

Cognitive Beliefs and Cultural Variables Matter in STEM Career Development



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Poll

- How did you hear about this webinar?
 - Email from the STEM Equity Pipeline listserv
 - Email from another listserv (Q&A)
 - Email forwarded from a colleague
 - Presentation at a conference (Q&A)
 - Announcement in the Pipeline Press
 - Announcement in another newsletter (Q&A)
 - STEM Equity Pipeline website
 - Another website (Q&A)
 - Search engine result

STEM
Equity
pipeline



STEM Equity Pipeline

- Project of the National Alliance for Partnerships in Equity Education Foundation
- Funded by the National Science Foundation
- Human Resources Directorate, Gender in Science and Engineering Program, Extension Services Grant



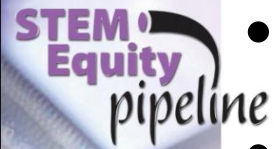
Goals

- Build the capacity of the formal education community to provide high quality professional development on gender equity in STEM education
- Institutionalize the implemented strategies by connecting the outcomes to existing accountability systems
- Broaden the commitment to gender equity in STEM education



STEM Equity Pipeline Project Methods

- Professional Development
- Teacher Training
- Consulting and Technical Assistance
- Virtual Web-based Professional Learning Community
- Best Practices Handbook

The logo for the STEM Equity Pipeline project, featuring the text "STEM Equity pipeline" in a stylized font. "STEM" is in purple, "Equity" is in blue, and "pipeline" is in a smaller, black, lowercase font. The logo is set against a background of a person wearing safety goggles and a blue cap, with a blurred image of a circuit board below.

How can you get involved?

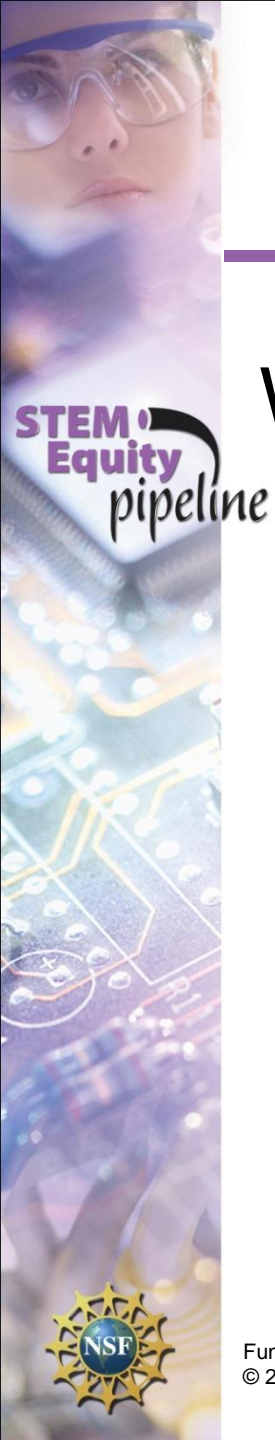
- Participate on your State Team if from
 - CA, GA, IA, IL, MN, MO,
 - OH, OK, NH, TX, WI
- Participate in the virtual learning community by going to www.stemequitypipeline.org



Poll

Who is participating in today's webinar?

1. School/College Administrator
2. Teacher/Faculty Member
3. Counselor/Student Services Staff
4. State Agency Staff
5. STEM Organization Staff
6. Other (Q&A)



Cognitive Beliefs and Cultural Variables Matter in STEM Career Development

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UNIVERSITY OF WISCONSIN

Center for Women's
Health Research

a National Center of Excellence in Women's Health



Grant #: 1R01GM094573-01

STEM Equity Pipeline Webinar

March 22, 2011

Overview

- Recent Research on Culture and Cognitions in STEM Career Development
- Implications for Culturally-Relevant Interventions for STEM Fields
- Case for STEM-Focused Career Awareness

Main Points:

1. **Culture and context matter** in all aspects of human behavior, including career choice & development and work
 - Self-concepts about work (e.g., career self-efficacy beliefs) form along side self-concepts about one's cultural referent groups (e.g., racial identity)
2. Social cognitive career theory is one model to investigate and intervene on 3 key factors in STEM Academic/Career Development--**Cognitive, Cultural, and Contextual**-- i.e. for underrepresented gender and racial/ethnic groups
3. Intentions would do well to promote **Multicultural STEM-Focused Career Development**

Demographic Perspective

The....

