PIPE-STEM™ EXPLORE & DISCOVER

Program Improvement Process for Equity in Science Technology, Engineering and Math

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Battle Creek, Michigan

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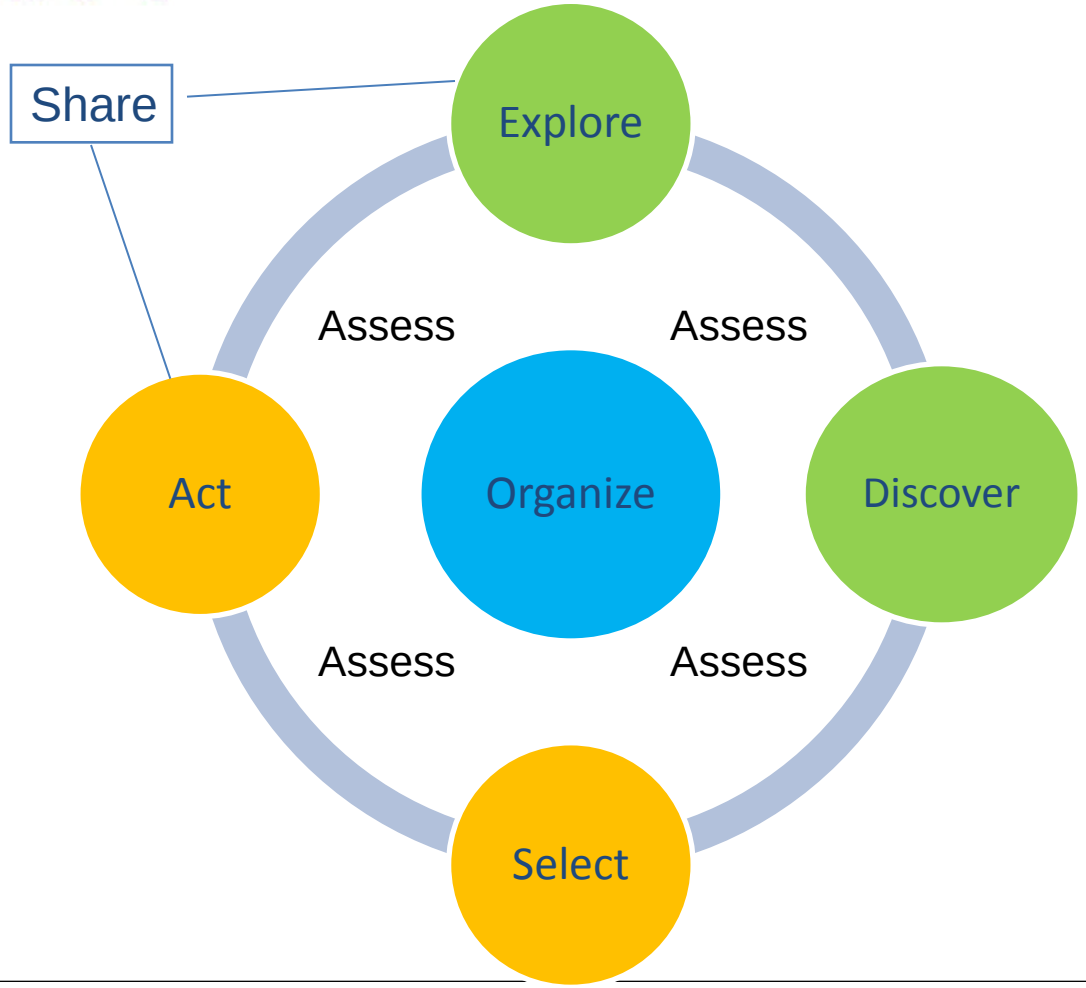
Agenda

- Introductions
- Review the PIPE-STEM Model and tasks for today and later in the year
- Explore Module
- Discover Module (get started)
- Lunch
- Root Cause Activities and Plans for Data Collection
- Synthesize outcomes in Implementation and Evaluation Plan
- Evaluation
- Review Next Steps for Additional Data Collection

REVIEW OF THE PIPE-STEM™ MODEL

STEM Equity Pipeline

Program Improvement Process For Equity ™



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

Activity 1: Meet, Share, Respond

1. Find someone you don't know or don't know well.
2. Get acquainted and discuss the questions.
3. Introduce each other by name, title/institution, and the response to one of the three questions.

EXPLORE MODULE

PLEASE COMPLETE THE PRE-TEST FOR EXPLORE

EXPLORE

By the end of this module…

- Compare the gendered difference in STEM participation in career and technical education compared to core academic STEM classes/STEM degree programs;
- Focus on the leaks in the STEM pipeline: transitions between levels;
- Explore and Reflect on STEM data within the local educational STEM Pipeline; and
- Identify additional data needs.

STEM Equity Pipeline Project defines STEM as…

- Agriculture, Food, and Natural Resources
- Architecture and Construction
- Health Science
- Information Technology
- Manufacturing
- Science, Technology, Engineering, and Mathematics
- Transportation, Distribution, and Logistics

Accountability Measures in Perkins Act

Secondary & Postsecondary Participation

Number of CTE participants from underrepresented gender groups who participated in a program that leads to employment in nontraditional fields during the reporting year

Secondary & Postsecondary Completion

Number of CTE concentrators from underrepresented gender groups who completed a program that leads to employment in nontraditional fields during the reporting year

