


Increasing Nontraditional Student Success in STEM Using Research- and Evidence-based Programs: The STEM Equity Pipeline

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Agenda


- Introductions
- Who is NAPE and What is the STEM Equity Pipeline™?
- PIPE-STEM™ and Outcomes
- Micromessaging to Reach and Teach Every Student™
- Other NAPE Resources
- Q&A/Discussion



Activity: Welcoming Awareness

Introduce yourself to the group


- Name
- Title
- Organization/unit

Who Is NAPE?

National Alliance for Partnerships in Equity


Professional Development	Research and Evaluation	Technical Support	Public Policy and Advocacy
Provide tools and curricula for educators through conferences, presentations, webinars, and formal training	Develop reports, identify research-based promising practices. Provide input to others' research.	Develop tools and resources for LEAs. Provide consulting services. Offer expertise on access, equity, and diversity issues.	Work with federal agencies. Educate legislators on equity and diversity issues. Develop policy briefs. Alert membership policy issues.



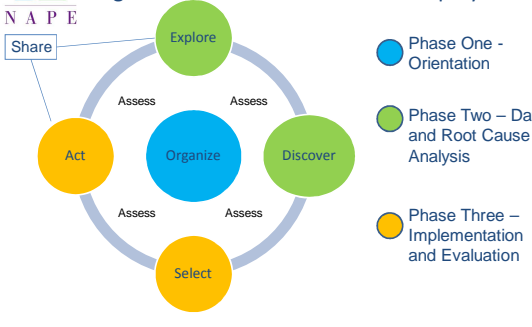
NAPE's Professional Development Suite of STEM Equity Programs

STEM Equity Pipeline™

<p>PIPE-STEM™ Project</p> <p>Working with institutional leaders (administrators, dept heads, etc.) to improve enrollment, retention, and completion of girls and under-represented populations in STEM courses</p>	<p>STEM Equity Teacher Training</p> <p>Training teachers to use pedagogy that improves enrollment, retention, and completion of girls and under-represented populations in STEM courses</p>	<p>STEM Equity Counselor Training</p> <p>Coaching counselors to encourage girls and under-represented populations in STEM careers</p>	<p>Tools & Resources</p> <p>Tools to support teachers' and counselors' learning and assist their students, e.g., camps, partner orgs, books</p>
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STEM Equity Pipeline Program Improvement Process For Equity™

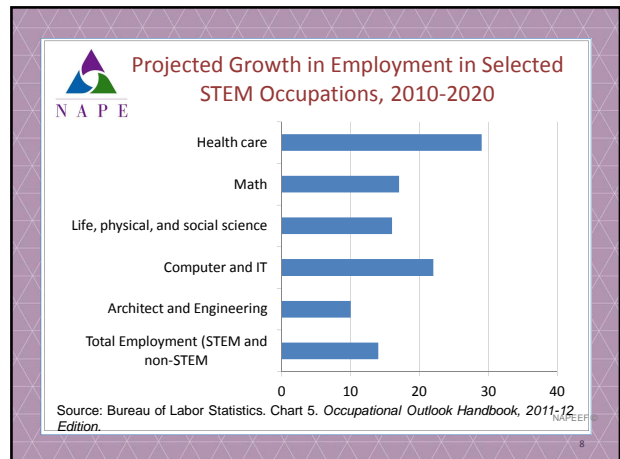


- Phase One - Orientation
- Phase Two - Data and Root Cause Analysis
- Phase Three - Implementation and Evaluation

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Why We still Care...

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NAPE **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
- 36% will not require education beyond high school

Note: The US will fall short by 5,000,000 workers with post-secondary education – at the current production rate

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.

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NAPE **People with lower levels of education in STEM make more than people with higher levels of education in non-STEM.**

- 63 percent of Associate's degrees in STEM earn more than Bachelor's degrees in non-STEM occupations.
- 65 percent and 47 percent of Bachelor's degrees in STEM earn more than Master's degrees and Ph.D. in non-STEM respectively.
- Certificate holders in engineering earn more than Associate's degree-holders in business and more than Bachelor's degree-holders in education.
- **Equity:** For women and racial minorities, STEM is the best equal opportunity employer.
 - Although pay gaps exist between minorities and Whites/Asians and women and men in STEM, they are smaller than in other occupations.