□ **Graying**

□ **Feminization**

□ **Browning**

.....of US population.

Demographic Perspective (cont'd)

- By 2014, 32% of total U.S. workforce will be age 50 or older (up from 27% in 2005)
- 68% of workers 50 - 70 y/o plan to keep working into retirement or never retire (AARP, 2005)
- Women accounted for 62% of labor force increase 1990 - 2005
- R/EM will account for largest growth in labor force participation 2006-16 compared to Whites (16-32% vs. 5.5%) (BLS, 2007)



New workforce will be largely female, ethnic minorities, and older individuals

The “Browning” Factor and STEM Careers

Why So Few?

Freshmen Intentions to Major in S&E, by Race/Ethnicity: 2006

Race/Ethnicity	All S&E Majors (%)	Engineering	Biological/ Agricultural Sci (%)
White	29.5	7.6	7.5
Asian/ Pacific Islander	44.7	11.7	17.3
African-American/ Black	34.0	7.2	9.4
Mex, Chicano /Puerto Rican	35.9	6.4	9.8
Other Hispanic	36.7	2.8	10.0
Amer Indian/ Alaska Native	34.4	7.5	10.0

Source: Women, Minorities, and Persons with Disabilities in Science and Engineering, 2009, NSF

National Data STEM Persistence

6-year tracking data of 1999, 2000 cohorts:

□ Continuation to 2nd Year:

- 71% of all entering STEM majors continue
- ~62% - 67% for targeted STEM majors

□ Graduation (6th year) Rate:

- ~ 40% of all entering STEM majors graduate with STEM degree
- 28% - 29% for targeted STEM majors

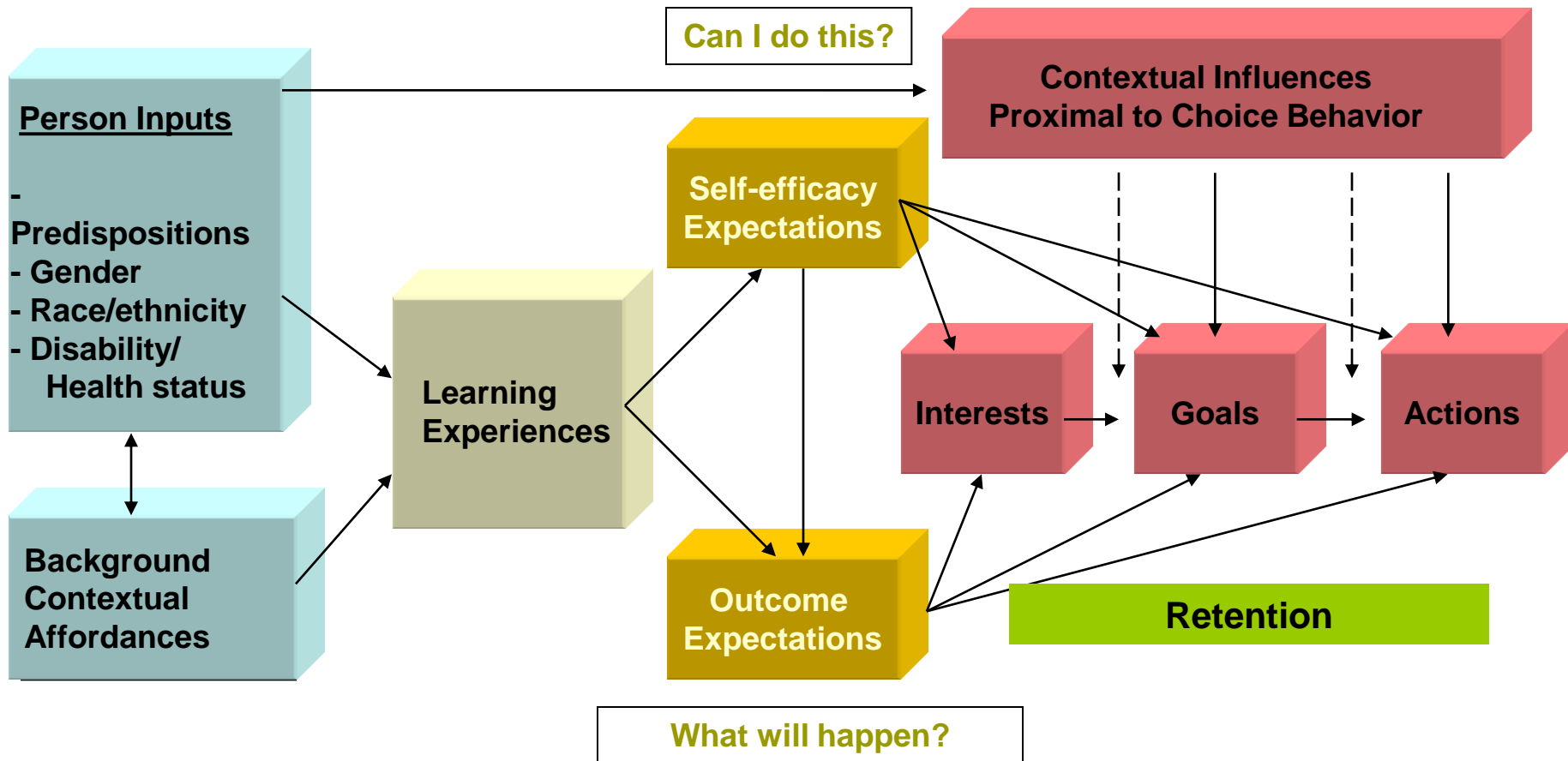
“People's level of motivation, affective states, and actions are based more on what they *believe* than on what is objectively the case.”