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 Population

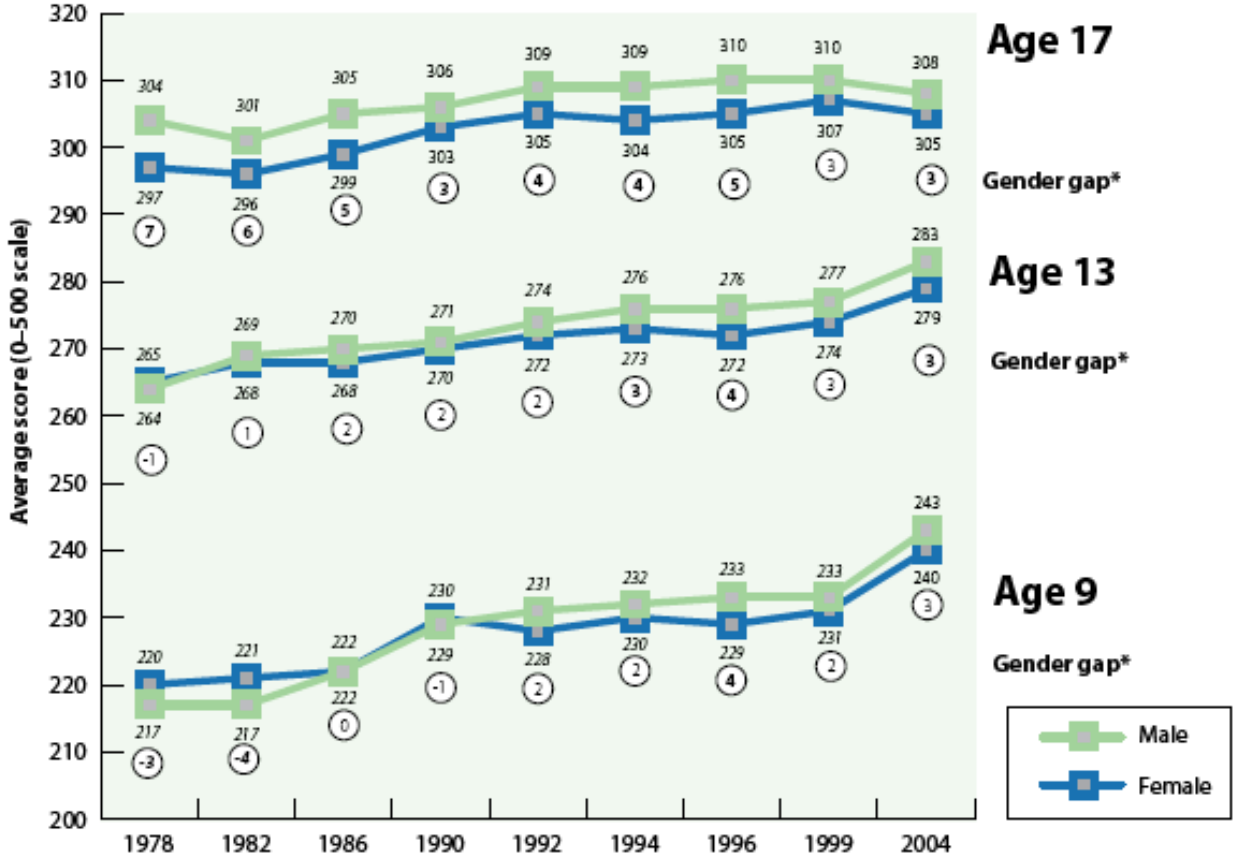
- –Underrepresented gender students in a nontraditional CTE program
- –Single Parent
- –Displaced Homemaker
- –Limited English Proficiency
- –Individuals with a Disability
- –Economically Disadvantaged

Gendered *PERFORMANCE* IN STEM

- Female students' performance in STEM education has improved over time and, in some cases, has surpassed that of male students.
- Male students outperform female students in high-stakes measures of STEM performance.
- Female CTE concentrators outperform male CTE concentrators in mathematics

STEM Performance
Core Academic – Longitudinal Data

FIGURE 2. NAEP-LTT MATHEMATICS ASSESSMENT AVERAGE SCORES, BY GENDER, 1978–2004

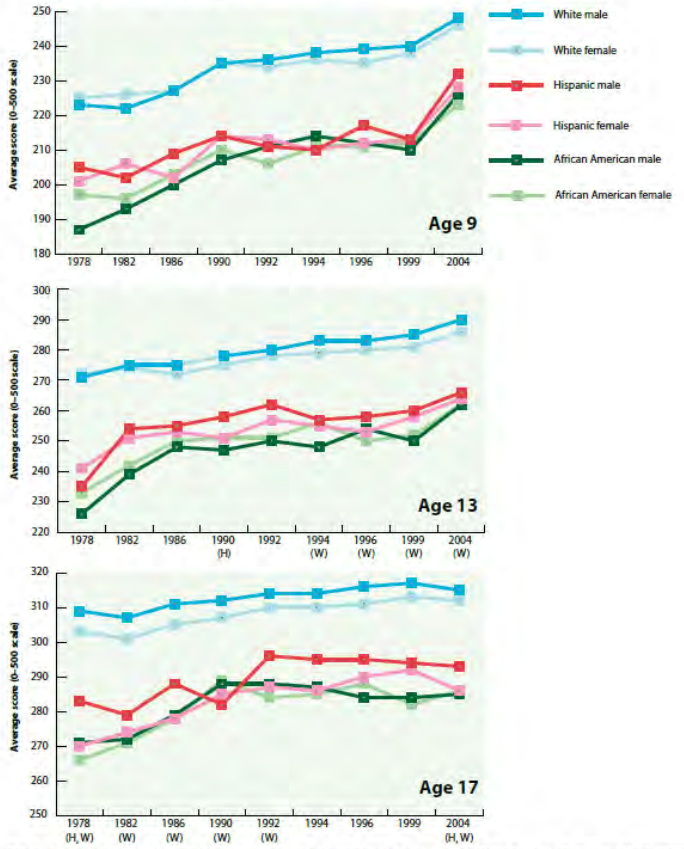


STEM Performance Gaps–Race

- White males and females out-perform Hispanic and African Americans on the National Assessment of Educational Progress – Mathematics Assessment

