

# EPICS: Broadening the Pathway into STEM


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# EPICS: Broadening Pathways Into STEM

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ADVANCE Gender and STEM  
Research Symposium

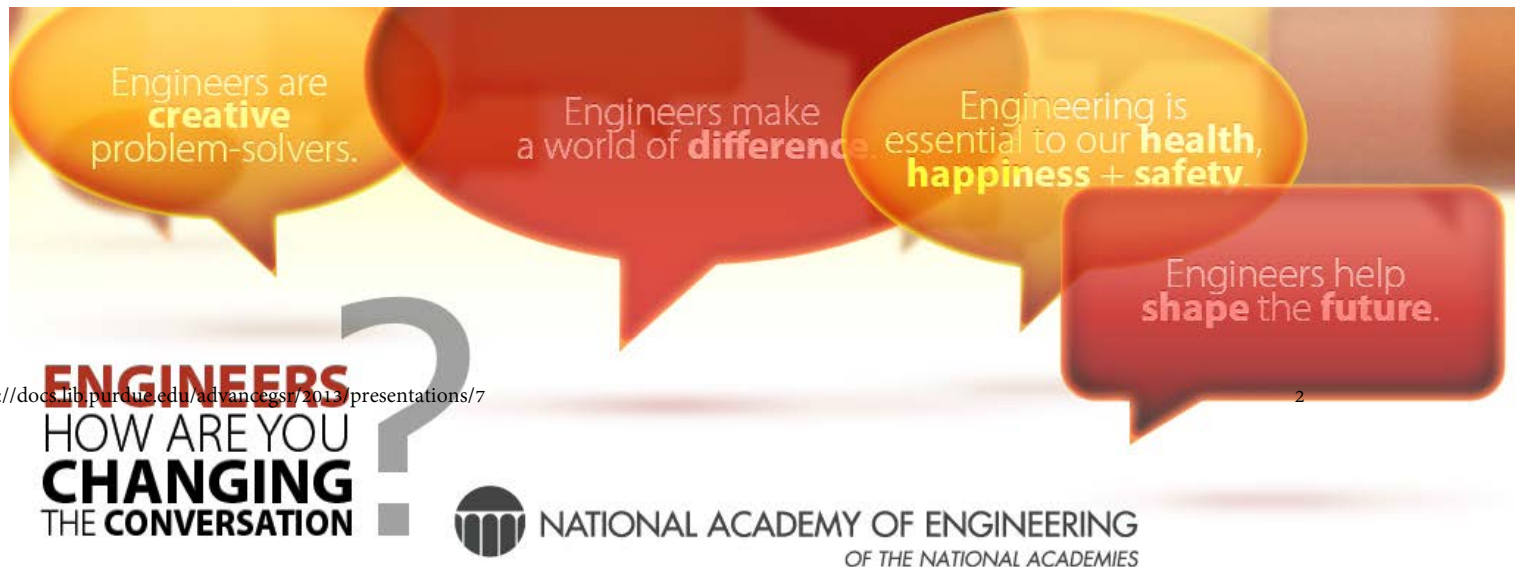
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# Changing the Conversation

ADVANCE+1: Inclusive Gender and STEM Research Symposium, Event 7 [ ]

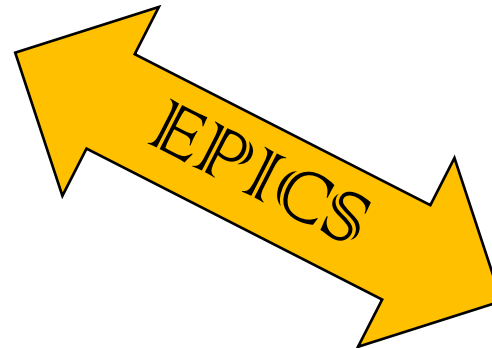
- National Academy of Engineering looked at the perceptions of engineers and engineering
- Report on “Changing the Conversation”
  - Messaging what engineering can be



# Opportunities for Impact

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Engineering will be central to addressing global grand challenges



Students need authentic learning experiences and a broad set of skills to succeed in today's global economy.



*Both local and global communities need access to technical expertise that is normally prohibitively expensive:*

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*improved, enhanced, new capabilities*

How do we attract the next generation of diverse professionals?

