


Developing Research- and Evidence-based Strategies to Increase the Participation of Under-represented Students in PLTW and other STEM Pathways


Engineering Careers and Workforce Development in SW Ohio Symposium, Tuesday, October 8, 2013

Ben Williams, Ph.D.
Project Director, Ohio STEM Equity Pipeline™
Coordinator, Special Projects,
Columbus State Community College
Columbus, Ohio
www.napequity.org




Agenda

- Introductions
- Who is NAPE and What is the STEM Equity Pipeline™?
- Overview of PIPE-STEM™
- Effective Strategies Implemented through Ohio Department of Education Project FY11-FY13
- New Counselor Toolkit and other NAPE Resources
- Q&A/Discussion




WHO IS NAPE AND WHAT IS THE STEM EQUITY PIPELINE™?



Who Is NAPE?

National Alliance for Partnerships in Equity


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



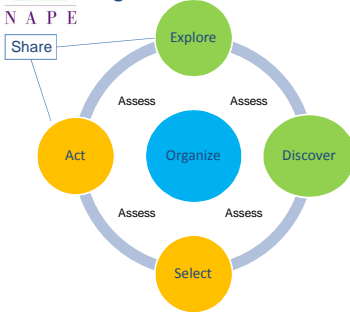
NAPE's Professional Development Suite of STEM Equity Programs

STEM Equity Pipeline™

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



STEM Equity Pipeline Program Improvement Process For Equity™



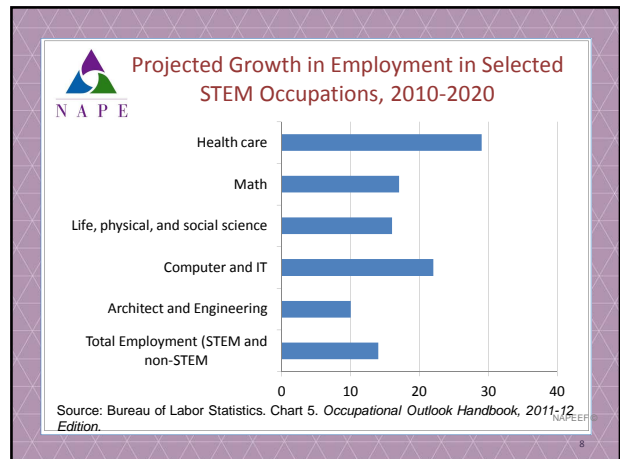

The diagram shows a circular process with the following steps: Share (blue), Explore (green), Organize (blue), Discover (green), Select (yellow), Act (yellow), and Assess (grey). The cycle repeats from Act back to Explore.

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



Why We still Care...

7

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.

9

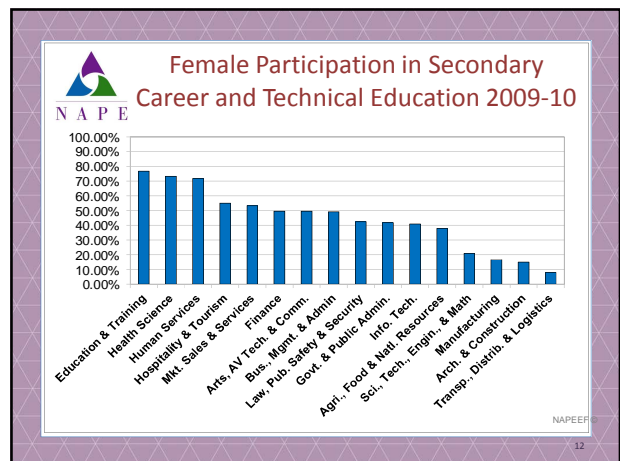
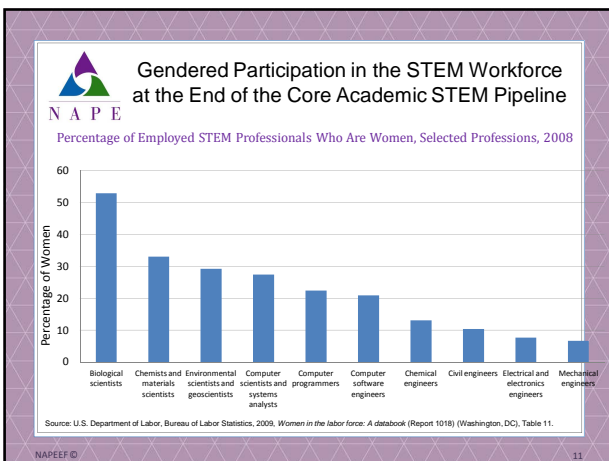


