

# Strategies to Increase Access and Success for Underrepresented Students in Career and Technical Education & STEM

**Welcome!**

The webinar will begin promptly at 11:00 a.m. PST/2:00 p.m. EST

To **access materials** that will be used throughout the webinar go to:  
<http://bit.ly/webinar-relnw-june2017>

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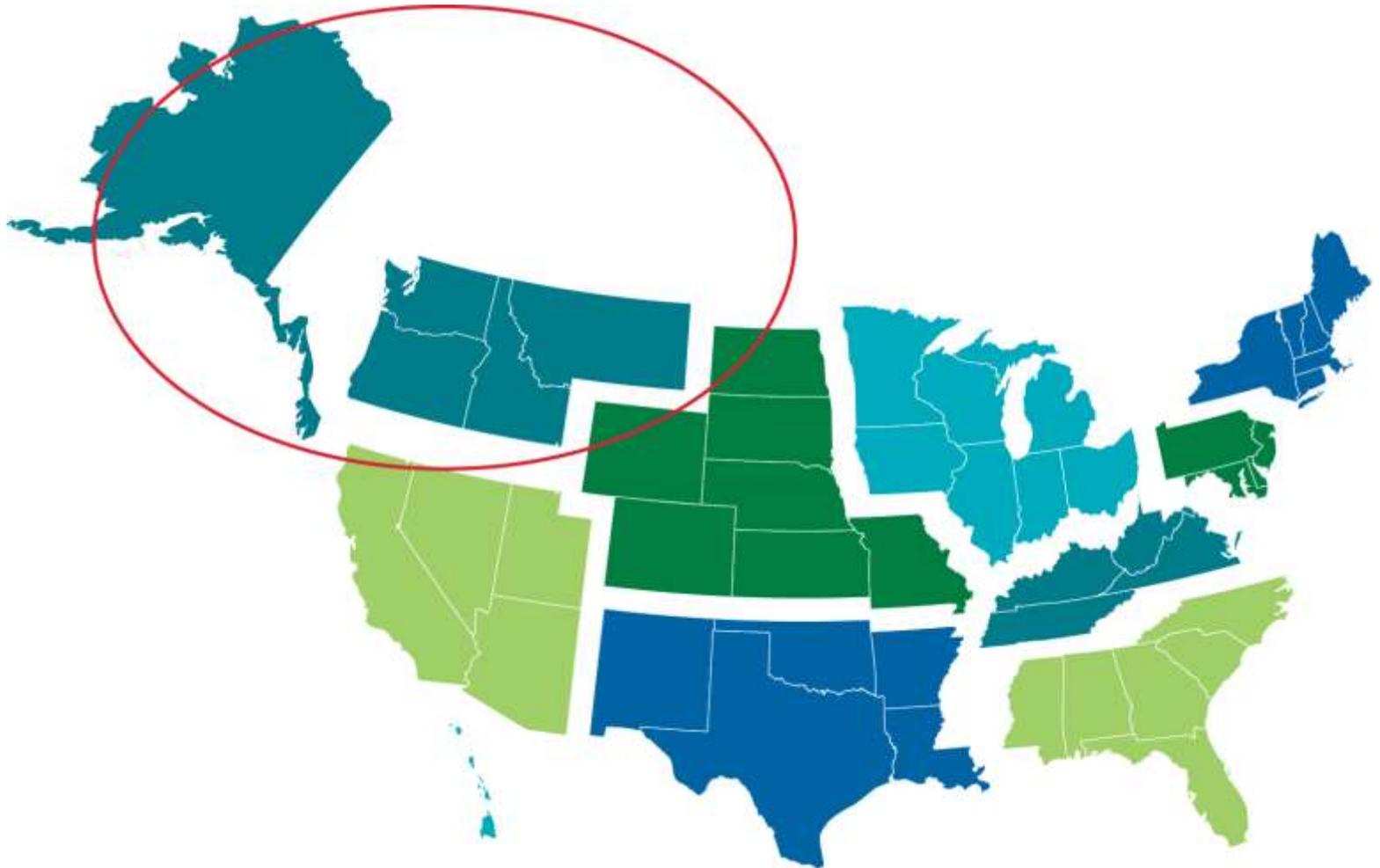
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# Strategies to Increase Access and Success for Underrepresented Students in Career and Technical Education & STEM

June 15, 2017

# REL Northwest Region



# Today's Presenter



**Ben Williams**  
Director of Special Projects  
National Alliance for  
Partnerships in Equity (NAPE)

REL Northwest Webinar Series  
Thursday, June 15, 2017

**STRATEGIES TO INCREASE ACCESS  
AND SUCCESS FOR UNDER-  
REPRESENTED STUDENTS IN CAREER  
AND TECHNICAL EDUCATION & STEM**

**Ben Williams, Ph.D.,** *Director of Special Projects*

@NAPEquity | @BenWilliamsPhD | #NAPEPD



**N A P E**

National Alliance for  
Partnerships in Equity

# Objectives for Today

- Learn how to use NAPE's PIPE™ as a framework for continuous improvement focused on access & equity
- Explore the power of “micromessages” and their effects on students’ perceptions of career pathways
- Identify effective strategies to increase access and success for students from groups historically under-represented in high-skill, high-wage, and high-demand STEM career pathways through CTE, especially Native American students
- Integrate one to two strategies into your own personal or institutional plan for the 2017-2018 academic year



# R A D I O

**Reflect**  
on bias and  
stereotypes

**Anticipate**  
impact of  
decisions,  
words, and  
behaviors

**Discover**  
and address  
negative  
micromessages

**Identify**  
ways to give  
positive  
micromessages

**Offer**  
high  
expectations  
and wise  
feedback



# NAPE's Mission

We build **educators' capacity** to implement **effective solutions** for increasing student **access**, educational **equity** and workforce **diversity**.