Race

FIGURE 4. NAEP-LTT MATHEMATICS ASSESSMENT AVERAGE SCORES, BY GENDER AND RACE/ETHNICITY, 1978–2004

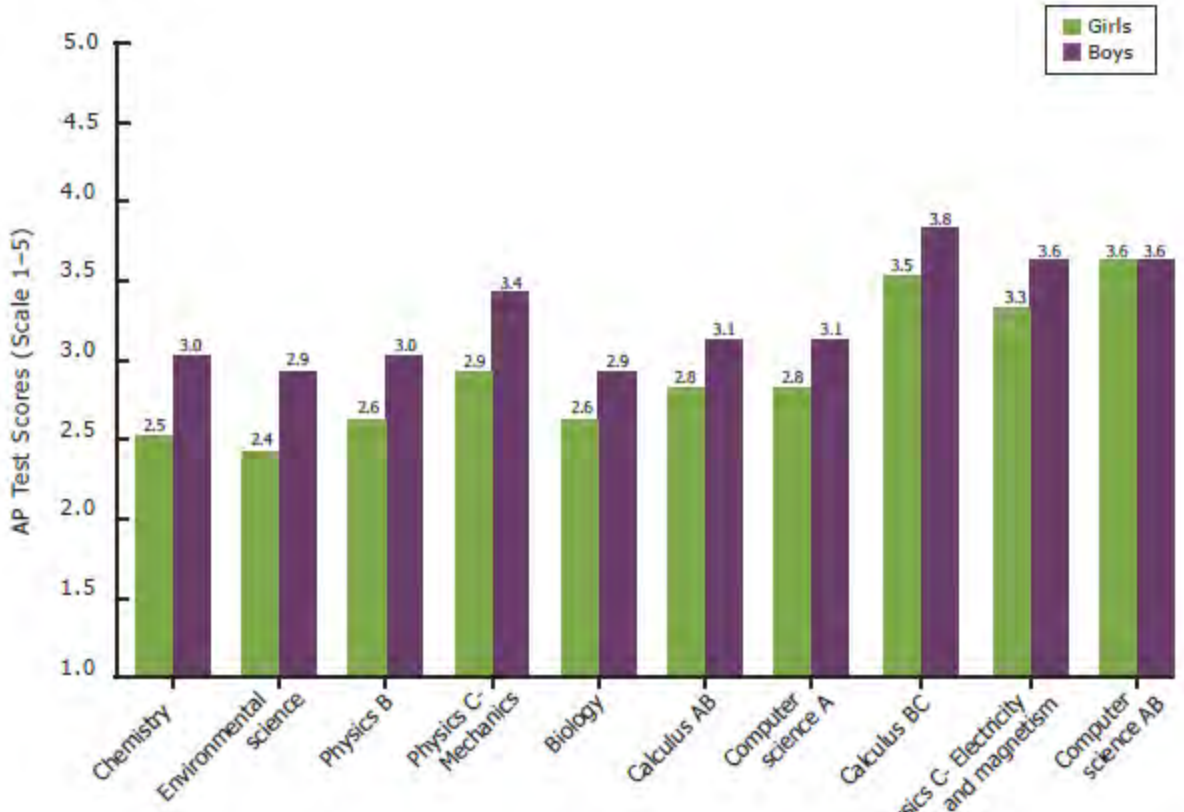


Note: A, H, and W indicate years in which there was a significant gender difference in scores among African American (A), Hispanic (H), or white (W) students.

Source: U.S. Department of Education, National Center for Education Statistics, *NAEP Data Explorer*. Washington, DC: Author.

STEM Performance: High-Stakes Tests

Average Scores on Advanced Placement Tests in Mathematics and Science Subjects, by Gender, 2009



Source: Retrieved November 11, 2009, from the College Board website at www.collegeboard.com.