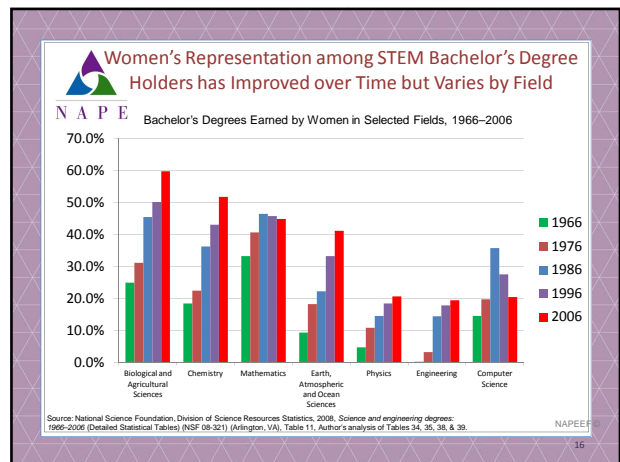
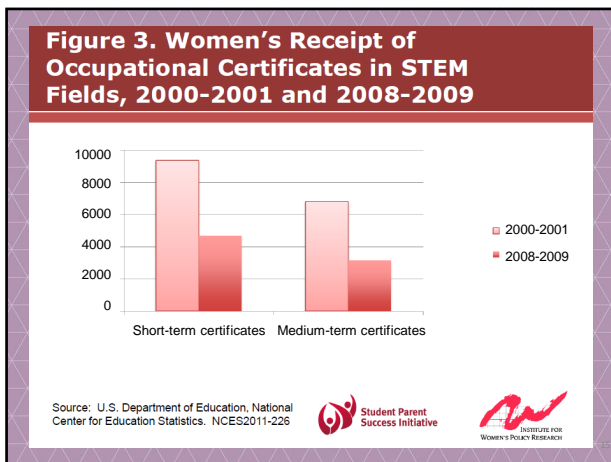
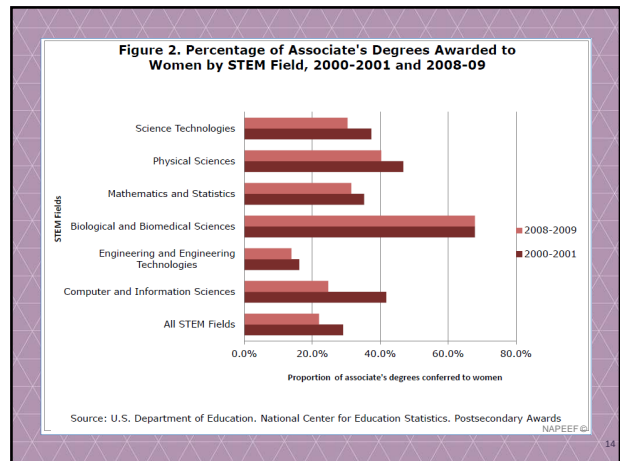
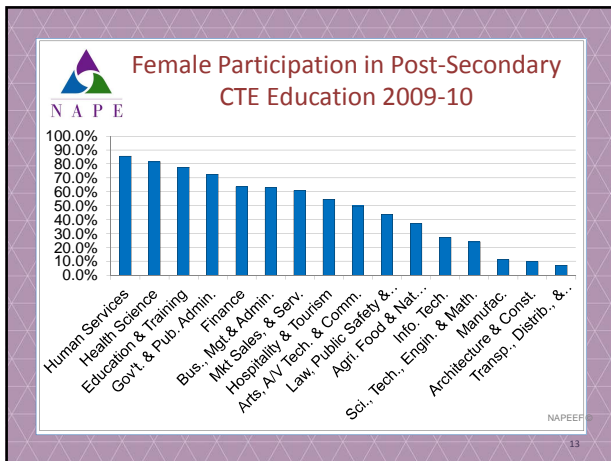
People with lower levels of education in STEM make more than people with higher levels of education in non-STEM.