**equity**

**access**

**diversity**



# What We Do

To ensure equity in programs preparing students for college and careers



Of effective practices and programs



Realize the potential of every student:  
Access, Equity,  
and Diversity



For federal agencies and state and local education agencies



For equity in education to ensure a strong and diverse workforce



# The Process We Employ





NAPE

LET'S THINK OF HIGH-  
SKILL, HIGH-WAGE,  
AND HIGH-DEMAND  
CAREERS

**WHAT ARE THE  
OPPORTUNITIES IN  
THESE FIELDS IN YOUR  
REGION OR COMMUNITY?**



**N A P P E**



# Fast Facts from 2014 to 2024

- Computing jobs will grow by **16%**
- Engineering jobs will grow by **11%**
- Advanced manufacturing jobs will grow by **12%**
- Of all job openings, **51% will require training at the middle skill level**

Sources: <http://vitalsigns.changetheequation.org/>;  
<http://www.nationalskillscoalition.org/state-policy/fact-sheets>

# Opportunities

## *Across post-secondary pathways*

- For the next 55 million job openings (until 2020):
- 35% will require at least a bachelor's
- 30% will require some college or an associate's
- 35% will not require education beyond high school

**Note:** At the current production rate, the US will fall short by 5,000,000 workers with post-secondary education.



Source: Carnevale, A.P.; Smith, N.; & Strohl, J. (2013). Recovery: Job growth and education requirements through 2020. *Georgetown Public Policy Institute*. Georgetown Center on Education and the Workforce.

EXECUTIVE SUMMARY

# CAREER AND TECHNICAL EDUCATION FIVE WAYS THAT PAY

September 2012

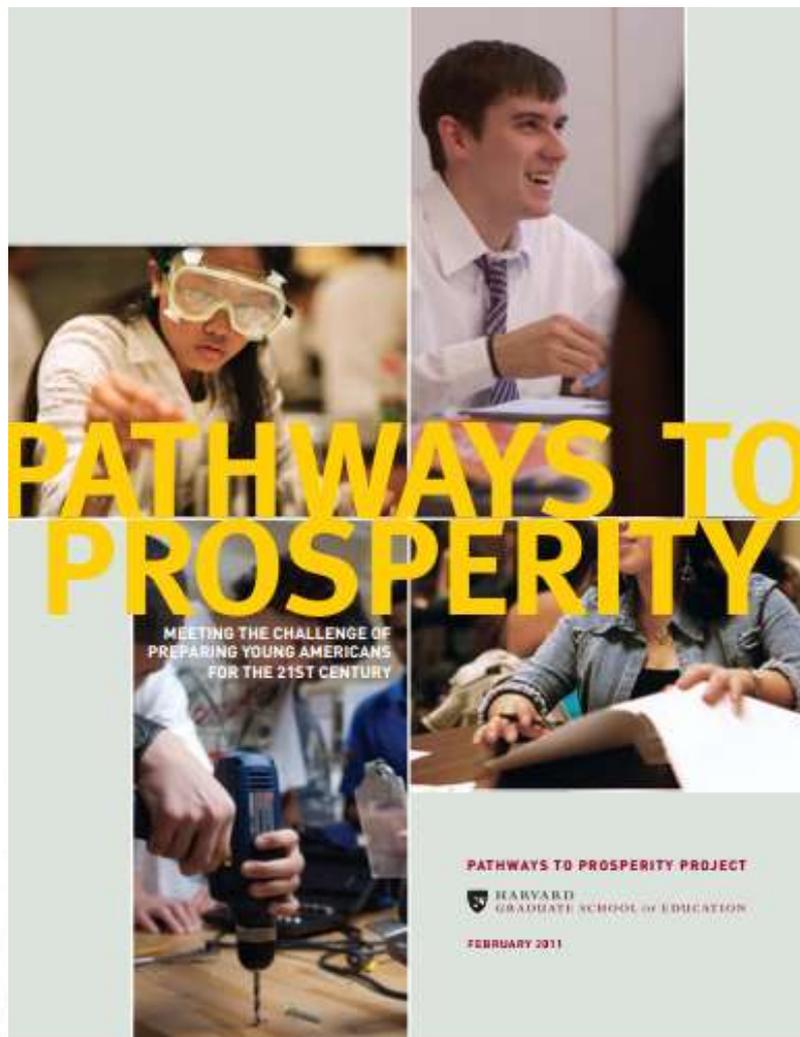


## ALONG THE WAY TO THE B.A.

Anthony P. Carnevale  
Tamara Jayasundera  
Andrew R. Hanson

IVIC  
ENTERPRISES

GEORGETOWN UNIVERSITY  
Georgetown Public Policy Institute  
Center for Education and the Workforce



# PATHWAYS TO PROSPERITY

MEETING THE CHALLENGE OF PREPARING YOUNG AMERICANS FOR THE 21ST CENTURY

**PATHWAYS TO PROSPERITY PROJECT**  
 HARVARD GRADUATE SCHOOL OF EDUCATION  
 FEBRUARY 2011

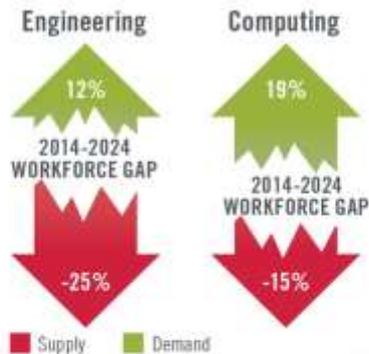
## DEMAND FOR STEM WORKERS EXCEEDS SUPPLY

Science and engineering are the fastest growing occupations

U.S. scientists and engineers with a PhD



Most cyber security and anti-terrorism jobs require U.S. citizenship and a PhD. In 2010, the number of U.S. scientists and engineers with a PhD was nearly half that of foreign-born.



The existing STEM workforce is aging; 46 percent of STEM jobs are held by those older than 45. When they retire, they take their knowledge with them.

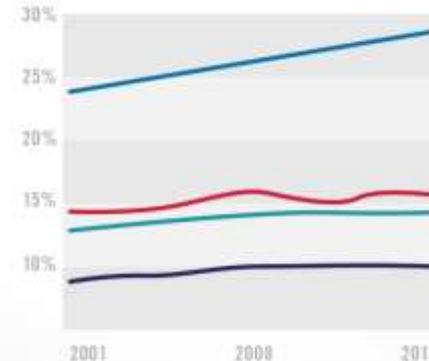
Rothwell, J. 2015 (September 15). Short on STEM talent. U.S. News & World Report. Available at [www.usnews.com/stem/articles/2014/09/15/the-stem-worker-shortage-is-real](http://www.usnews.com/stem/articles/2014/09/15/the-stem-worker-shortage-is-real).  
National Science Foundation. 2014. Science and engineering labor force. Science and Engineering Indicators. Available at [nsf.gov/statistics/seind/d4/content/chapter-3/chapter-3.pdf](http://nsf.gov/statistics/seind/d4/content/chapter-3/chapter-3.pdf).  
Change the Equation. 2015. Solving the Diversity Dilemma. Available at [changetheequation.org/solving-diversity-dilemma](http://changetheequation.org/solving-diversity-dilemma).