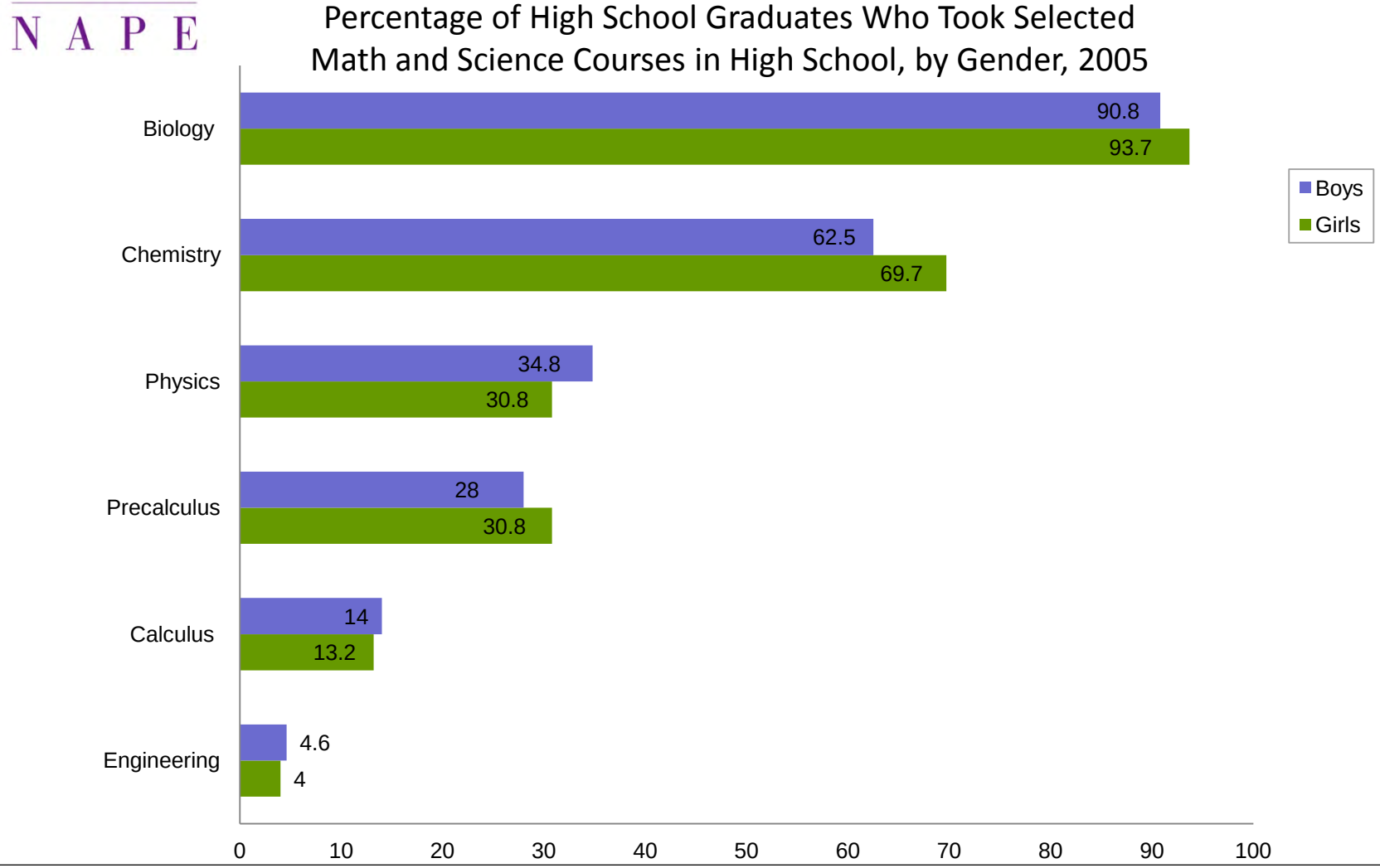
Gendered *Participation* in STEM

- Female students' participation in core academic STEM education has increased over time and, in some cases, has surpassed that of male students.
- Participation in CTE STEM is stubbornly sex-segregated.
- Significant leaks in the STEM pipeline contribute to occupational sex-segregation.

Activity 2: Startling Statements

1. Interview three other people (not including yourself) and ask them to guess what they think the number is that belongs in the blank in your statement.
2. Talk to each person individually (not as a group) so they will not influence each others' answers.
3. Once you have your three answers, prepare to report out the average of your three responses (add the three and divide by three) and the range (the high and low response).

Gendered *Participation* in High School Core Academic STEM Classes

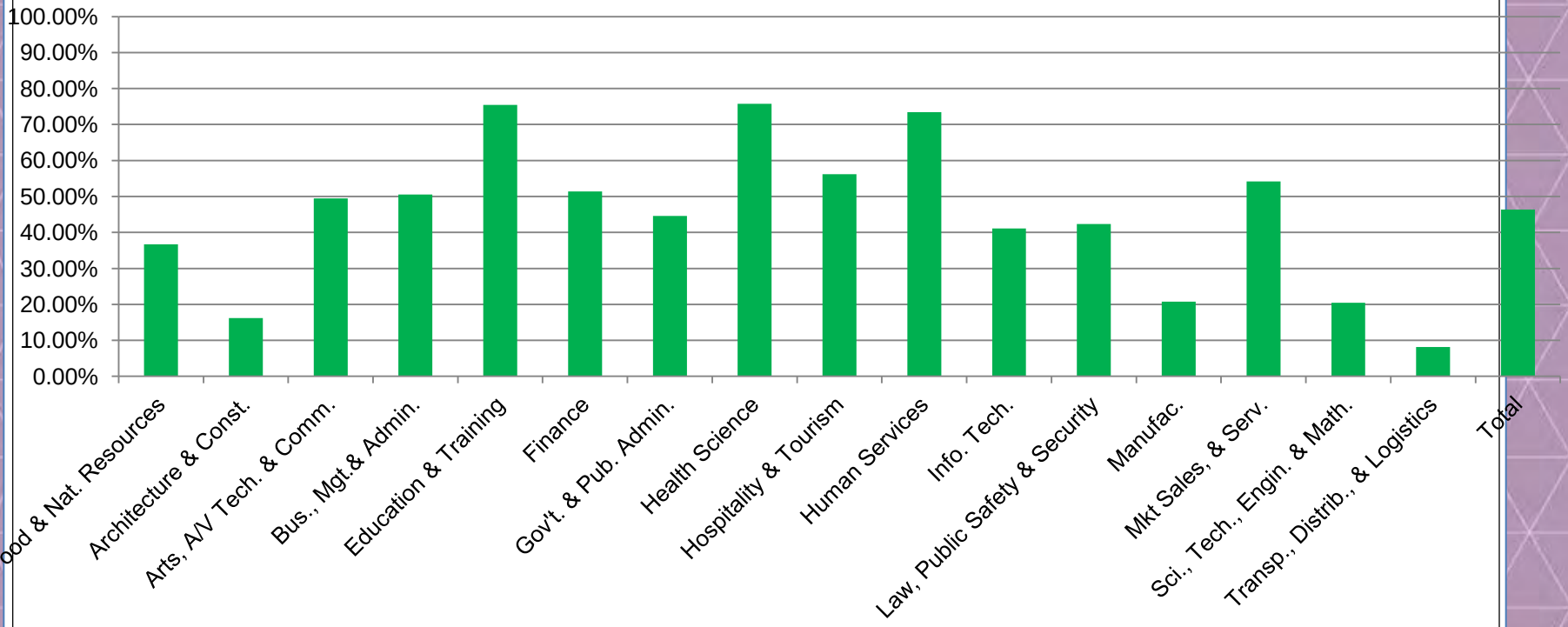


Source: National Center for Education Statistics. (2007). *Digest of Education Statistics.*