Albert Bandura

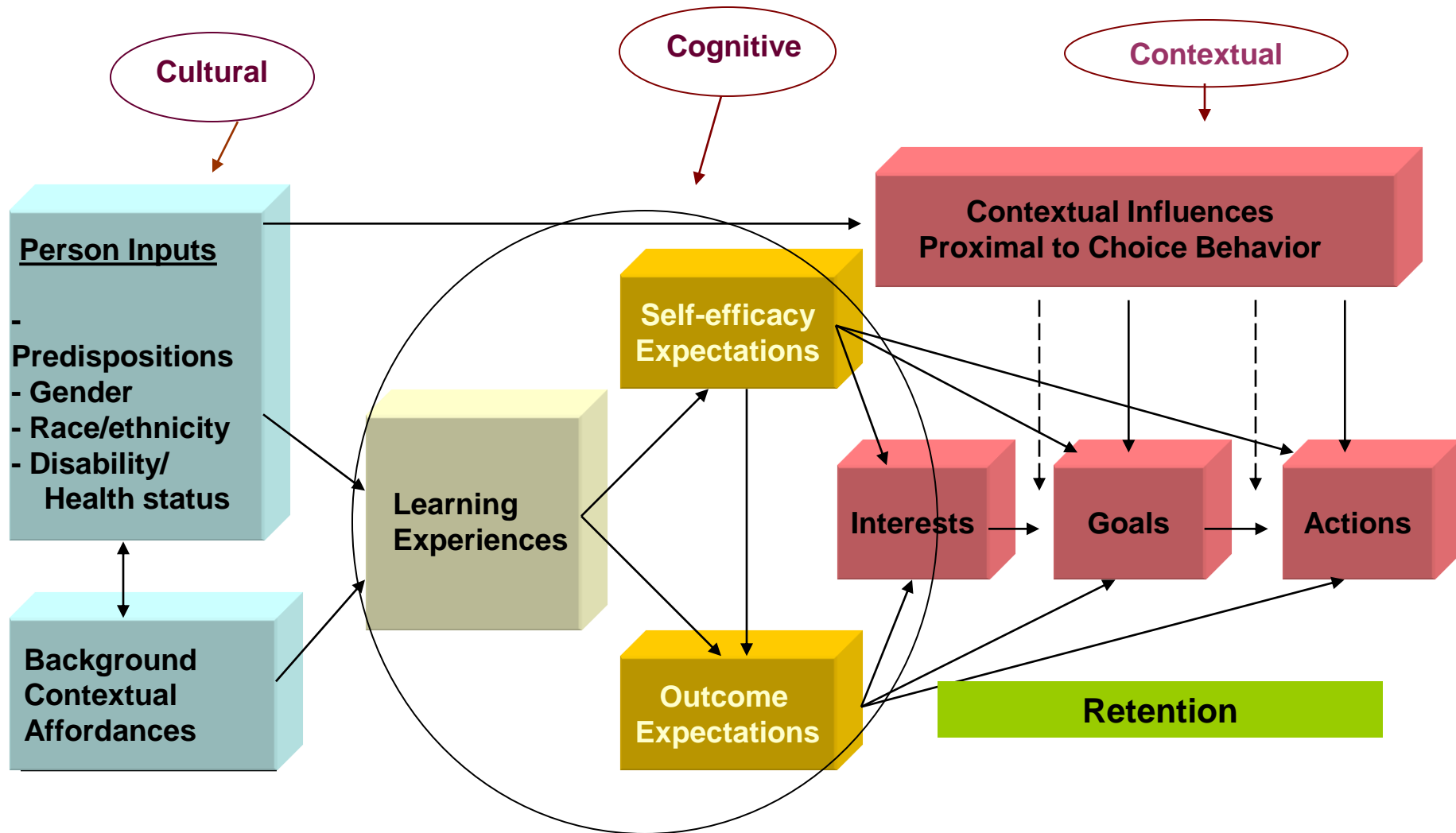


Social Cognitive Career Theory

(Lent, Brown & Hackett, 1994, 2000)



Social Cognitive Career Theory (Lent, Brown & Hackett, 1994, 2000)



Key Factors in Academic and Career Development (Byars-Winston et al., 2010)

CONTEXTUAL

- ❖ Perceptions of environment: campus climate, faculty support, and academic or career barriers

COGNITIVE

- ❖ Confidence in ability to succeed and cope with challenges (“Can I do this?”)
- ❖ Outcome expectations (“Is this major worth it?”)

CULTURAL

- ❖ Salience of culture; e.g. ethnic identity
- ❖ Comfort interacting with others outside of own racial/ethnic group