## WORKFORCE GAP

Women's participation in STEM jobs has plateaued since 2001

2001	VS.	2014
13%	Engineering	12%
27%	Computing	26%
10%	Advanced Manufacturing	10%

African Americans and Latinos are grossly underrepresented in U.S. STEM jobs



African American/Latino Percentage of:

- U.S. working-age population
- Advanced manufacturing workforce
- Computing workforce
- Engineering workforce

Change the Equation. 2015. Solving the Diversity Dilemma. Available at [changetheequation.org/solving-diversity-dilemma](http://changetheequation.org/solving-diversity-dilemma).





# What We Do



Performance



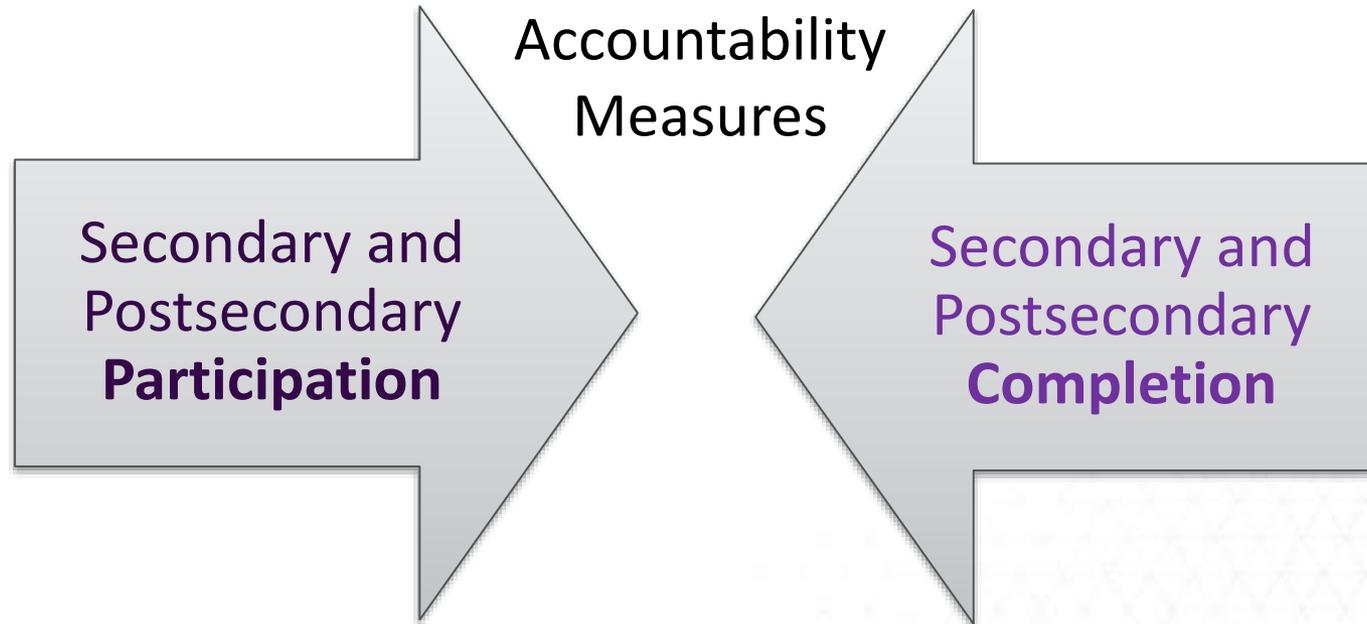
Participation



Pipeline



# The Perkins Act



Does **participation** or **completion** lead to employment in nontraditional fields?

# Data Collection

## *Disaggregation required in Perkins IV*

### Gender

- Male
- Female

### Race/Ethnicity

- American Indian or Alaskan Native
- Asian or Pacific Islander
- Black, non-Hispanic
- Hispanic
- White/non-Hispanic

### Special Populations

- Underrepresented gender students in a nontraditional CTE program
- Single parent
- Displaced homemaker
- Limited English proficiency
- Individuals with a disability
- Economically disadvantaged



*When are the intersections of equity important?*

# Data Collection

## *Recommended Analysis*

### Current Context

- National level data
- State level
- Best performer in state
- Selected peer benchmark
- Set your own benchmark