Gendered *Participation* in High School STEM CTE

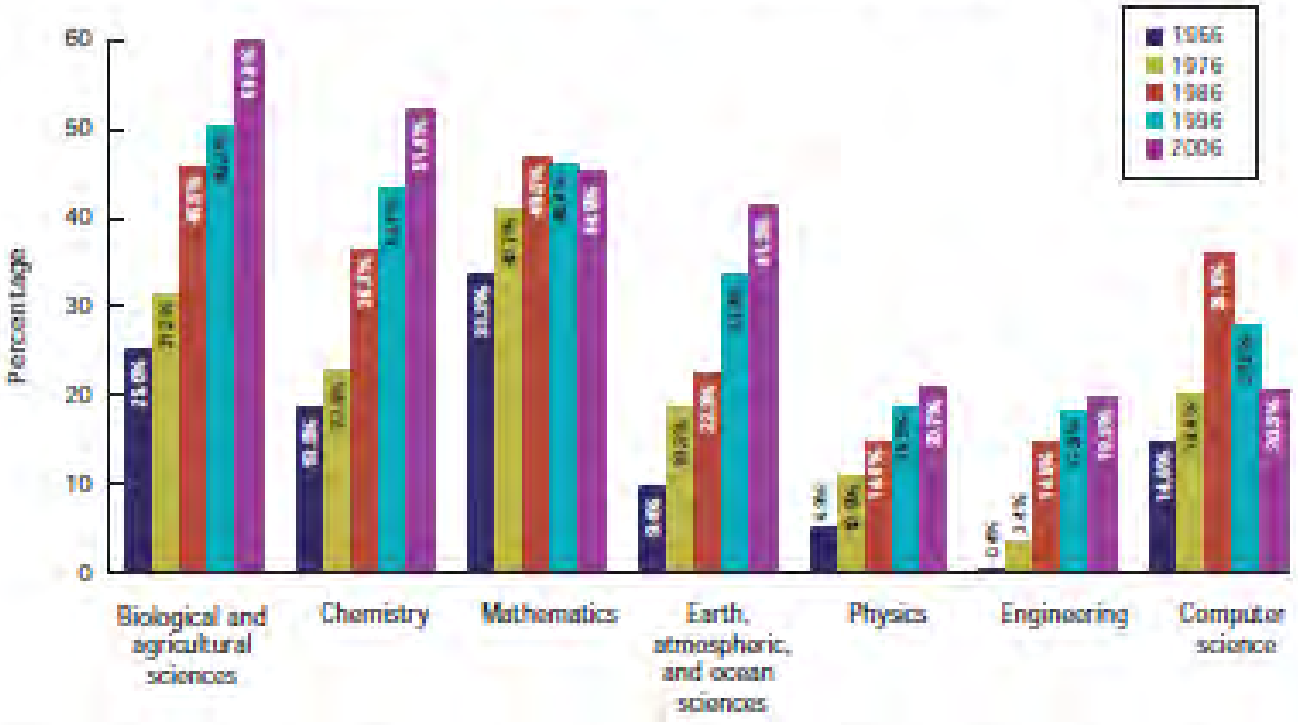
National Concentrators in CTE 2008-09

Secondary Females



Gendered *Participation* in Post-Secondary Core Academic STEM

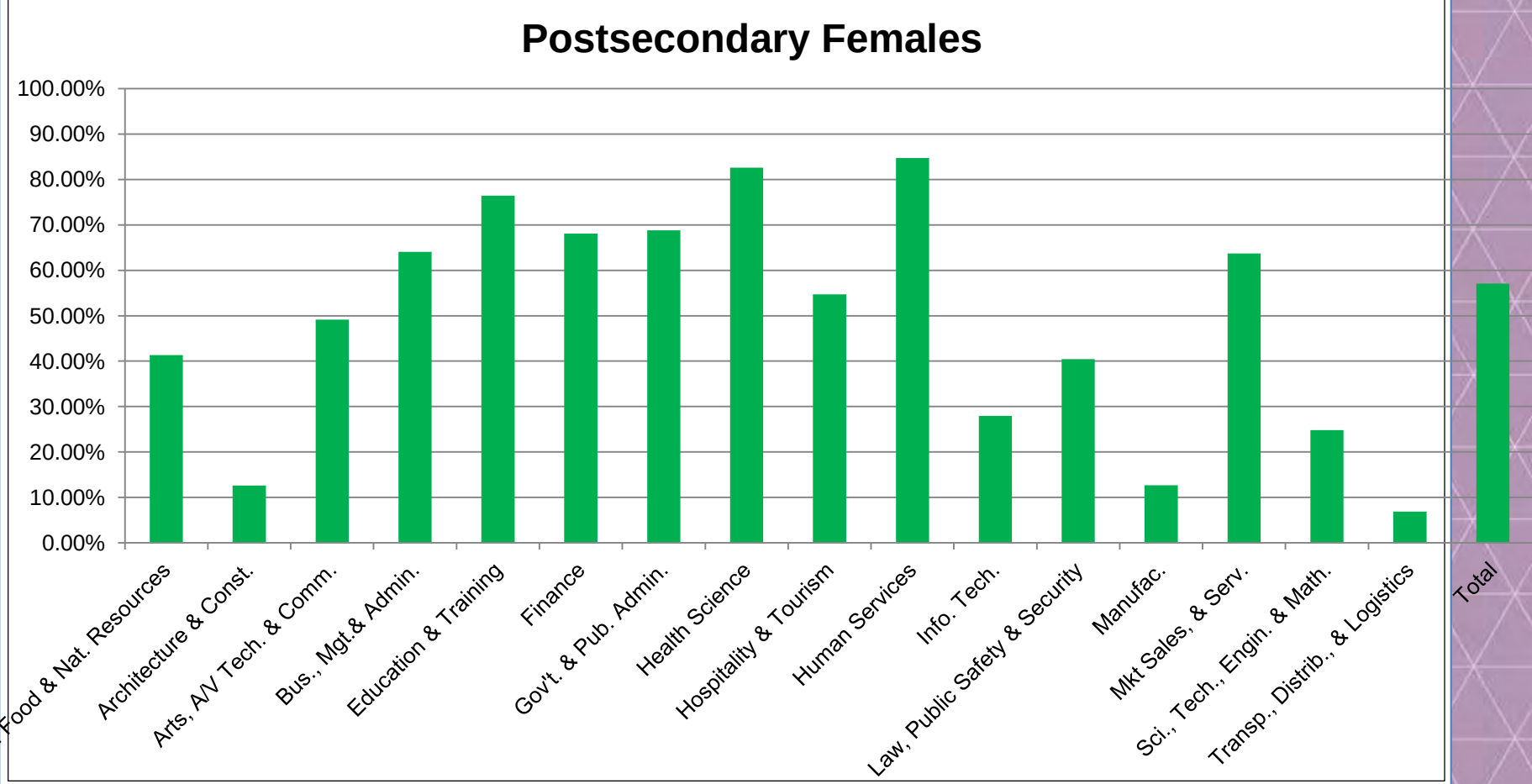
Figure 6. Bachelor's Degrees Earned by Women in Selected Fields, 1966–2006



Source: National Science Foundation, Division of Science Resources Statistics, 2008, Science and engineering degrees: 1966–2006 (Detailed Statistical Tables) (NSF 08-321) (Arlington, VA), Table 11, Author's analysis of Tables 34, 35, 38, & 39.