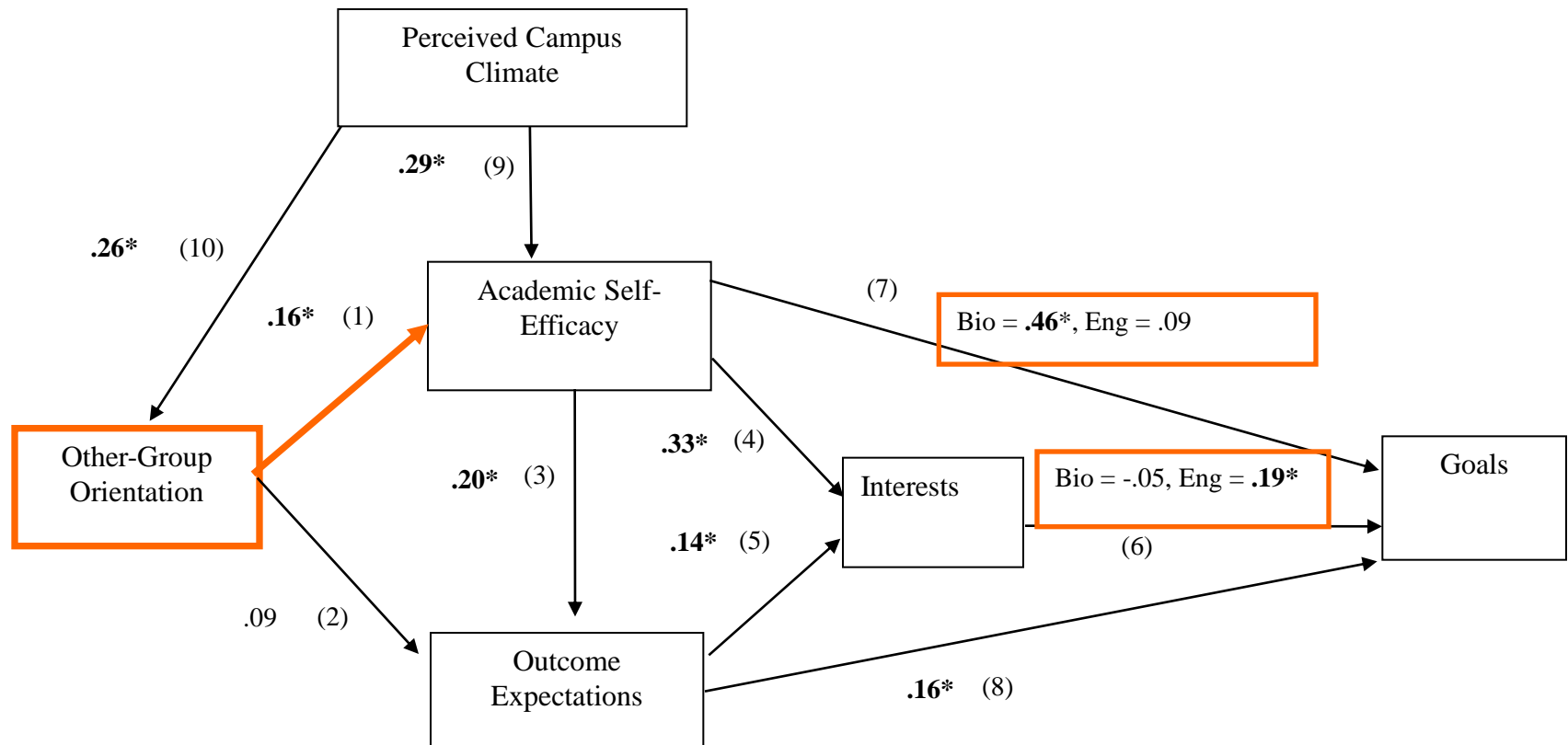
Questions Guiding My Research

- What is the vocational significance of culture on career cognitions and choice behavior (Byars-Winston, 2010)?
- *The case of STEM:* What is the vocational relevance of cultural identity variables within the context of minority status and restricted occupational opportunities as influences on academic, career choice behavior?

What Have I Found?

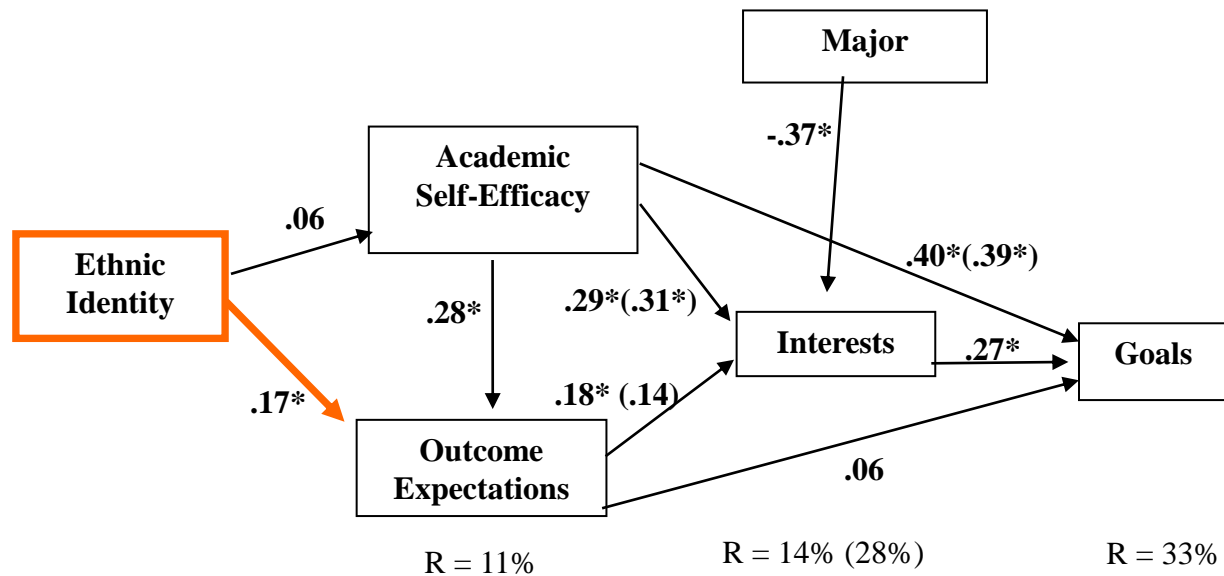


Multiple-Groups Analysis Path Model (Byars-Winston et al., 2010, *JCP*) –PWI



CFI = .98; $\chi^2 (18) = 20.76$; $p = .29$; RMSEA = .04; SRMR = .07, .10

Multiple-Groups Analysis Path Model (Byars-Winston & Fife, 2010) –HBCU



General Research Findings

- ALANA STEM students' interests related to *academic confidence* and *outcome expectations*
- Intentions (goals) to graduate with STEM degree related to *academic confidence, outcome expectations* and *interests*