# Core Values of EPICS

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## 1. **EPICS students earn academic credit** Team-based design projects

- Solve technology-based needs in the community;

## 2. **EPICS teams provide service**

- Local or global community
- Partnering with not-for-profit community organizations, educational institutions, and governmental agencies;

## 3. **EPICS programs support these reciprocal partnerships**

– **Over multiple years**

- Without obligation for remuneration to EPICS.

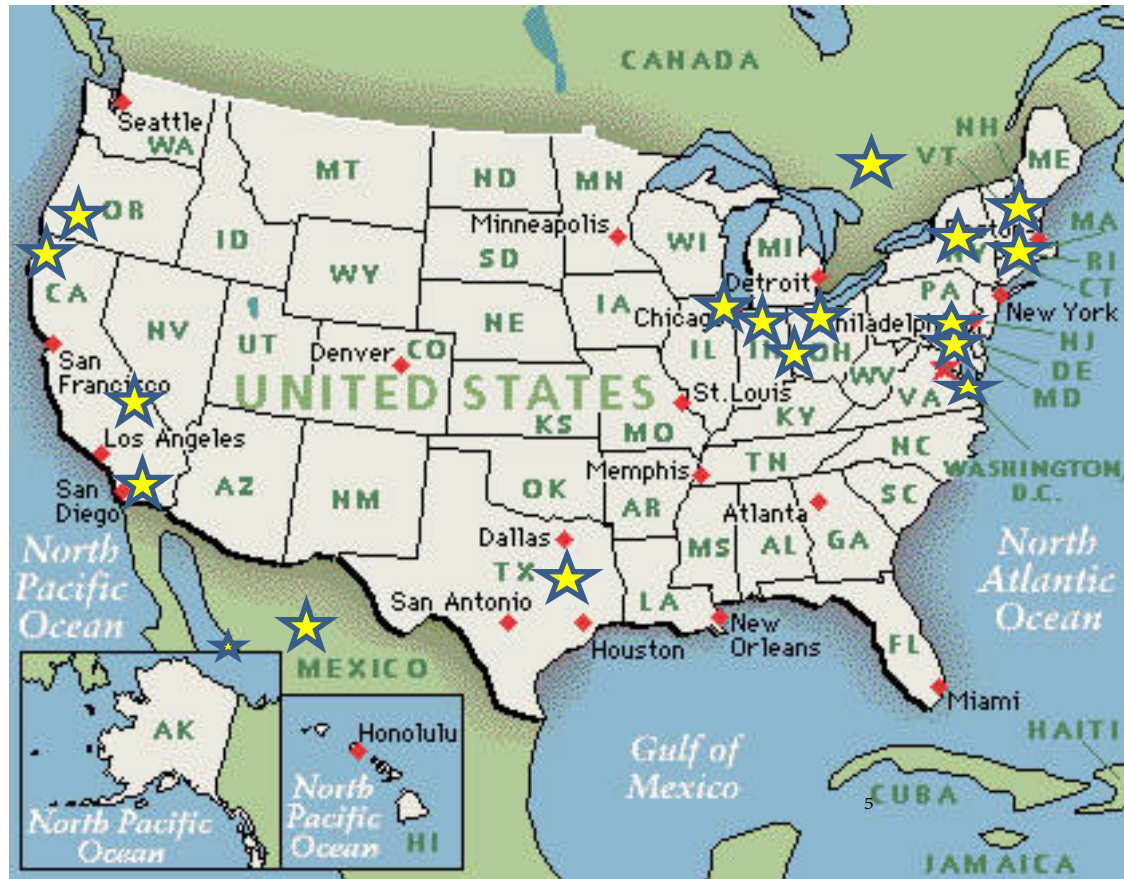


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## EPICS Member Sites

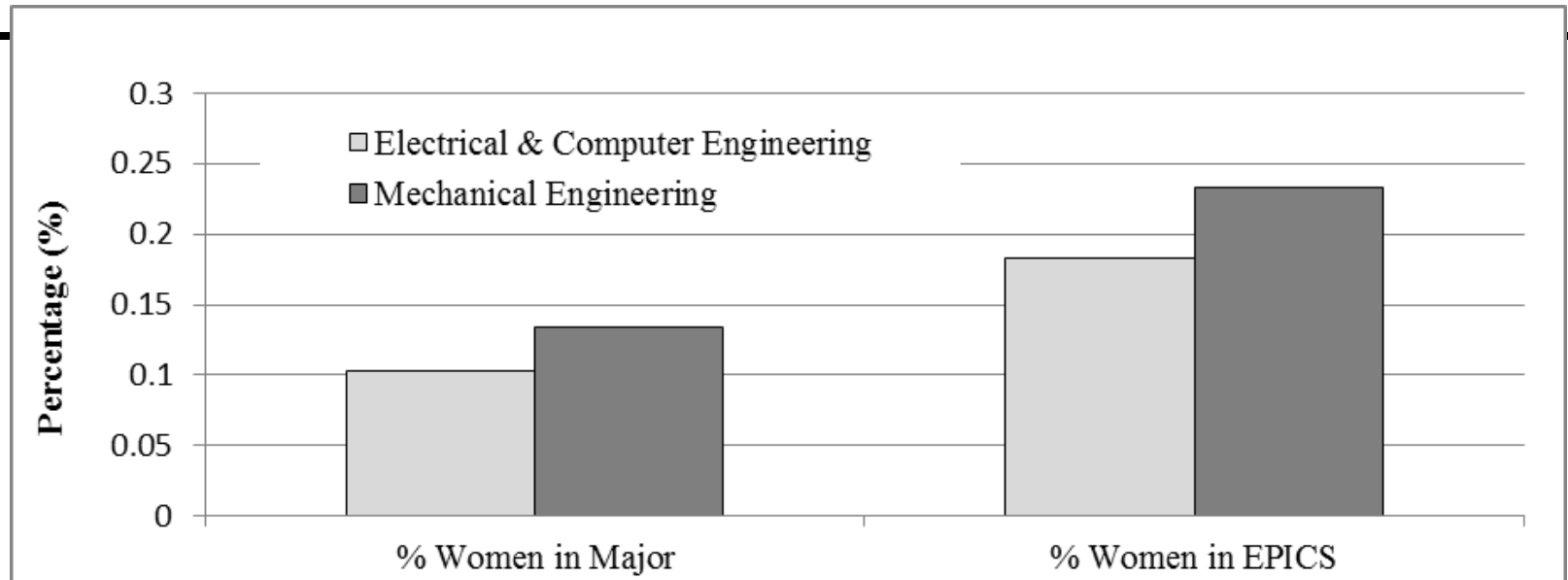
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- Arizona State University
- University of Auckland, New Zealand
- Butler University
- University of California, Merced
- University of California, San Diego
- Columbia University
- Dartmouth College
- Drexel University
- George Fox University
- Illinois Institute of Technology
- Ivy Tech
- University of Notre Dame
- Ohio Northern University
- Penn State University
- Princeton University
- University of Puerto Rico Mayaguez
- San Jose State University
- Texas A&M University
- University of Sherbrooke
- University of Virginia
- Worcester Polytechnic Institute



# EPICS and Women

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Over twenty semesters, the average participation rates of women in EPICS were more than 70% higher than in their respective majors.

From *Why Women Choose Service-Learning: Seeking and Finding Engineering-Related Experiences* by Holly M. Matusovich, William Oakes, and Carla B. Zoltowski. Appeared in the *International Journal of Engineering Education*, Vol. 29, No. 2, 2013, pp. 388-402.

# Getting Engineering Experience

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- The predominant reason most (5/8) study participants chose to enroll in EPICS was to get engineering experience.
  - They described this as “hands-on”, “real world/life” or “design” experience. These women value this experience as a way to develop their own skills set and/or to look better to prospective employers.
- “...the whole process of being able to have a customer and being able to meet the customer’s needs and deadlines and stuff, so I guess there’s a whole design process... plus being able to use mechanical engineering in real life situations” (Elaine)
- “I think on the technical side I would like to learn the design process and creating a job... but that’s something I really would like to say I’ve accomplished by the end of it. I’d like to be able to say “I’ve designed this, I built this, I’ve led this to where it was being implemented later”, I would love to say that.” (Carol)