Gendered *Participation* in Post-Secondary STEM CTE

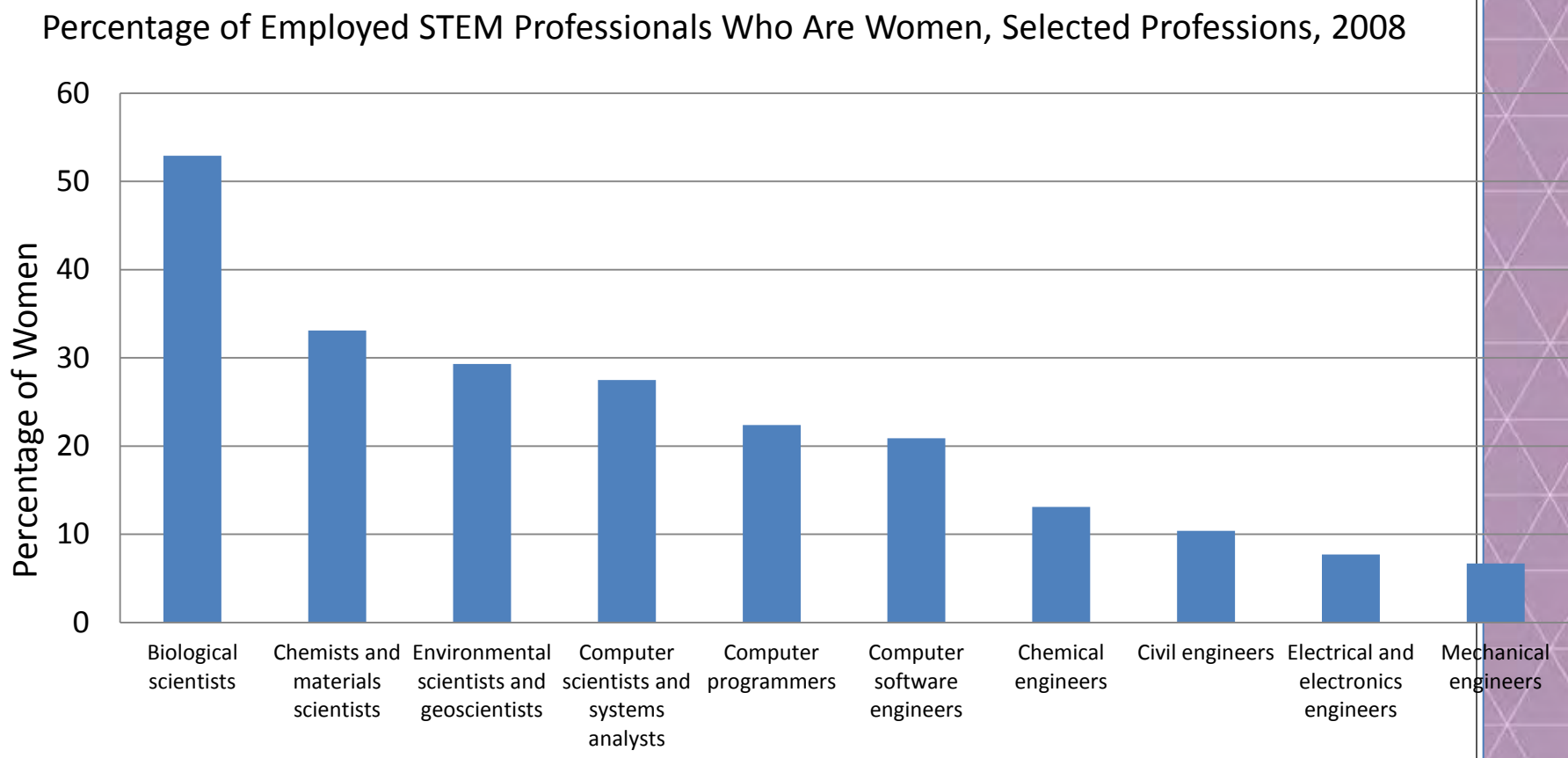
National Concentrators in CTE 2008-09



STEM Pipeline

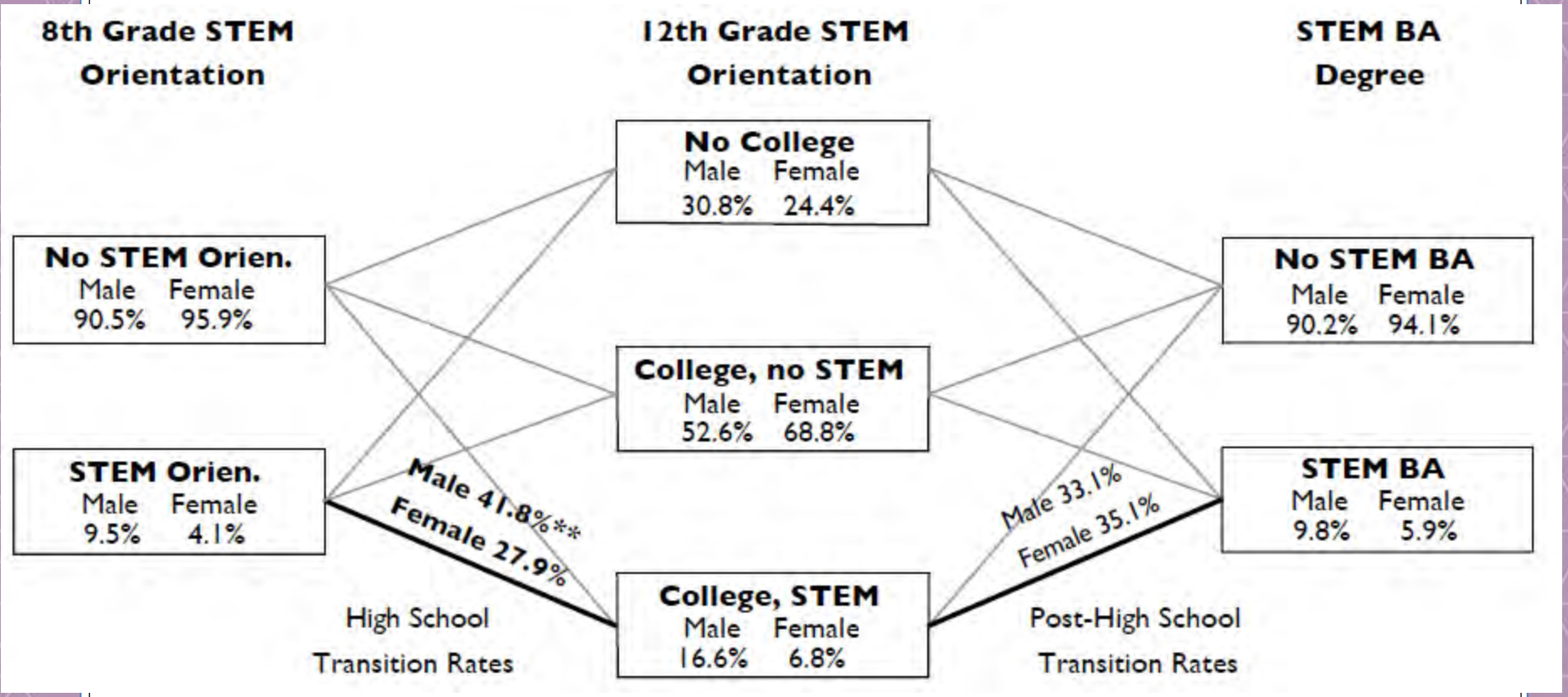
- Leaks at every transition (middle school to high school, high school to postsecondary, postsecondary to labor market)
- Occupational gender-segregation (1/4 nontraditional for women)
- “Bridge” supports make a difference

Gendered Participation in the STEM Workforce at the End of the Core Academic STEM Pipeline



Source: U.S. Department of Labor, Bureau of Labor Statistics, 2009, *Women in the labor force: A databook* (Report 1018) (Washington, DC), Table 11.