### Site Specific

- District
- School/College
- Programs

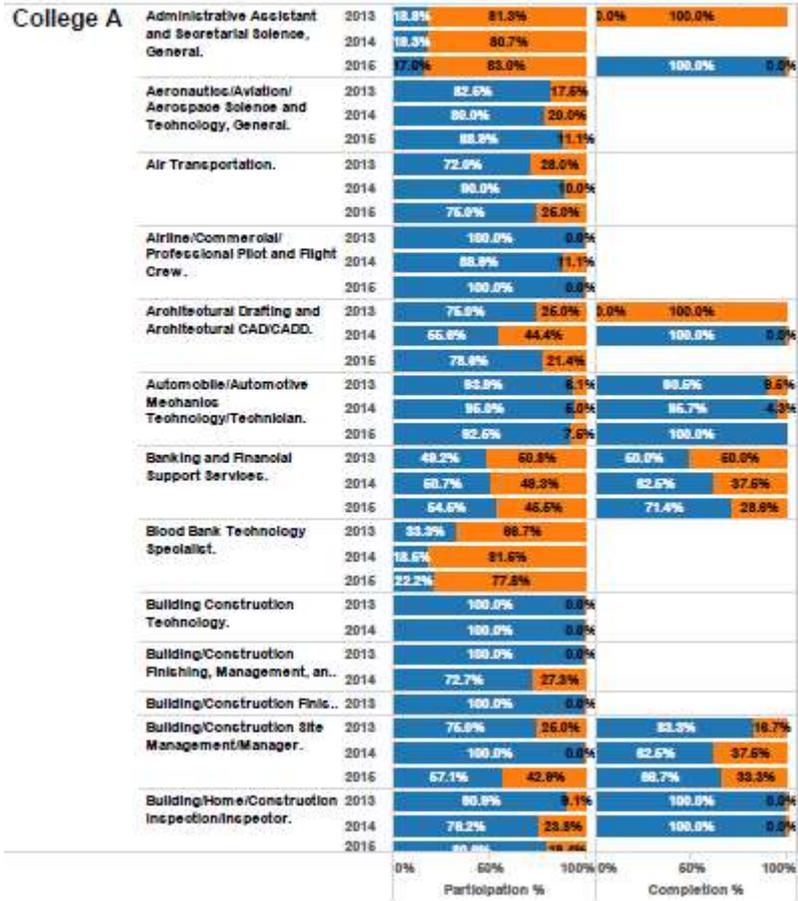
### Trends

- At least 2 years
- Prefer 3-5 years



# Data Dashboard

Graph of Non-traditional Participation (5P1) and Non-traditional Completion (5P2) by Gender and Programs within select Community Colleges (2013-2015)



Gender  
 Female  
 Male

College Name  
 College A  
 College B  
 College C  
 College D

Program Name

- Accounting Technology/Technician.
- Accounting.
- Administrative Assistant and Sec.
- Aeronautics/Aviation/Aerospace S.
- Agricultural Business and Manage..
- Air Transportation.
- Airline/Commercial/Professional Pi.
- Architectural Drafting and Architeo.
- Architectural Engineering TechnoL.
- Architecture.
- Autobody/Collision and Repair Tec.
- Automobile/Automotive Mechano..
- Banking and Financial Support Serv.
- Blood Bank Technology Specialist.
- Building Construction Technology.
- Building/Construction Finishing, M.
- Building/Construction Finishing, M.
- Building/Construction Site Manage..
- Building/Home/Construction Inspe..
- Building/Property Maintenance.
- Business Administration and Mana.
- Business/Commerce, General.
- CAD/CADD Drafting and/or Design T.
- Carpenters.
- Cinematography and Film/Video Pr.

Year  
 2013  
 2014  
 2015

NonTrad Group  
 NTF  
 NTM

CIP Code

- 01.0101
- 01.0803
- 01.0805
- 04.0200
- 04.0201
- 04.0401
- 04.0801
- 04.0801
- 04.0801
- 08.0701
- 10.0203
- 10.0303
- 11.0100
- 11.0200
- 11.0201
- 11.0301
- 11.0301
- 11.0801
- 11.0802
- 11.0700
- 11.0801
- 11.0801
- 11.1002
- 11.1003
- 11.9899
- 12.0600
- 12.0603
- 13.1001
- 13.1200
- 13.1202
- 13.1208
- 13.1208
- 14.0100
- 14.0101
- 14.0800
- 15.0000



# WHAT DO YOU EXPECT TO SEE?



N A P P E





# WHAT BARRIERS KEEP STUDENTS FROM PURSUING PROGRAMS THAT LEAD TO THESE STEM JOBS?



NAPE

# Review Research Summary

## Nontraditional Career Preparation ROOT CAUSES & STRATEGIES



The goal of Nontraditional Career Preparation is to assist you in recruiting and retaining more students into nontraditional careers through the most effective means possible. This chart provides a "quick find" to the research and is intended as a summary. Online and downloadable versions of the complete document are available on the NAPE website at [www.napequity.org/root](http://www.napequity.org/root).

	ROOT CAUSE	THEORY	STRATEGIES
EDUCATION	<b>Academic Proficiency</b> When female students are academically proficient, they are more likely to persist in choosing nontraditional careers, while the opposite is more predictive for male students.		<ul style="list-style-type: none"> <li>Teach students that ability can be expanded.</li> <li>Intervene to revise underachievement.</li> <li>Provide math camps for female students.</li> <li>Identify and assist students who aspire to science and engineering careers but lack academic proficiency.</li> <li>Create incentives for taking AP courses.</li> <li>Teach visual-spatial skills.</li> <li>Use age-appropriate video games that appeal to female individuals.</li> </ul>
	<b>Access to and Participation in Math, Science, and Technology</b> Encourage participation and success in math, science, and technology courses, especially those taught in an equitable and "hands-on" manner.		<ul style="list-style-type: none"> <li>Utilize real-life teaching strategies.</li> <li>Keep and sustain interest in math.</li> <li>Make math and science a requirement.</li> <li>Make other programs available such as after-school or weekend or summer camps.</li> <li>Invite, involve, and educate parents.</li> </ul>
	<b>Curriculum</b> Essential elements of a bias-free curriculum include relevancy, inclusive images and text, and hands-on instructional practices.		<ul style="list-style-type: none"> <li>Foster interest and curiosity, as well as skill, in math and science.</li> <li>Provide comprehensive professional development.</li> <li>Stress professional development self-assessment.</li> <li>Utilize intervention programs for information technology (IT) in formal education.</li> <li>Identify and correct bias in curricular and professional materials.</li> </ul>
	<b>Instructional Strategies</b> Female students prefer learning experiences that they help to design, that are learner centered, and that involve them in a community.		<ul style="list-style-type: none"> <li>Provide comprehensive pre-service and in-service professional development relating to gender issues.</li> <li>Stress professional development self-assessment.</li> <li>Utilize intervention programs for IT in formal education.</li> <li>Incorporate student experiences in the instructional process.</li> <li>Utilize either virtual or hands-on science activities.</li> </ul>
	<b>School/Classroom Climate</b> Students who experience a school climate supportive of nontraditional careers and gender equity are more likely to participate in nontraditional careers.		<ul style="list-style-type: none"> <li>Facilitate informal support groups.</li> <li>Enforce civil rights and sexual harassment policies and practices.</li> <li>Address climate issues.</li> <li>Practice inclusive hiring processes.</li> <li>Issue recommendations.</li> <li>Strengthen support systems and eliminate barriers.</li> <li>Schedule students in nontraditional programs in cohorts whenever possible.</li> <li>Support nontraditional student clubs and after-school activities.</li> </ul>
	<b>Support Services</b> Students enrolled in nontraditional career and technical education programs who receive support services are more likely to succeed.		<ul style="list-style-type: none"> <li>Provide tutoring, child care, transportation, and tuition assistance.</li> <li>Post tutoring locations and hours in a highly visible area of the classroom.</li> <li>Make loaner laptops available to students.</li> </ul>
FAMILY	<b>Family Characteristics</b> Characteristics and engagement of family of origin have a strong influence on career choice.		<ul style="list-style-type: none"> <li>Design activities to promote family roles in gender-neutral career guidance.</li> <li>Invite, involve, and educate parents.</li> <li>Involve parents in developing their child's career plan.</li> <li>Engage male and female students by providing activities that they may not have been culturally socialized to participate in.</li> </ul>