Unique Research Findings

- PWI: Students' feeling comfortable with ethnically different people (OGO) also felt:
 - academically confident
 - positive about campus climate
- HBCU: Students' comfort with themselves as *cultural beings* (ethnic identity) also:
 - had positive outcome expectations

Implications of Research

(Byars-Winston, 2010, *Journal of Career Dev*)

- Cultural group membership (i.e., cultural identity variables) is associated with academic-related variables

- May facilitate appraisal and negotiation of the cultural context of education, work
 - Buffering – dealing with racial stigma in STEM
 - Bridging – forming inter-ethnic supports
 - Bonding – affiliation with in-group

Participant Demographics

$N = 26 (34) \sim 76\%$ completion rate

College	Gender	Academic Standing	Race and/or Ethnicity
Science (n = 9)	Male – 2 Female – 7	Fresh – 1 Soph – 2 Junior – 4 Senior – 2	African American - 3 Latino/a – 2 Native American – 1 Southeast Asian – 3 Cambodian – 1 Vietnamese – 2 Hmong – 0
Engineering (n = 17)	Male – 10 Female – 7	Fresh – 2 Soph – 2 Junior – 6 Senior – 7	African American – 7 Latino/a – 7 Native American – 0 Southeast Asian – 3 (1 unknown) Cambodian – 1 Vietnamese – 1 Hmong – 0

Insights

- ⌘ Persisting students acknowledged academic challenge of college vs. high school; challenges unavoidable
- ⌘ Expectational stance (Padilla, Trevino, Gonzalez, & Trevino, 1997)
- ⌘ Took proactive, agentic stance and protected themselves preemptively by deciding that it would be worthwhile to face such challenges
- ⌘ High intrinsic goal commitment

Insights (cont'd)

- ⌘ Ownership of degree, informed consumer
- ⌘ Self-nurturing, self-affirming, sought out nurturing others-regardless of cultural fit
- ⌘ Did not emphasize view of self as “other”
- ⌘ Limited social lives to focus on studies

Quotes

- ⌘ *"I'll be only one of two minorities, so I feel kind of uncomfortable. But things haven't really bothered me because I'm just here to learn."*
- ⌘ *"I don't really experience much prejudice or racism much here. Like I know I've heard stories up the wazoo about people being called names and stuff like that just walking down the street... I haven't experienced stuff like that, I guess because I know what I want and I kind of stick my head to it. I guess if someone would say something like that, I wouldn't pay attention to it."*

Quotes (cont'd)

- ⌘ *"I'd like to consider myself a minority, but I don't consider myself disadvantaged in any way."*
- ⌘ *"In the summer programs, with [name of student support program] and stuff, they say things like not just towards a race but people in general, like bad things can happen, watch out for this, watch out for that, and this and that...But they never say anything that people go around just saying hi like in the first few days. They never said anything about people being nice in that way or just being open."*

Implications

STEM career intervention efforts should address:

- Students' beliefs about their *academic ability* and their *academic expectations*
 - Sustain academic self-efficacy beliefs
 - Facilitate accurate self-perceptions
 - Discuss recovery from failures, "bounce back" plans
 - Use efficacy sources to bolster confidence in academic and coping ability, academic expectations
- Students' experiences with and negotiation of themselves as *cultural beings* (ethnic identity, bicultural competence-OGO)

Culture Matters in Career Interventions

- ❑ The influences of culture reside both within the client and counselor as individuals as well as between them in the counseling relationship
- ❑ Career counseling is a cultural process in itself (Fouad & Byars-Winston, 2005; Stead, 2004)
- ❑ Recognize how culture is connected to career development

The Case of Renee

(Byars-Winston, 2010, *Journal of Career Dev.*)

- Renee, a sophomore, is considering leaving her engineering major. She came to her university, which is predominantly-White, because she was aggressively recruited. She often goes through the day without seeing another Black student. Renee is usually the only Black person in her classes and she does not feel at ease to voice her own opinions, especially in her study groups, where she feels like her intellectual capacity is always in question. She reports feeling “tired of the hassle of justifying my existence” in response to others’ stereotypes about her presumed academic weakness. Although she wants to switch out of engineering, she really likes the field. Renee also feels that if she switched majors she would let people down, as well as herself, and confirm others’ belief that she is incapable of earning an engineering degree.