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# Alumni Investigation

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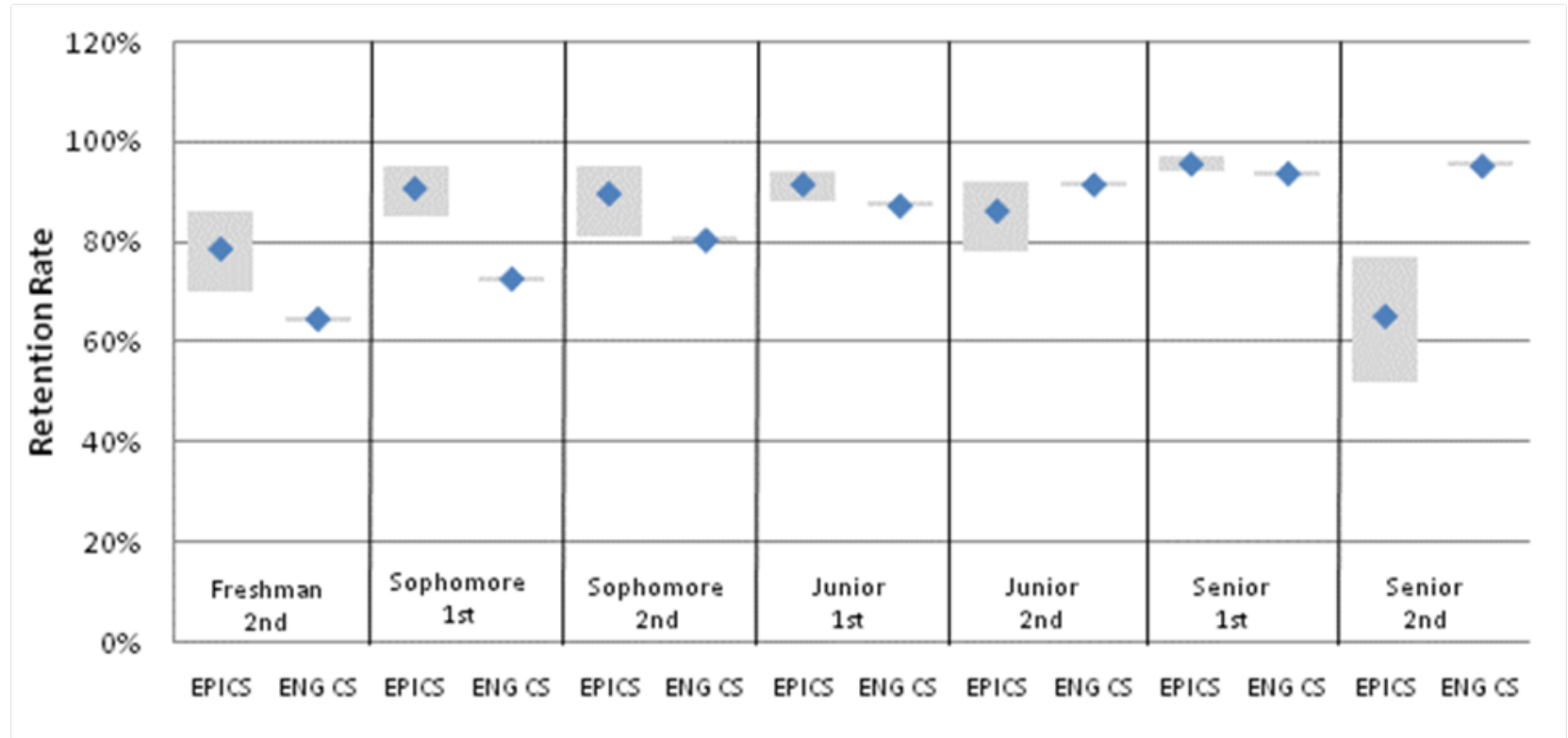
- 528 alumni completed a survey and > 84% said EPICS contributed to their ability to:
  - function in a team environment.
  - work with people from very different disciplines.
  - demonstrate leadership in a team environment.
- Comments Included:
  - “EPICS was a wake up call to the real world. Not only did it provide me with valuable experience, but it changed the way I viewed my education
  - “Through EPICS I have learned how to listen to the needs of people and to try to use my skills to meet their needs.”
  - “My rapid promotion is a direct result of the leadership skills gained through EPICS. I am now pursuing an MBA at an elite school, and I attribute it all to EPICS.”

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# Student Retention in Engr/CS

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Column = Semester Began EPICS  
(Through 2007)

# Increased Commitment to Engineering

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For all but one woman interviewed, EPICS increased or reinforced their commitment to engineering.