# Key barriers to Success

- Stereotype Threat
- Low expectations
- “Inappropriate pedagogies that lack the incorporation of technology and ignore students’ cultural experiences.” (Upadhyay, 2005)
- “Instructional methods that fail to encourage or incorporate a ‘connected, relational understanding’” (Boaler, 2012, p.135)
- Lack of role models and mentors in whom students can see themselves mirrored



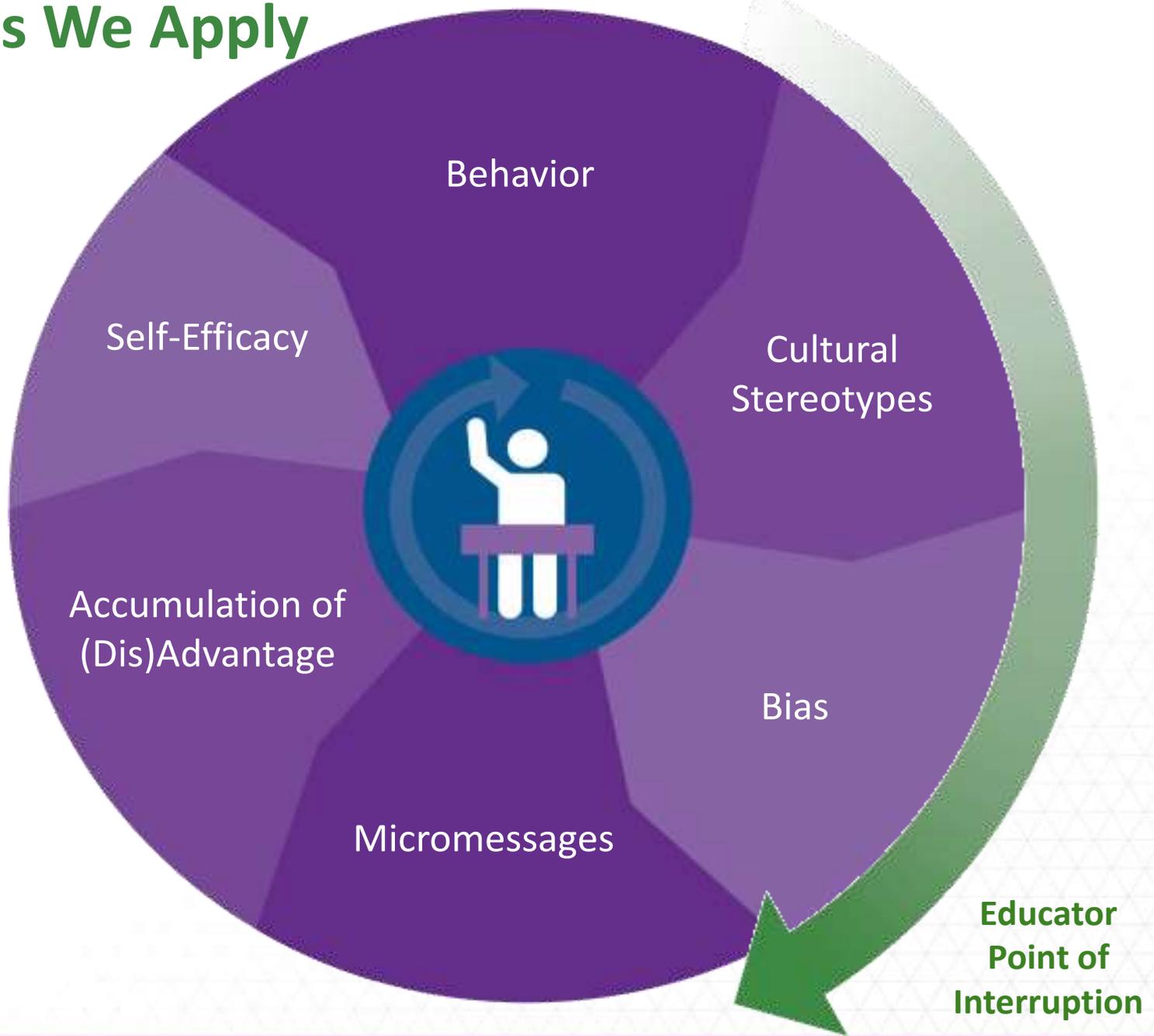
Sources: Upadhyay, B. R. (2005). Using students’ lived experiences in an urban science classroom: An elementary school teacher’s thinking. *Science Education*, 90, 94–110. Boaler, J (2012). Both referenced in Advancing Equity in CTE Literature Review (Draft).

# MICROMESSAGES



N A P P E

# The Lens We Apply





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# WHAT ARE CULTURAL STEREOTYPES?









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What **cultural stereotypes** are prevalent at your institution?

What is the **impact** of these stereotypes on **students**?