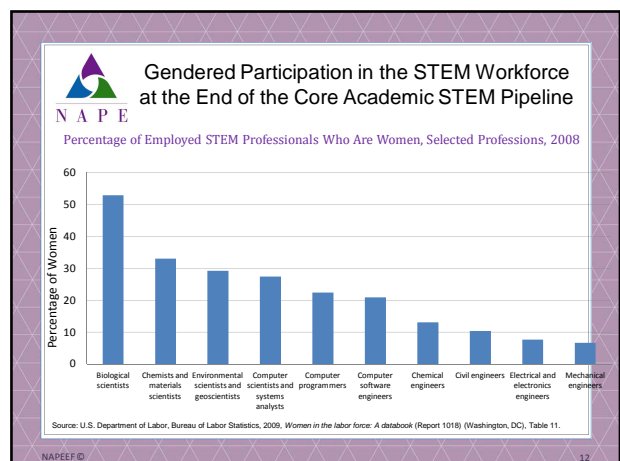
Source: **The Georgetown University Center on Education and the Workforce (2011). STEM.**

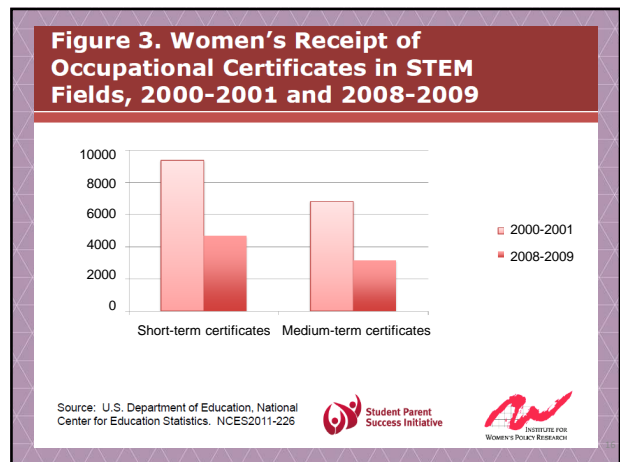
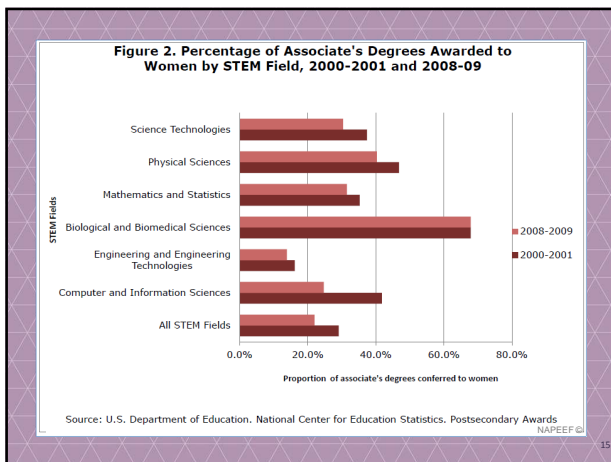
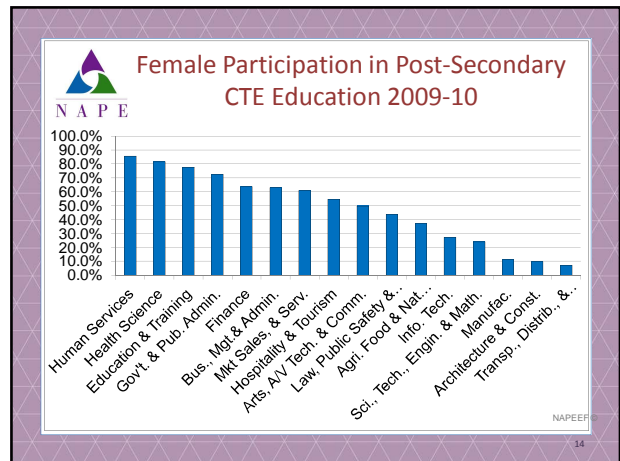
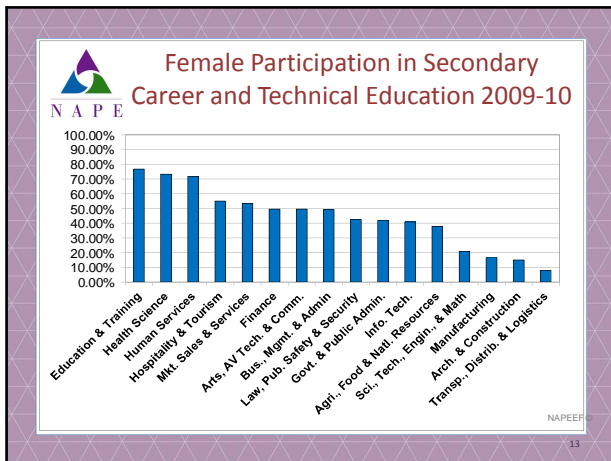
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NAPE **Activity**

What number belongs in the blank?