- 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.](#)

10





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

HRD-1203121

Ohio STEM Equity Pipeline™

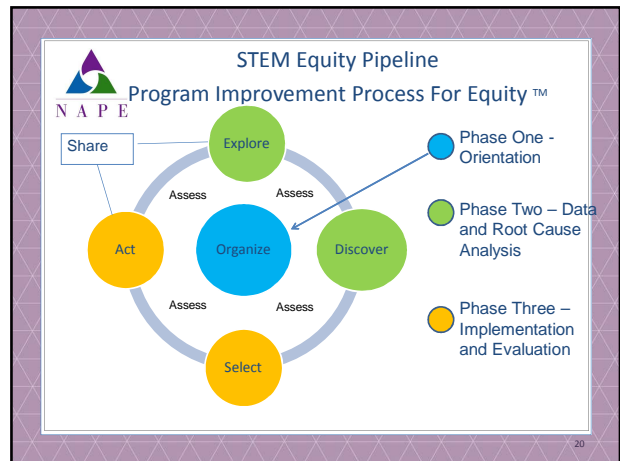
- Initially part of the National Science Foundation-funded STEM Equity Pipeline Project
 - Three pilots in community colleges in FY10–FY12
- Expanded through Ohio Department of Education Office of Career-Technical Education through contract with Columbus State Community College
 - Utilized state Perkins funds
 - Eight secondary LEAs in FY12–FY13
 - Six additional LEAs in FY14–FY15
- Additional projects contracted directly with NAPEE in FY13

Ohio Department of Education Project




- LEAs selected
 - CTE secondary programs not meeting nontraditional participation and/or nontraditional completion indicators
 - Some required to submit Performance Improvement Plans (PIPs)
 - PIPE-STEM™ Plan can be their “PIP”
 - Selected in consultation with ODE field agents
 - CTE directors or other administrator designated as “site lead”
- Team information at <http://www.stemequitypipeline.org/> (click on “State Teams”)

NAPEEF ID 19

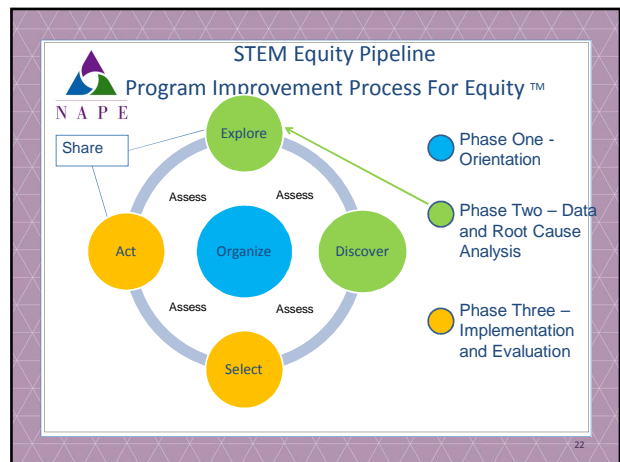


PIPE-STEM Team





- 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

NAPEEF ID 21




How we define STEM

US Dept. of Ed., Office of Vocational and Adult Education STEM Transitions Project - www.stemtransitions.org

NAPEEF ID 23

Perkins Act Accountability



Core indicators on Nontraditional CTE

- Participation in CTE programs preparing students for nontraditional fields (6S1/5P1)
- Completion of CTE programs preparing students for nontraditional fields (6S2/5P2)

NAPEEF ID 24

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

Comparisons

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

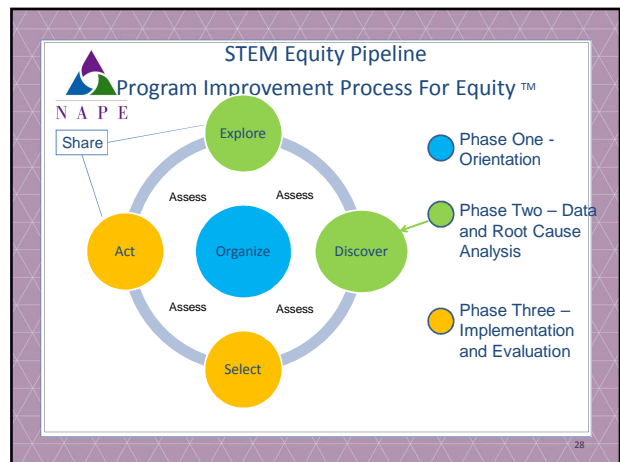
Trends

- At least 2 years
- Prefer 3-5 years

Site Specific

- Statewide
- District
- School/College
- Programs

Data Dashboard



Review Research Summary

Nontraditional Career Preparation ROOT CAUSES & STRATEGIES

The goal of this research was to identify the root causes of the barriers to nontraditional career preparation and to provide strategies to address these barriers. The research was conducted through a series of focus groups and interviews with stakeholders in the field.