Women and Girls in STEM – Bridge Support During Transitions



LOCAL DATA:
ANALYSIS AND DISCUSSION

(Refer to “Data Dashboard”)

Reflections

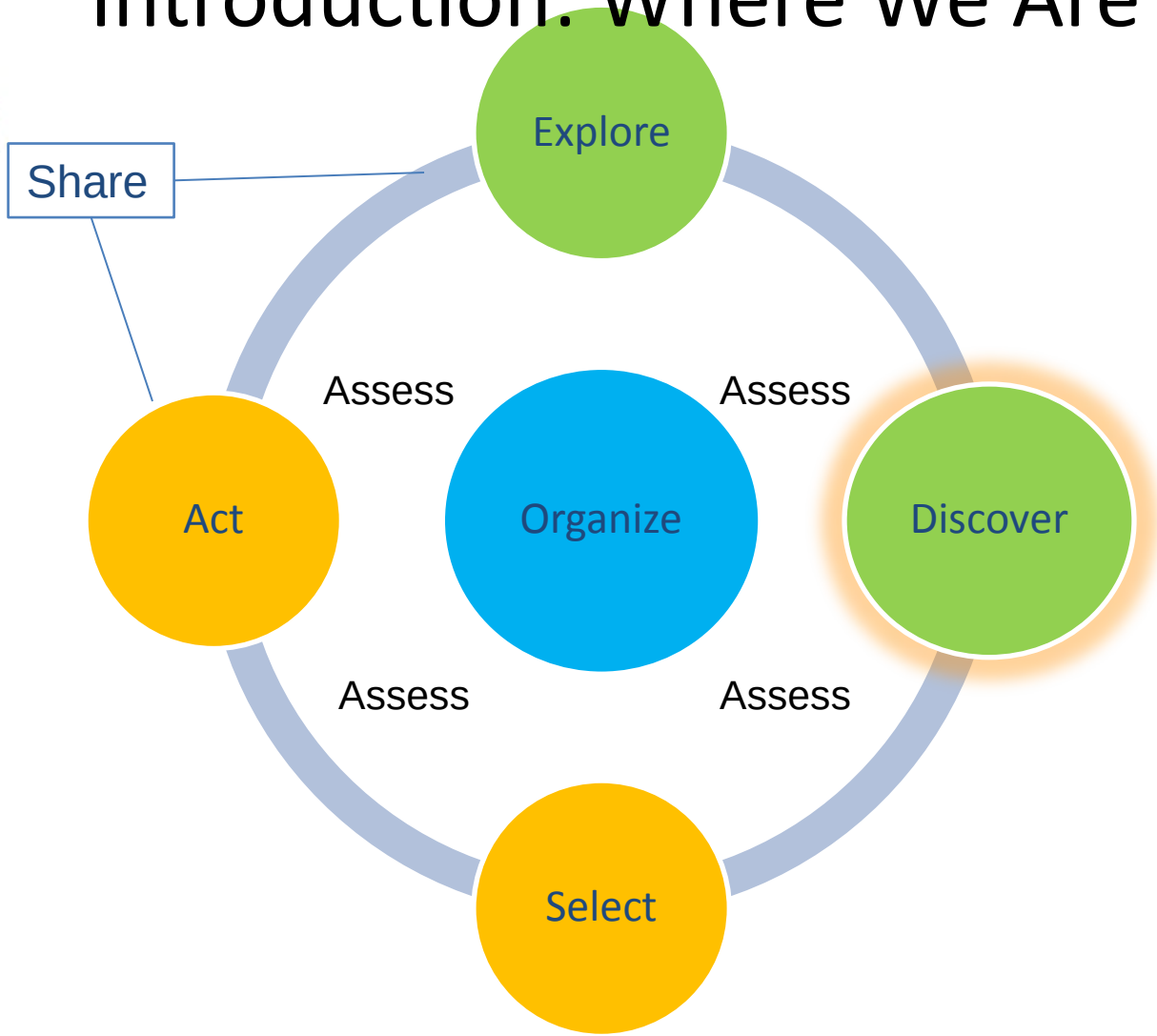
PLEASE C0MPLETE THE EXPLORE POST-TEST

BREAK

DISCOVER MODULE

(PLEASE COMPLETE THE DISCOVER PRE-TEST)

Introduction: Where We Are



What You'll Do

- Demonstrate an understanding of the research regarding non-traditional career preparation, particularly for women in STEM
- Identify root causes of under-representation of females in your STEM programs
- Prioritize root causes of gendered disproportionality in local STEM programs

Why Search for Root Causes?