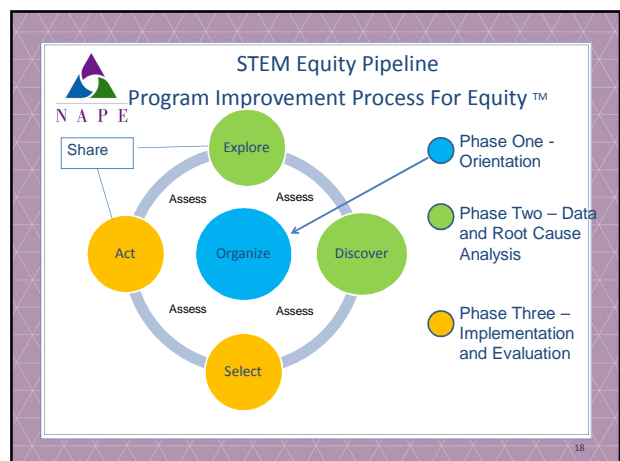
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STEM Equity Pipeline™ Goals

- 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




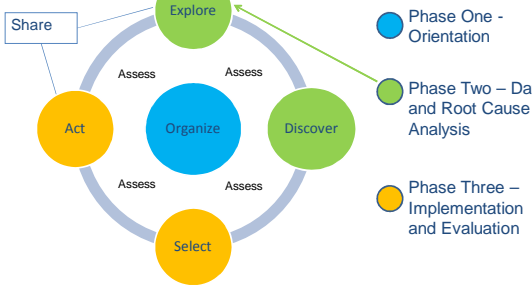
PIPE-STEM Team



- Site lead – director of secondary CTE or other designee
- Administrator(s)
- CTE faculty
- School counselor(s)
- Middle school administrator or counselor, in some cases
- Postsecondary partner(s)
- Business & industry partner
- Community partner

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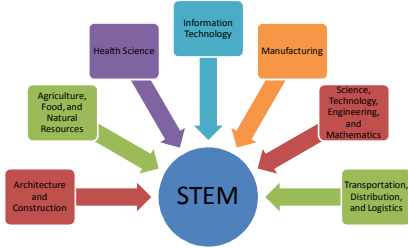
STEM Equity Pipeline
Program Improvement Process For Equity™

- Phase One - Orientation
- Phase Two – Data and Root Cause Analysis
- Phase Three – Implementation and Evaluation


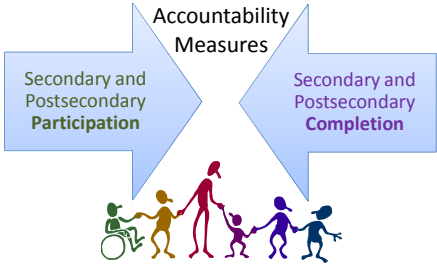
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STEM's Seven Career Clusters

NAPEEF ID 21


The Perkins Act

Does participation or completion lead to employment in nontraditional fields?

NAPEEF ID 22

Disaggregation in Perkins Law




Gender	Race/Ethnicity	Special Populations
<ul style="list-style-type: none"> • Male • Female 	<ul style="list-style-type: none"> • American Indian or Alaskan Native • Asian or Pacific Islander • Black, non-Hispanic • Hispanic • White/non-Hispanic 	<ul style="list-style-type: none"> • 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?