ROOT CAUSE	STRATEGIES
Academic Proficiency	Use alternative assessment methods; Provide targeted interventions; Offer remedial courses; Encourage students to seek help.
Access to and Participation in Work, Service, and Technology Experiences	Offer flexible scheduling; Provide transportation support; Offer virtual experiences; Encourage family involvement.
Curriculum	Ensure curriculum is relevant and up-to-date; Offer experiential learning opportunities; Encourage industry partnerships.
Instructional Strategies	Use differentiated instruction; Offer personalized learning; Encourage student choice; Provide ongoing feedback.
Student-Centered Climate	Encourage student voice and choice; Provide a safe and supportive environment; Offer social and emotional learning opportunities.
Support Services	Offer career counseling; Provide financial aid support; Offer tutoring and academic support; Encourage family involvement.
Family Characteristics	Offer family engagement opportunities; Provide resources and information; Encourage family involvement in student learning.

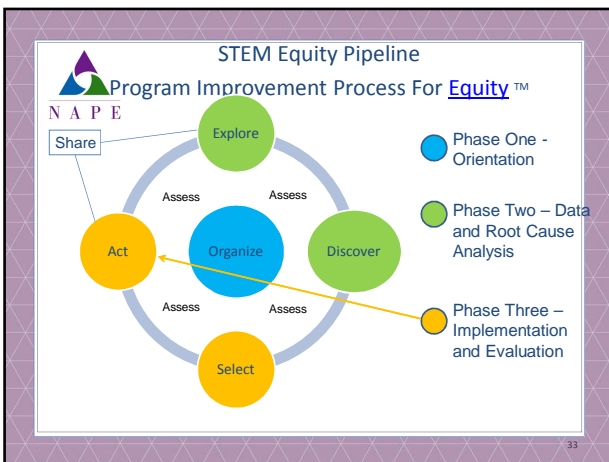
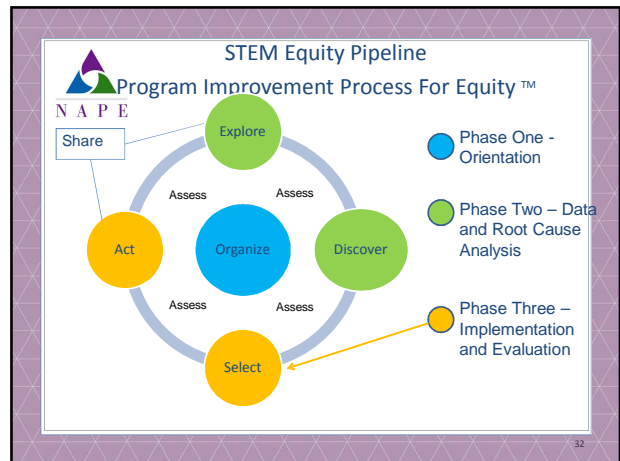
- ### Root Causes
- Educational Environment
 - Career Information
 - Family Characteristics (Family Perceptions)
 - Individual Factors
 - Societal Issues

Confirming Your Hypotheses

NAPE

- 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

NAPEEF ID 31



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 34

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 35

NAPE


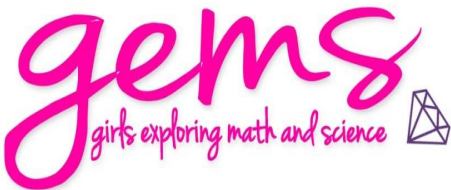

EFFECTIVE STRATEGIES



**GEMS: Girls Exploring Math and Science –
Washington Local Schools/
Whitmer Career & Technology Center**

Jamie Squibb, PLTW Instructor
jsquibb@wls4kids.org


Deb Heban, Director CTE
dheban@wls4kids.org

Program Overview

- 2-year program in which the girls would perform hands-on math and science project
- Girls would be followed for 7th and 8th grade, so there is a consistent program and so that the program does not solely contain one meeting and then no follow through
- Activities would be performed during school day

NAPEEF ID 39




GEMS 7th Grade

Camp:

- Camp Miakonda – August 17-18, 2013 and May 31-June 1, 2013
- One overnight trip for the 50 girls in both the fall and spring.
- Girls would interact with professional in STEM careers, students at both the college level and at the high school level and would perform various STEM activities while at camp.
- STEM activities for fall overnight camp will include:
 - Bubble Gum Science
 - Giant Bubbles
 - Soda Geysers
 - Food Cars
 - Glow in the Dark Slime
 - Jewelry Making With UV Beads
 - Paper Rockets

NAPEEF ID 40




GEMS 7th Grade

Staying Connected:

- Girls will meet quarterly and discuss how classes are going and also do a STEM activity.
- Meet with groups of 12-15 quarterly.
- This would be 1 meetings per quarter with students and then we will keep a blog/facebook/twitter to keep active in between meetings.
- Summer day camps (one during July and one during August) will be held to keep them connected both with me and with the other girls in the program.