- Keep from fixating on the “silver bullet” strategy
- Identify the conditions or factors that cause or permit a gender-based gap to occur
- Identify direct causes within your control

Summary of the Research

- *"Nontraditional Career Preparation: Root Causes and Strategies"*
- Authors: Lynn Reha, ICSPS; Mimi Lufkin, NAPE; Laurie Harrison, Foothill Associates

Activity 1: Analyzing the Research

1. Read your assigned section.
2. In small groups, discuss your assigned root causes.
3. Use 1-2 minutes per root cause and highlight the key research.
4. Report out to the larger group

Reflections

LUNCH

Questions?

Group Root Causes Activity

In groups of 3

- Review the root causes cards/post-its
- Arrange the root causes by your group's sense of their impact and relationship to students in programs nontraditional by gender
- Post the cards on the wall in whatever arrangement best fits your group's thinking

Individual Root Causes Activity

- Place a sticker on the poster identifying the two most significant root causes that you have observed for students entering programs nontraditional for their gender

- Write any additional root causes that have not been identified and place it on the "other root causes" poster

How to Identify Root Causes

Select root causes that:

- Have the strongest theory and evidence to support them
- Focus on direct causes of performance gaps
- Address the most critical needs
- Provide the best opportunity to have high impact on performance
- Are supported by stakeholders who will help develop and implement solutions

(See page 17 of the OVAE Guidebook)

Activity 2: Identifying Root Causes at Your Institution

As you think about root causes at your institution, consider:

- What evidence do you have that this is a high priority?
- How much control do you have over this root cause – direct or indirect influence?
- Who else has necessary input into hypothesis development?

Confirming Your Hypotheses

- Search for most direct and highest impact causes
- Employ a systematic evidence-based process
- Formulate and test theories or hypotheses
- Draw on current research and evaluation
- Use multiple methods and data sources
- Likely to find multiple causes

How to Conduct a Root Cause Analysis

- Conduct equity audit
  - School environment: physical space, support services
  - Curriculum & instruction
  - Publicity (website, recruitment materials, etc.)
- Interview students
  - Who drop out of nontraditional programs
  - Who stay in nontraditional programs
  - Who never choose
- Conduct focus groups
  - Teachers of nontraditional programs
  - Parents
  - Business/Industry/Advisory committee members

Prioritize Root Causes

Select root causes that:

- Have the strongest theory and evidence to support them
- Focus on direct causes of performance gaps
- Address the most critical needs
- Provide the best opportunity to have high impact on performance
- Are supported by stakeholders who will help develop and implement solutions

(See page 17 of the OVAE Guidebook)

Activity 3: Planning for Root Cause Analysis

1. Complete the “root causes” section of the Implementation Plan.
2. Discuss:
   - What additional data do we need to know before we plan an intervention strategy?
   - How can we get the information?
3. Identify next steps/timelines/people responsible for each of the identified activities.

NAPE

SYNTHESIZE OUTCOMES IN PIPE-STEM PLAN

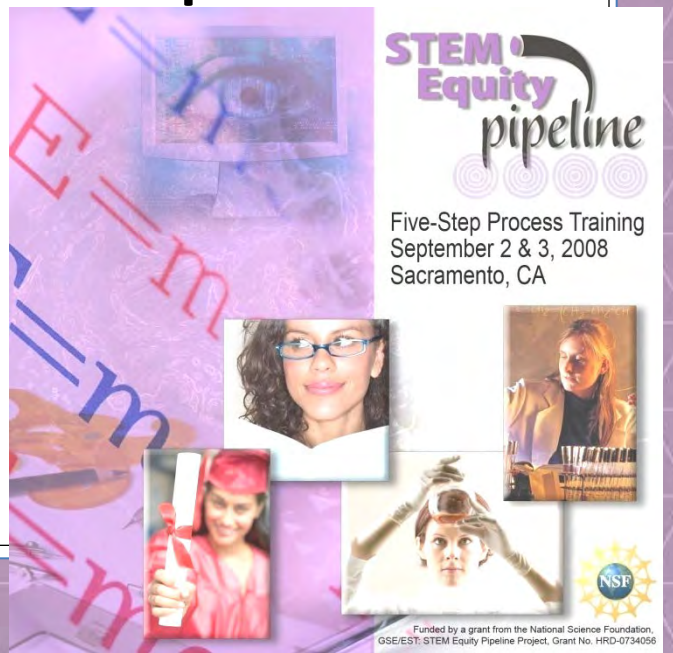
(PLEASE FILL OUT DISCOVER EVALUATION)

BREAK

REVIEW “NEXT STEPS” MEMO AND RESOURCES FOR ADDITIONAL DATA COLLECTION

Resources available at www.stemequitypipeline.org

- Survey Instruments
- How to Conduct Interviews
- How to Conduct Focus Groups



Other Resources

[The New Look Self-Study]

Illinois Center for
- Specialized
- Professional
- Support

Resources

- Assessing Women and Men in Engineering
  www.aweonline.org
- Implicit Association Test
  https://implicit.harvard.edu/implicit/
- Refer to handouts in your folder

EVALUATION
THANK YOU SO MUCH FOR YOUR CONTRIBUTIONS TODAY!