Applying SCCT

- What would you focus on with Renee from a Social Cognitive approach?
- 3 Cs—
 - Cognitions
 - Context
 - Culture

Culturally Relevant STEM Career Interventions Require Us to...

- ❑ **Be aware of how our personal cultural experiences shape our views of work and career development**
- ❑ Understand the lived experiences of people with whom we counsel, educate, work
- ❑ Recognize how culture is connected to STEM career development
- ❑ Select culturally appropriate career planning strategies (Byars-Winston & Fouad, 2006)
- ❑ Facilitate cultural competence

What Do You Do Now?



Discussion and Resources

Multicultural STEM-Focused Career Development

Career Counselor Awareness of STEM

Communication About STEM

(Educators Students/Adults Employers)

Skill Development

Diversity/Talent
Development

Leadership & Opp
Development

(Byars-Winston, 12/9/2010)

Strategies

- ❑ Challenge stereotypes—directly address and discuss potential implicit bias, prejudice against URMs in STEM
- ❑ Raise awareness about relevance of STEM careers to local context and community needs

Greening the Ghetto

Speakers Majora Carter: Activist for environmental justice



Majora Carter fights for environmental justice in her hometown of New York's South Bronx. She's working not just to hold back the polluters who target low-income neighborhoods like hers, but to bring back the green -- and create green jobs.



Majora Carter
ghetto

18:36 Posted:

Majora Carter on the Web
.....

[Homepage: The Majora Carter Gr](#)

[Twitter: @MajoraCarter](#)

[Television: Sundance: *The Green*](#)

[Majora Carter](#)

The Case of Infrastructure

“The Crumbling of America”

ASCE American Society of Civil Engineers

REPORT CARD **america's INFRASTRUCTURE**

SEARCH

★ HOME ★ REPORT CARDS ★ STATES ★ CATEGORIES ★ SOLUTIONS ★ TAKE ACTION ★ NEWSROOM ★

2009 Grades

- Aviation
- Bridges
- Dams
- Drinking Water
- Energy
- Hazardous Waste
- Inland Waterways
- Levees
- Public Parks and Recreation
- Rail
- Roads
- Schools
- Solid Waste
- Transit
- Wastewater

America's Infrastructure GPA
Estimated 5 Year Investment
Need: **\$2.2 Trillion**

Camden High School, NJ



Diversity/Talent Development

- ❑ Broaden individuals' knowledge of what STEM careers are
- ❑ Challenge stereotypes of STEM occupations and workers
- ❑ Increase cultural competence to learn and work in historically mono-cultural STEM environments
- ❑ Develop strategies and exercises to build career resilience for URMs in STEM

Useful References & Resource

- ❑ Byars-Winston, A. (2010). The vocational significance of Black identity: Cultural formulation approach to career assessment and career counseling. *Journal of Career Development, 37*, 441-464.
- ❑ Byars-Winston, A., Estrada, Y., Howard, C., Davis, D., & Zalapa, J. (2010). Influence of social cognitive and ethnic variables on academic goals of underrepresented students in science and engineering: A multiple-groups analysis. *Journal of Counseling Psychology, 57*, 205-218.
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- ❑ Ponterotto, J., Rivera, L., & Sueyoshi, L. (2000). The career-in-culture interview: A semi-structured protocol for the cross-cultural intake interview. *Career Development Quarterly, 49*, 85-96.
- ❑ Rich Feller's www.stemcareer.com

Thank You



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UW Center for Women's Health Research

UW Sloan Project website: www.cew.wisc.edu/sloan

WIKI Website: <http://cbe.wisc.edu/STEMRetention>