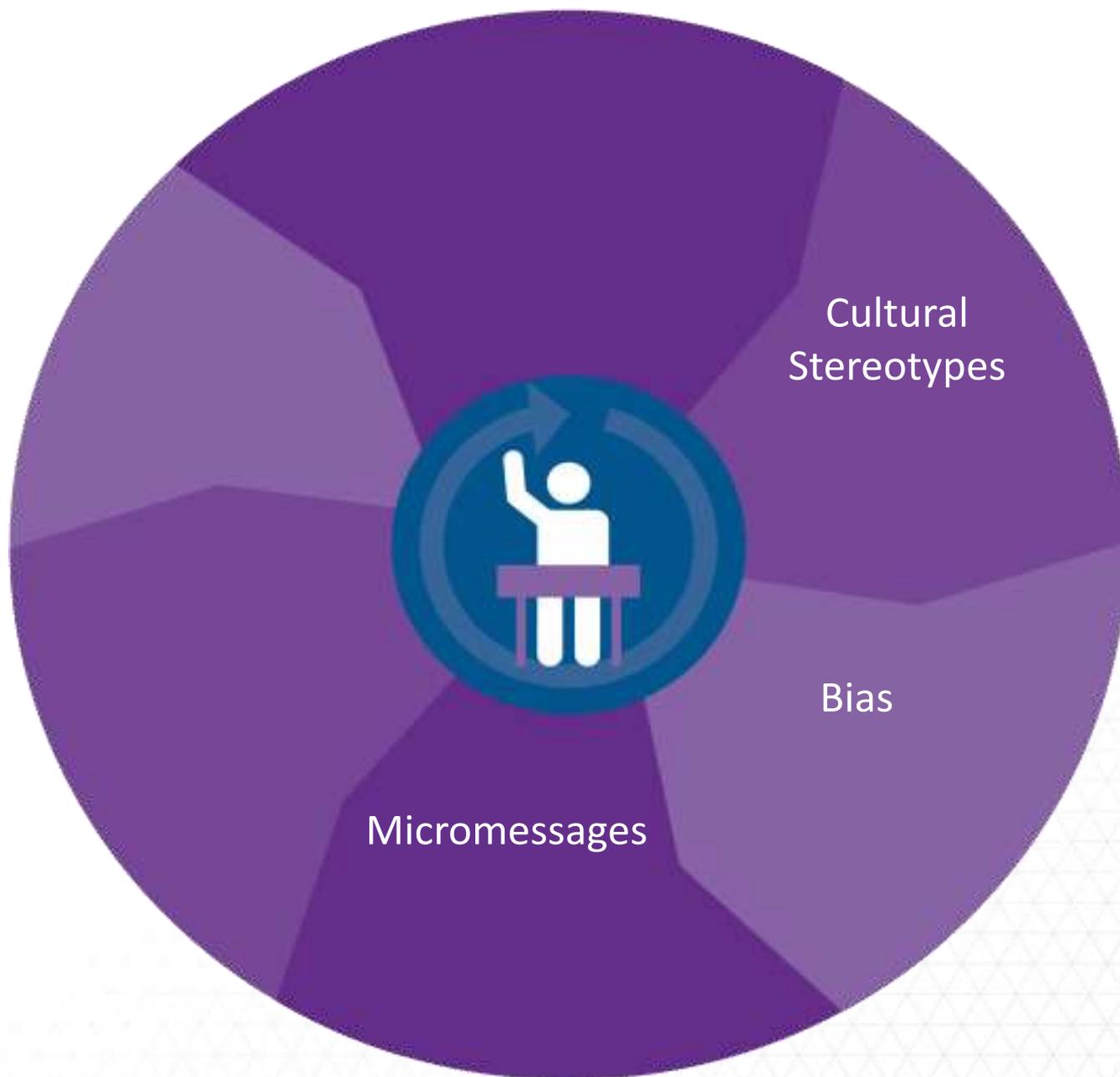
*“The **single story** creates stereotypes, and the problem with **stereotypes** is not that they are untrue, but that they are **incomplete**. They make one story become the only story.”*

Chimamanda Adichie: [\*The Danger of a Single Story\*](#), TedTalk

# Reflection Questions



- What are the stories we tell about students and our cultural assumptions of their career interests, pursuits, and pathways?
- What is the impact of single stories, or cultural stereotypes on your students (current and prospective)?





*Small, subtle,  
unconscious messages*

*sent and received when  
we interact with others*



- Valued
- Included
- Encouraged
- Intentional
- Positive

Micro-Affirmations



Micro-Inequities



- Excluded
- Devalued
- Unintentional
- Negative
- Discouraged







# Self-Efficacy



**Self-confidence does not equal self-efficacy!**

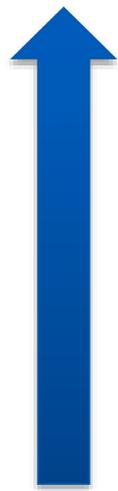
# Inspire the Courage to Excel



## **self – efficacy**

*is the belief one holds in  
their ability to perform a  
specific task*

# Inspire the Courage to Excel



ACHIEVEMENT  
INTEREST & MOTIVATION  
ENGAGEMENT  
PERSISTENCE  
PERFORMANCE

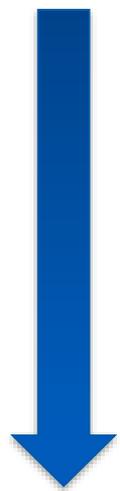
## **self – efficacy**

*is the belief one holds in their ability to perform a specific task*

*An individual with high self-efficacy is more likely to adopt and commit to more challenging goals.*