NAPEEF ID 41




GEMS 8th Grade

Staying Connected (Similar to 7th Grade):

- Girls will meet quarterly and discuss how classes are going and also to have question and answer sessions with math and science teachers at the high school to start to prepare them for their freshman year.
- Meet with groups of 12-15 quarterly.
- This will be 1 meetings per quarter with students and then we would keep a blog/facebook/twitter to keep active in between meetings.

NAPEEF ID 42




GEMS 8th Grade

Camp:

- During January of the 8th grade year, the 50 girls will attend Camp Miakonda for one last time (before scheduling).
- This would be an opportunity to talk in depth with girls about what their interests would be for high school and what classes they could take that could steer them in the right direction.
- Help girls with developing an educational plan that they could work through during high school in the direction they would like to go for college.


NAPEEF ID 43



Results to Date

- Presentations were made to all 6th grade girls (8 elementary schools visited)
- Within 48 hours, 50 students had been accepted
- Within 72 hours, there was an additional 53 students on wait list
- Overnight camp is scheduled for August 17-18

NAPEEF ID 44



Priming the Pump for Gateway Students to Enter Project Lead the Way – Mansfield Senior High School

Leslie Nielsen, PLTW Instructor
lnielsen@mansfield.k12.oh.us
 Shawna Fletcher, Interim Director,
 Women in Engineering, The Ohio State University
Shawna_Fletcher@engadmin.ohio-state.edu

NAPEEF ID 45




Mansfield Best Practices

Strategies Implemented (Year One)

- STEM Gateway Program (8th Grade) 2012-2013
- Project Lead the Way Program (9th Grade) 2013 – 2014 – Year Two Implementation
- Large-Scale Data Project
- Industry Advisory Board Established
- Lessons Learned
- Results & Impact

NAPEEF ID 46



Mansfield Data/Assessment Project

Evaluating Mansfield Students:

- ❖ What did we want to know?
- ❖ How did we go about gaining information?
- ❖ Lessons Learned about Mansfield 8th grade students and gathering information
- ❖ Lessons Learned about Mansfield culture and approach to STEM

- Population
- Barriers and Supports
- Career Interest
- Knowledge Base
- Self Efficacy
- GRADES
 - Language
 - Math
 - Science
 - STEM Gateway Course


NAPEEF ID 47



Mansfield Best Practices

- Career Information
 - STEM Gateway Program
 - Field Trips (VEX robotics) 32 students attended in April
 - Afterschool Clubs / Programs
- Barriers & Supports
 - Involve Parents
 - Educating Administrators


NAPEEF ID 48



Impact / Results

- 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 © 49



Mansfield STEM Gateway: Lessons Learned & Future Directions


- Emphasize importance of taking surveys
- Emphasize Importance of Grades and OAA testing to enter career fields
- Link all of the above with General Interest areas and provide career information
- Experience trumps “reputation” of activities (ie: engineering camp or STEM club)
- More work to involve parents and administrators
- More work to engage students & peers

NAPEEF © 50



SHORT-TERM RESULTS FROM FIRST ODE PROJECT


NAPEEF ©



Significant increase in nontraditional student enrollment

- 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 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 (meeting with counselors in fall 2012)


NAPEEF © 52



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

NAPEEF © 53



NEW COUNSELOR TOOLKIT

NAPEEF ©



EXPLORE STEM careers

Kudos!
Acknowledging gifts, skills related to science, technology, engineering, and math can make a world of difference!

You are generous in helping others.

You


www.napequity.org/counselors



Join NAPE! Napequity.org
Ohio now a member!



NAPEEF © 56



Questions?
Contact Information

Ben Williams, Ph.D.
Project Director, Ohio STEM Equity Pipeline™
Coordinator, Special Projects, Admissions
Columbus State Community College
bwilli03@csc.edu; 614-287-5689
<http://www.stemequitypipeline.org/StateTeams/OH.aspx>

National Alliance for Partnerships in Equity
www.stemequitypipeline.org
www.napequity.org

NAPEEF © 57