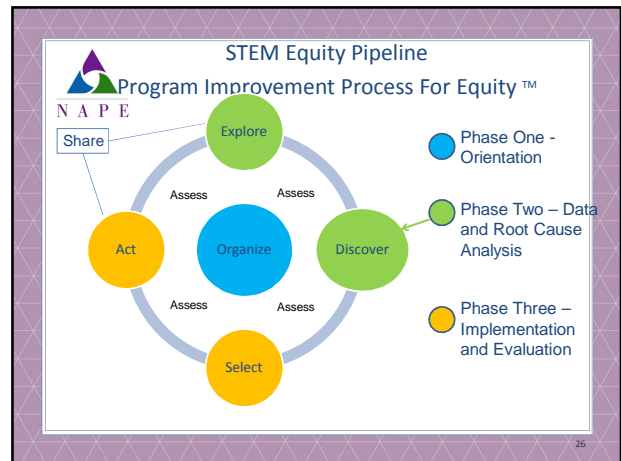
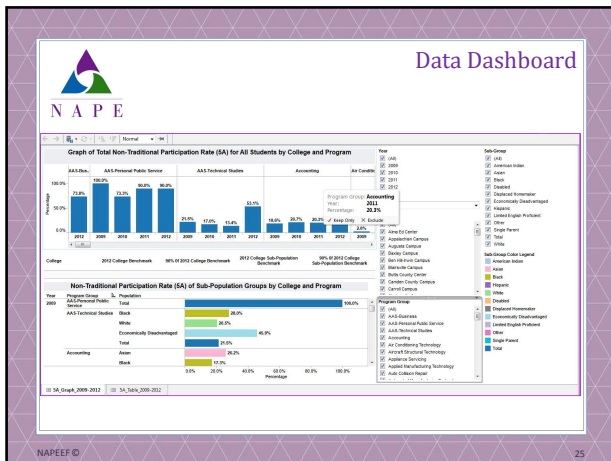
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Data Collection Recommended Analysis



Comparisons	Trends	Site Specific
<ul style="list-style-type: none"> • State performance level • Best performer in state • Selected peer benchmark • Set your own benchmark 	<ul style="list-style-type: none"> • At least 2 years • Prefer 3-5 years 	<ul style="list-style-type: none"> • Statewide • District • School/College • Programs

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Review Research Summary

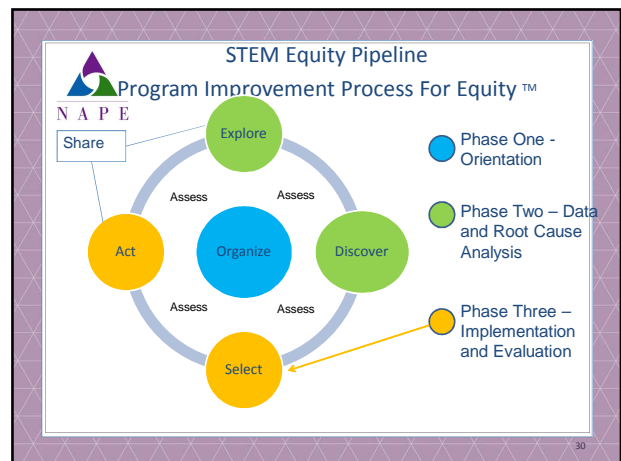
Nontraditional Career Preparation ROOT CAUSES & STRATEGIES

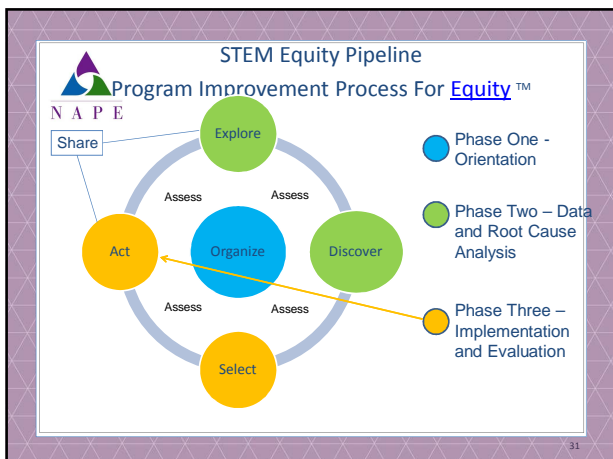
The goal of nontraditional career preparation is to assist post-secondary and working students in their career development through technical and career readiness. This research report provides the research findings and recommendations for nontraditional career preparation. For more information, visit the NAPE website at www.nape.org/ncp.

ROOT CAUSE	IMPACT	STRATEGIES
EDUCATIONAL ENVIRONMENT	Students who do not have access to career preparation resources are less likely to complete a nontraditional career preparation program.	Provide career preparation resources to all students, including those who do not have access to career preparation resources.
CAREER INFORMATION	Students who do not have access to career information are less likely to complete a nontraditional career preparation program.	Provide career information to all students, including those who do not have access to career information.
FAMILY CHARACTERISTICS	Students whose families do not have access to career preparation resources are less likely to complete a nontraditional career preparation program.	Provide career preparation resources to all students, including those whose families do not have access to career preparation resources.