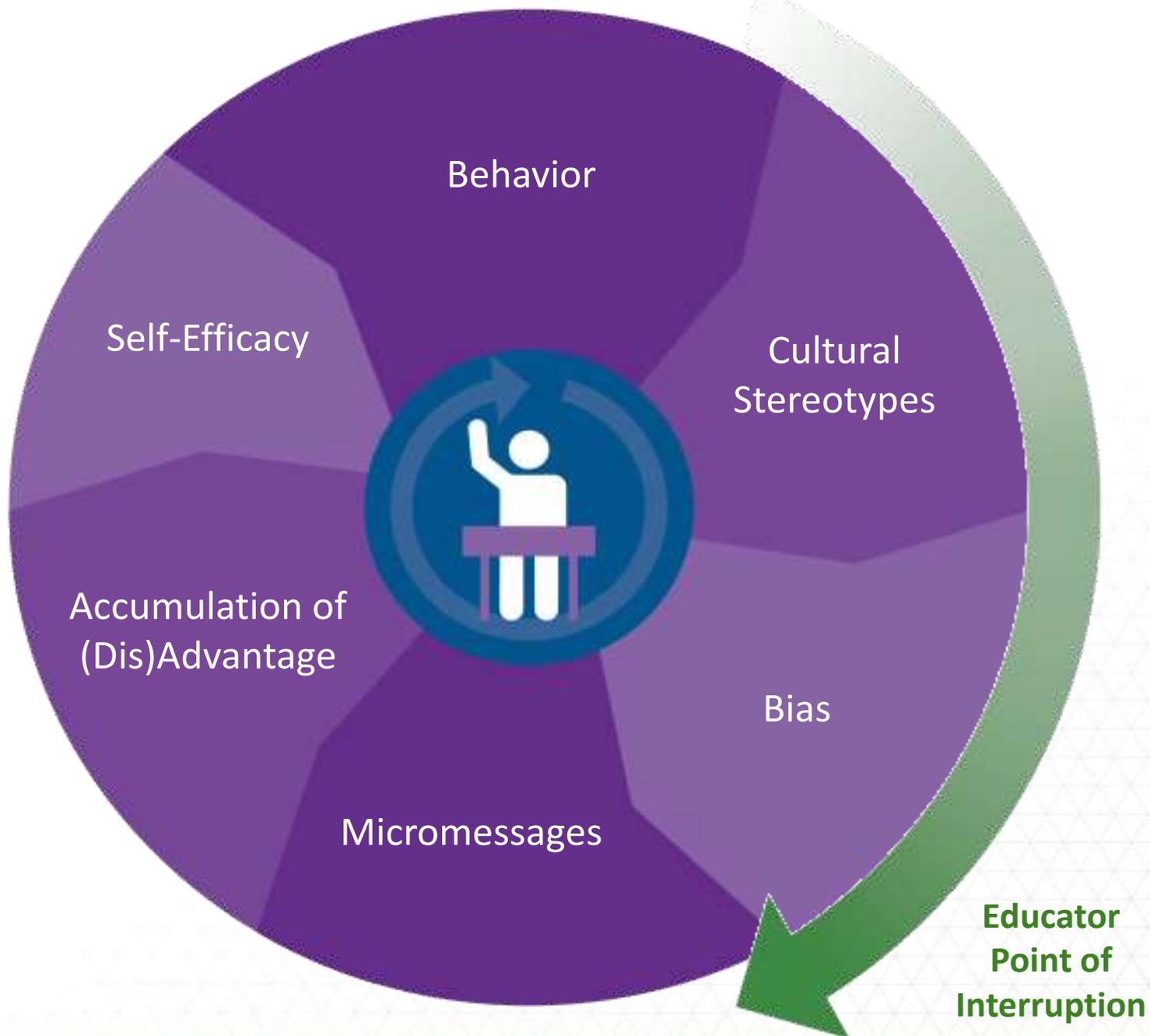
# Inspire the Courage to Excel



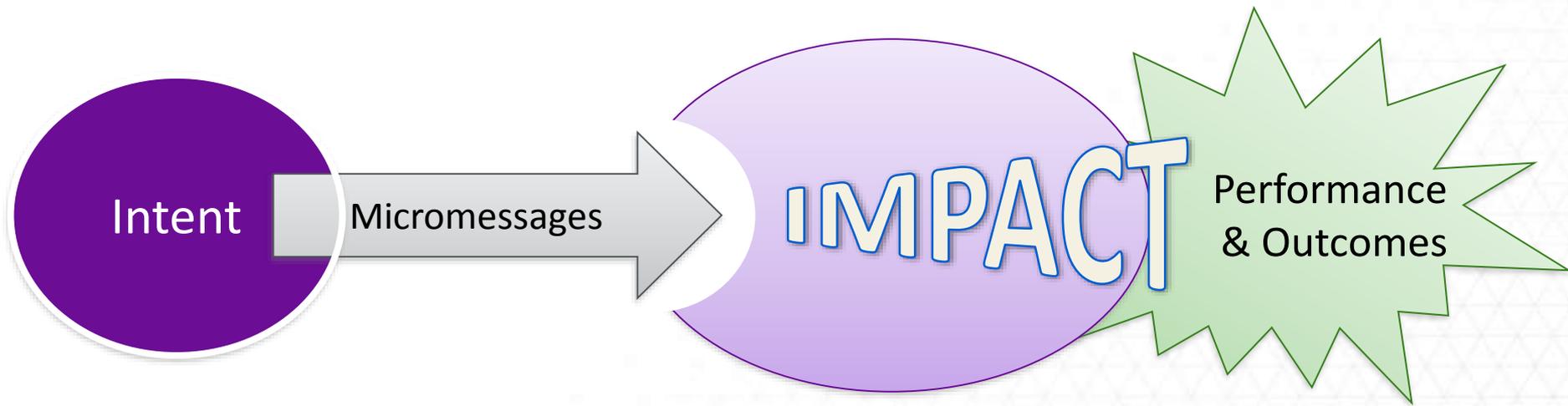
DOUBT  
FEAR  
AVOIDANCE

**self – efficacy**  
*is the belief one holds in  
their ability to perform a  
specific task*

*An individual with low self-  
efficacy is more likely to avoid  
challenges.*



# Why Think About Micromessaging?



*Impact is more important than Intent!*



# Root Cause Analysis Through Action Research

## Root Causes

- Surveys
- Equity Audits
- Interviews
- Focus Groups





# Research- and Evidence-based strategies with links: [www.napequity.org/root](http://www.napequity.org/root)

[Feedback](#) [Contact Us](#) [My Profile](#) [Log in](#)



National Alliance for Partnerships in Equity

*The Equity Professionals*

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## EARLY INTERVENTION

Review the [Theory and Evidence](#).

### Recommendations and Strategies\*

- *Conduct interventions for middle school students:* NSF's New Formulas for America's Workforce 2 Projects provide programming for American girls for whom timing of their future plans can have an ill-timed conjunction with eroding self-efficacy and greater awareness of social messages, about femininity.
- *Target elementary and middle school students, especially for math interventions:* "Intervention programs should be started early to counteract the belief that 'mathematics is a matter for boys.'"
- *Intervene early in youth's development:* Interventions that address occupational factors may be vital to getting students ages 10- 13 more interested in an



## Root Causes

[Support Services](#)

[Academic Proficiency](#)

[Early Intervention](#)

[Access to and Participation in Math, Science and Technology](#)

[Characteristics of an Occupation: Job Satisfaction/Career-Family Balance/Occupational Perception/Wage Potential](#)

[Curriculum](#)

[Family Characteristics](#)

[Instructional Strategies](#)

[Internal/Individual](#)

[School and Classroom Climate](#)

[Societal Issues](#)

[Materials and Practices: Assessment,](#)



# Super Strategies to Effectively Serve Native American Students in CTE and STEM

- **Group**

- Design group activities based on successful teamwork
- Assign group roles contrary to first instinct