“I don’t think changed [EPICS], more enforced it. Like it helps thinking “okay, I can get through my classes and then I’ll be able to do something more actually pertaining to life” (laugh), instead of just studying all the time.” (Elaine)

“...your freshman year you’re kind of just taking like basic classes like math, chemistry, physics and I really wanted to get an idea of what engineering, like what you could do with that information instead of just like, “okay now I know how to find a chemical equation or something, now”, like I just wanted to get some like experience in it so that, I don’t know, I guess that it kind of makes me want to stay in engineering and like know that this is what I want to do.” (Corina)

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# EPICS High Motivation

Connecting Engineering with People and Local Communities

- High % of students interested in volunteering
- Service hours are needed for diplomas/course requirements
- Attracting a diverse population of student to STEM

**44% Females**

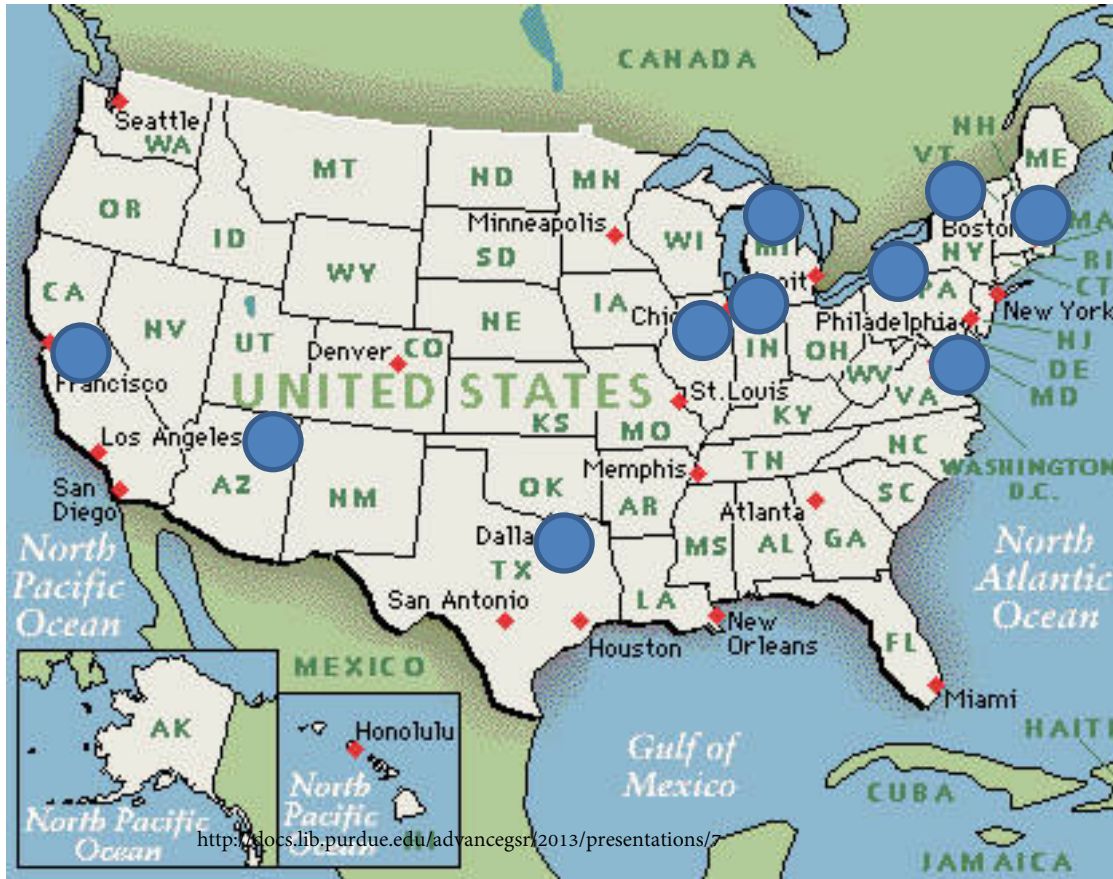
**>50% underrepresented Minorities**

- Over 1 million people positively affected by EPICS High projects

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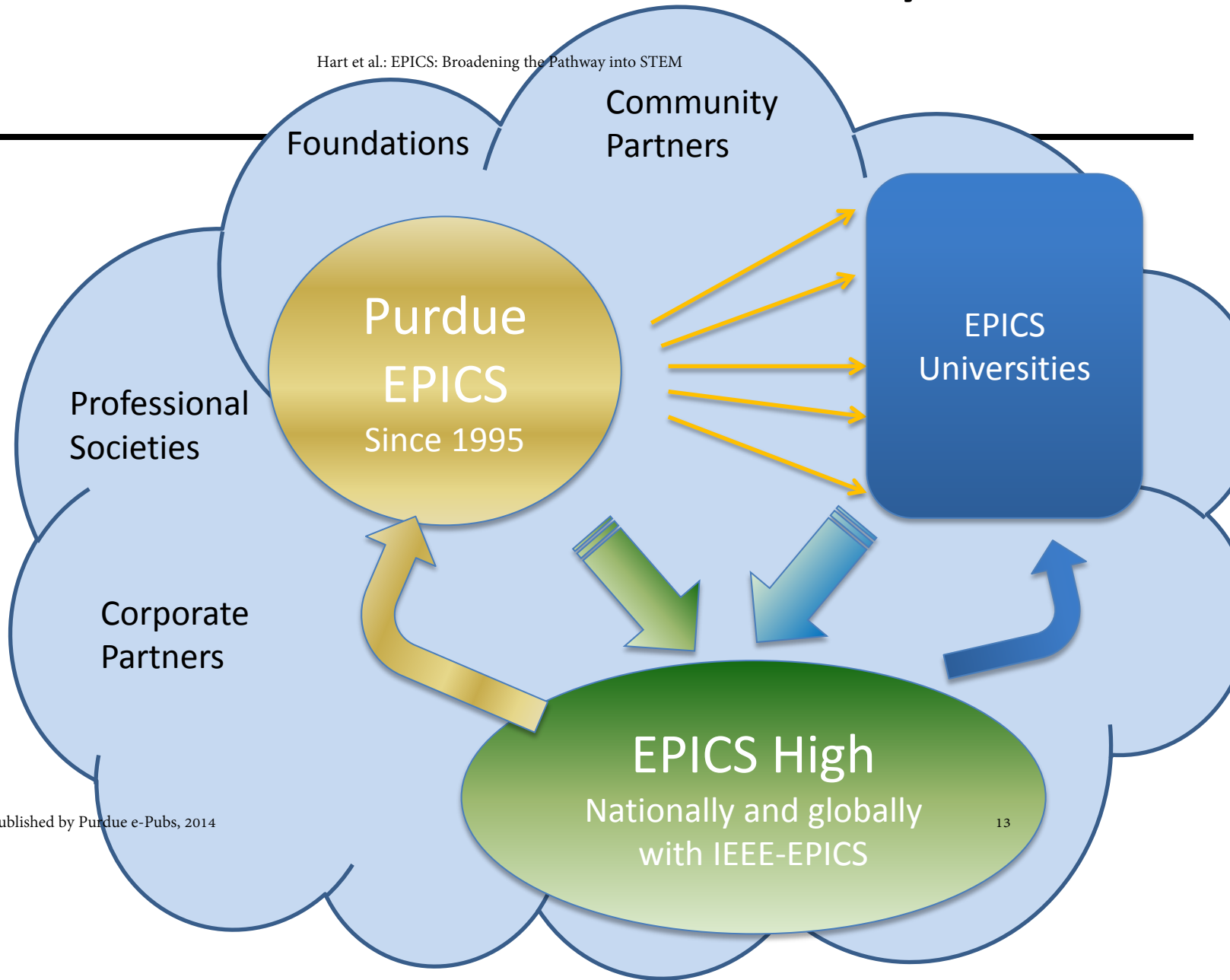
## Epics High Schools are in 11 states



Arizona  
California  
Florida  
Illinois  
Indiana  
Massachusetts  
Michigan  
New York  
Pennsylvania  
Texas  
Virginia

# EPICS is a Community

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# Conclusions

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- Service-learning has great potential in STEM to promote diversity
  - More than just “helping people”
  - Authentic experiences with a purpose
- EPICS is a context for multi-disciplinary service-learning (Design)
  - University, retention and experience
  - High School, draw into STEM pathways prepare for college

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# QUESTIONS?