- ### Root Causes
- Educational Environment
 - Career Information
 - Family Characteristics (Family Perceptions)
 - Individual Factors
 - Societal Issues

- ### Confirming Your Hypotheses
- Conduct a root cause analysis
 - Conduct equity audit
 - School environment: physical space, support services
 - Curriculum & instruction
 - Publicity (website, recruitment materials, etc.)
 - Interview students
 - Who drops out of nontraditional programs?
 - Who stays in nontraditional programs?
 - Who never chooses?
 - Conduct focus groups
 - Teachers of nontraditional programs
 - Parents
 - Business/industry/advisory committee members





- Themes in Strategies**
- NAPE
- Early Intervention – providing career information and characteristics of STEM occupations to middle school and high school students
 - NAPE’s new Counselor Toolkit
 - Collaboration between secondary and postsecondary partners in getting students excited about nontraditional STEM occupational pathways
 - Educating parents, teachers, school counselors, & administrators about career pathways through STEM in career-technical education, especially for women and others underrepresented in STEM
- NAPEEF ID
- 32

- Strategies continued**
- NAPE
- Professional development for STEM educators, e.g., NAPE’s “Micromessaging to Reach and Teach Every Student”™
 - Providing additional supports to underrepresented students
 - Regular programs
 - Mentors and role models
- NAPEEF ID
- 33

- PIPE-STEM™ Outcomes: Mansfield STEM Gateway/PLTW**
- NAPE
- 220 students in STEM Gateway (year one)
 - 46 signed up for PLTW 9th grade
 - 40% are female (19 total)
 - 35% African American
 - Increased student curiosity and engagement
 - more females indicated will take in 10th grade
 - females willing to engage in larger variety of subjects
 - Impact on all students
- NAPEEF ID
- 34

- Significant increase in nontraditional student enrollment**
- NAPE
- More than doubled female enrollment in targeted programs at Maplewood Career Center (IT, CAD, and Electronics)
 - Enrollment in the Welding Program for Fall 2013 includes five (5) female students (out of 25 in the class), which represents 20% of the class
 - Previous years have had one to two females per year
 - Attributed to better promotion of nontraditional careers by counselors
- NAPEEF ID
- 35

- PIPE-STEM™ Outcomes**
- NAPE
- After conducting a targeted personal outreach event, enrollment in high school freshman PLTW increased from 32 to 87—with 15 girls
 - After hiring a female teacher’s aide in a community college auto technology program, enrollment of women increased from 4 to 15 in one semester
 - Community college nuclear engineering program graduated its first class with 6 (25%) women, and 7 (30%) women enrolled for the fall
- NAPEEF ID
- 36

Strengths of PIPE-STEM™

- Data driven (national and local)
- Collaborative across the pipeline
- Assessment, Assessment, Assessment
- Continuous improvement and learning
- Evidence that it has made a difference
- A national model
- NSF-supported...twice

MICROMESSAGING TO REACH AND TEACH EVERY STUDENT™

Adapt a Recognized Model: The Educator as Classroom Scientist: PIPE-STEM™

Effective Pilot Program DISD Gender Equity Training

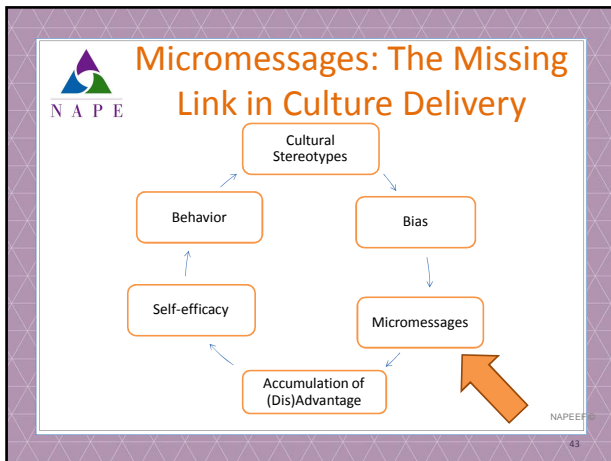
Both boys and girls of teachers who had Gender Equity training are passing at rates 20-30% points higher than students of teachers without the training.

