellor

https://www2.calstate.edu/impact-of-the-csu/research/stem-net

Frank A. Gomez  CSU Office of the Chancellor  fgomez@calstate.edu
Webcast Feedback Survey

Please take a few moments to tell us about your webcast experience.

Use the QR Scan Code to download it
STEM-NET June Webcast
Topic: STEM Program Assessment and Evaluation
Date: Wednesday, June 29, 2022
Time: 10am- 11:15am

Virtual Research Café 10.0
Date: Wednesday, June 15th, 2022
Time: 11am-12pm
Join our CSU STEM-NET Community listserv
csustemnet@lists.calstate.edu

Begin a Conversation with Colleagues and Join our Private CSU STEM-NET Facebook Group
https://www.facebook.com/groups/2629611737269292
THANK YOU FOR JOINING US TODAY!
For more information about STEM-NET visit our website:

Frank A. Gomez  
CSU Office of the Chancellor  
fgomez@calstate.edu