- **Cooperation**

- Balance cooperative activities with competitive ones
- Allow students to grade based on cooperation

- **Give and Share**

- Encourage and value sharing of information/knowledge

Source: Handout (downloadable today). Authors: Wren Walker-Robbins, PhD, Meagan Pollock, PhD, and resources from <http://literacynet.org/lp/namericans/values.html>



# Super Strategies to Effectively Serve Native American Students in CTE and STEM

- **Patience**

- Employ strategies to call on every student
- Wait 15 seconds after a question before any prompts

- **Listen**

- Model and teach to notice and listen first, and then question
- Create a classroom welcome to listeners as well as talkers

- **Flexible Time**

- Allow time for low-pressure learning not tightly restricted
- Although order is important, be empathetic when it comes to time



Source: Handout (downloadable today). Authors: Wren Walker-Robbins, PhD, Meagan Pollock, PhD, and resources from <http://literacynet.org/lp/namericans/values.html>

# Super Strategies to Effectively Serve Native American Students in CTE and STEM

- **Work Value**

- Explain value and purpose of every lesson and activity (relevance)
- Encourage learning and effort towards it over performance

- **Communities of Practice**

- Peer observation
- Small group professional development
- Action research



Source: Handout (downloadable today). Authors: Wren Walker-Robbins, PhD, Meagan Pollock, PhD, and resources from <http://literacynet.org/lp/namericans/values.html>







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# EXPANDING PERCEPTIONS OF CAREER PATHWAYS

*Roseburg High School, Douglas ESD, Oregon*

# Select: Strategies

- Welding instructor buy-in**
- Welding equipment**
- Freshmen Cruise**
- “Pride Night” (Open House)**
- Explore Nontraditional Careers**



# Results

Fall 2015: 4 female students enrolled in Welding

Spring 2016: **38 female students enrolled in Welding (800% increase!)**



# Students this fall



# Recent ACTE Techniques Article



INCREASING ACCESS, EQUITY AND DIVERSITY:

## NAPE's Program Improvement Process for Equity

By Ben Williams



**T**he demand for a skilled and educated STEM (science, technology, engineering and math) workforce continues to increase. Over the next five years, companies will need to replace 945,000 U.S. workers who have basic STEM literacy and 637,000 U.S. workers who have advanced STEM knowledge (Business Roundtable & Change the Equation, 2014). Yet, the participation of women, people of color and individuals from "special populations" (i.e., individuals with disabilities; individuals considered to be economically disadvantaged; individuals with limited English proficiency, including English language learners; single parents; displaced homemakers; and individuals pursuing programs that lead to nontraditional occupations) has stagnated in some cases and dropped in others. For example, from 2001 to 2014, the participation of women in engineering, computing and advanced manufacturing remained flat, and the participation of African-Americans and Latinos in those fields relative to the U.S. working-age population declined (Change the Equation, 2014).

The U.S. Department of Education's Office for Civil Rights (OCR) and the Office of Career, Technical, and Adult Education (OCTEA) released a "Dear Colleague" letter on June 19, 2016, to provide "significant guidance" in addressing the critical need for state and local education agencies (SEAs and LEAs) to increase gender equity in career and technical education (CTE).

The letter states the following: Ensuring equitable access to CTE by eliminating discriminatory practices and taking proactive steps to expand participation of students in fields where the sex in underrepresented can increase overall participation and success in high-growth fields, such as nursing, advanced manufacturing, information technology, computer science and cybersecurity, for both men and women... (U.S. Dept. of Education, 2016)

The Carl D. Perkins Career and Technical Education Act of 2006 (Perkins) requires every SEA to set negotiated performance measures and annually report its progress to OCTEA. If a state does not meet at least 90 percent of its negotiated target,



(FIGURE 1) PIPE training includes five modules: Organize, Explore, Discover, Select, and Act.

it is required to develop and implement an improvement plan outlining the action it will take to improve its performance.

Included in the Perkins accountability system are two measures directed toward gender equity in CTE. These measures are focused on increasing the participation and completion rates of underrepresented gender students in programs that lead to nontraditional occupations, i.e., those with less than 26 percent of one gender represented in the workforce, such as women in engineering technology and men in nursing. These accountability provisions also apply to every LEA receiving Perkins funds.

**NAPE's Solution: The Program Improvement Process for Equity™ (PIPE™)**  
The National Alliance for Partnerships in Equity (NAPE)' Education Foundation has designed a highly effective process to translate current research on gender equity in CTE into practice and transfer this knowledge to and through state offices of education, especially those responsible for the implementation of Perkins.

PIPE is a research-based institutional change model and professional develop-

ment program designed to increase the participation and success of underrepresented students in nontraditional CTE programs, including girls and women in STEM (Williams, 2014). PIPE training includes five modules: Organize, Explore, Discover, Select and Act.

**Module 1: Organize**  
PIPE is most effective when a cross-functional team representing the CTE and STEM education and workforce pipeline in the local community is assembled. Team members typically include administrator(s), teachers and staff members (including counselors and advisors) from local high schools and/or career centers, community colleges and middle schools, as well as community partners and employers. Also part of each PIPE team is a site team leader from NAPE who orients and prepares the team for training.

**Module 2: Explore**  
The data typically provided in Perkins coordinators relative to their institution's performance on the Perkins accountability measures are aggregated at the institutional level. For example, an institution's



Accessible from [napequity.org/pipe](http://napequity.org/pipe)

**Check the RADIO,**  
and tune-in to micromessages!



# R A D I O

**Reflect**  
on bias and  
stereotypes

**Anticipate**  
impact of  
decisions,  
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**Discover**  
and address  
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**Identify**  
ways to give  
positive  
micromessages

**Offer**  
high  
expectations  
and wise  
feedback



# Take-Aways and Questions



“I am only one, but still I am one. I cannot do everything, but still I can do something; and because I cannot do everything, I will not refuse to do something I can do.”

-Edward Everett Hale



# Thank you for your participation!

Ben Williams, PhD

Director of Special Projects

[bwilliams@napequity.org](mailto:bwilliams@napequity.org)

[@NAPEquity; @BenWilliamsPhD](#)

[www.napequity.org](http://www.napequity.org)



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<https://ies.ed.gov/ncee/edlabs/>.