DFW: Professional Development

Since implementation in 2003, AP Physics test pass rates improved for both girls and boys:

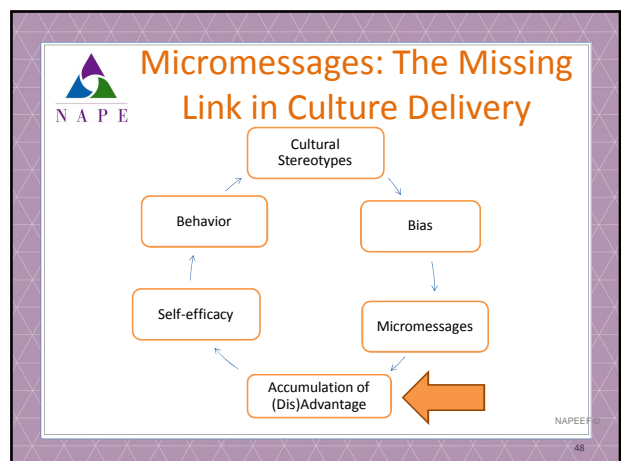
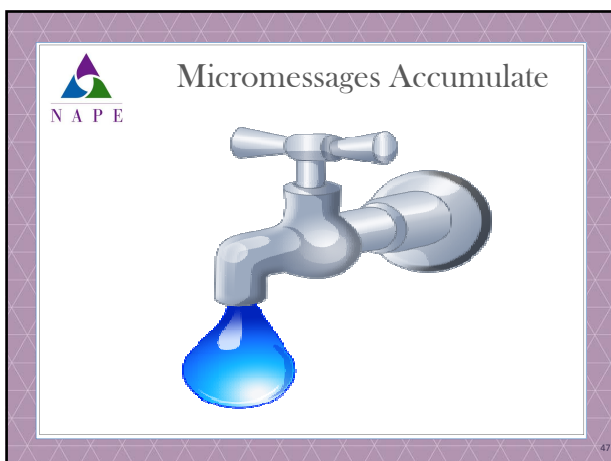
- 4x tests passed by girls
- 4x tests by African Americans
- 6x tests passed by Hispanics

Micromessages



Micromessaging

- Micromessages**: Small, subtle, semi-conscious messages we send and receive when we interact with others.
- Micro-inequities**: Negative micro-messages we send other people that cause them to feel devalued, slighted, discouraged, or excluded.
- Micro-affirmations**: Positive micro-messages that cause people to feel valued, included, or encouraged.



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Exercise

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Negative Implicit Bias = Micro-Inequities

Unconscious

Subtle

Unintentional

PERVASIVE

POWERFUL

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Why Think About Micromessaging?

Intent → Engagement with students in the STEM classroom → Impact

Teacher Micro-messaging → Student Performance

Small and seemingly insignificant behaviors may result in unfavorable learning outcomes.

Impact Is More Important Than Intent!

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Key Micromessaging Elements

What is said

How it's said

Body language

Who or what else is present-culture, artifacts, etc.

Verbal

Para-Verbal

Non-Verbal

Contextual

Omission

Praise and Criticism

Feedback messages

What is not said or not done

Micromessages

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Micro-inequities and Micro-affirmations

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Positive Micromessages


Micro-affirmations are micromessages we send that validate and recognize other people in positive and supportive ways.




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 **Impact of Micro-Affirmations on Females in STEM**
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- Enhanced creativity and innovation and willingness to take risks
- Increased engagement in complex tasks and open-ended thinking
- Improved caring about learning
- Increased interest in STEM and development of girls' STEM identity




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 **A powerful testimonial from one participant, Annissa Langworthy, Stark State College**
 N A P E

- Previous labeling of levels of difficulty - easy, challenging, and difficult.
- Changed verbiage to Level 1, Level 2, and Level 3
- Results:
 - All six sections of APII students' scores averaged 80th percentile and above.
 - Change in terminology allowed more students to attempt all three levels on the practical.
 - Students wrote out their critical thinking on the less challenging questions, which had not been seen previously

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 **Wrap-up and Questions**
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 **Moving Forward**
 N A P E

- As the scientist in your classroom, review your data and begin to formulate a hypothesis for any weaknesses or gaps that exist in student outcomes.
- As a researcher in your classroom, think about how your methods might be changed to improve your students' performance.
- As the coach in your classroom, consider the key messages you can make to your "team members" to affect their best game.
- As the educator in your classroom, recognize and reflect on the power you have to impact the lives of students.


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 **"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."**
 N A P E

-Edward Everett Hale



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 **Questions? Contact Information**
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<http://www.stemequitypipeline.org/StateTeams/OH.aspx>

National Alliance for Partnerships in Equity
www.stemequitypipeline.org
 Join NAPE at www.napequity.org

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