ASEE K-12 STEM and Precollege Activities:
What do you need to know?

James H. Aylor, Dean, U. of Va
Elizabeth Parry, Chair, ASEE K-12 and Precollege Division, NCSU
ASEE K-12 and Precollege Division

- Formed in 2005
- 742 members (12th largest in ASEE)
- 90% of members are university faculty, instructors or staff
- Majority (80%+) are discipline engineers
- 42% women (vs. 22% ASEE overall)
- In 2012, division received 176 abstracts and will present 128 papers in sessions scheduled in every time slot at the annual conference
- 20% of JEE articles published in last 4 years involved work in K-12
- Seven division members are ASEE fellows
K-12 and Precollege Strategic Areas

• Goal is to be the center of competency for K-12 engineering research and practice
• Focus on development of research based professional development and curricula for K-12 students and teachers
• Fully participate in policy issues impacting K-12: funding priorities, standards and assessments
• Utilize extensive research, university and industry talent base to ensure ASEE is “at the table” on key national STEM issues
• Promote engineering as the context to integrate science and math with all subjects
K-12 Engineering: Division View

- Engineering in K-12 is focused on the process of engineering design ("engineering the verb")
- Foundational ideas, based on ABET Criteria 3 on Student Outcomes, are promoted, including:
  - Design under constraints
  - Collaboration
  - Communication
  - Ethics
  - Failure/Improvement

- The primary goal in K-12 is to introduce engineering design to all students to create a better prepared, more informed, more diverse and larger pool of students who are able to choose engineering and who are technological and engineering literate citizens
Current Division Work Efforts

- Members represent K-12 engineering on foundation boards, STEM advocacy groups and NAE studies
- Leadership regularly interacts with EDC, CMC K-12 SIG, HQ and other STEM constituency groups (NSTA, ITEEA, NCTM, NAEP, NAE, etc)
- Chair and members working on Next Generation Science Framework and Standards review and implementation
- Members contributing to research base on effective K-12 engineering education and publishing results
- Members on state K-12 engineering standards writing teams in several states
Current Division Work Efforts (cont)

- Executive board convening invited national meetings on K-12 engineering:
  - May 2010: Defining Engineering in Elementary Grades (Raleigh, NC)
  - June 2010: Defining the Top Research Questions in K-12 engineering (Louisville, KY)
  - June 2011: Identifying Barriers and Opportunities in K-12 Engineering (Vancouver, BC)
  - June 2012: Defining Professional Development Standards for K-12 Engineering (meeting collaboration with UTEACH, San Antonio, TX)
  - July 2012: Colloquium on P-12 Engineering Education (collaboration with STEM Center, Minneapolis, MN)
- Division leadership collaborating with Purdue INSPIRE on J-PEER journal of engineering education research
What is the value of OUTREACH to the university?

Outreach: single visits to promote engineering

- Single visit: classroom visits (presentations and activities), mentorships in FIRST, Future City, clubs, etc.
- Participation increases undergraduate satisfaction, confidence and retention
- Creates goodwill with community
- Supports STEM career knowledge and development in K-12 students
- Increases K-12 and community knowledge of university and of engineering
- Attractive to industry and alumni
What is the value of SUSTAINED ENGAGEMENT to the university?

Sustained Engagement: longer partnerships to conduct research and change practice

- Attracts a larger and more diverse cross section of university student participants
- Qualifies for significant research funding for university (NSF, NIH, DOD, Department of Ed, Foundations)
- Increases satisfaction and retention of undergraduate participants
- Promotes intra and inter university collaborations
- Addresses national priority to increase STEM pipeline
- Builds research base on effective teaching and learning best practices K-20
- Positively impacts graduate school interest and enrollment
- Appealing to broad and diverse cross section of faculty
- Attracts and increases industry and alumni support
- Often sustained by graduates when they start career
The Role of Colleges of Engineering in K-12 STEM

- Provide expertise on engineering principles
- Participate in K-12 standards development and refinement to support engineering literacy and pipeline
- Conduct rigorous research to define best practice
- Initiate collaborations to support short and long term goals
• In fifth year of engineering design focus
• Engineering is the integrator of all core subjects
• Students are 99% African American and >90% high poverty
• Long term NCSU partnership supported through NSF, Department of Education and NIH research grants
• Collaboration between College of Engineering and College of Education
• Overall student proficiency (Math, Language arts and Science) has increased from 19% to 69%
• Model has been implemented in 5 other NC schools and in six additional states
• District is implementing engineering based middle and high schools now
What can Deans do in the short term?

- Join the K-12 and Precollege Division
- Promote the Division to faculty and staff
- Support outreach efforts
- Encourage substantive involvement of K-12 experts on your campus in research grants
- Initiate dialogue with Colleges of Education
- Demonstrate that effort by faculty and students in K-12 STEM is valued; P&T consideration, etc.
What can Deans do in the long term?

- Encourage research grant submission for sustained engagement involvement
- Seek meaningful collaboration with Colleges of Education
- Promote K-12 STEM efforts to foundations and alumni
- Recognize the value of contributions to engineering education by faculty, staff and students working in K-12 STEM
- Establish an effective model for K-12 outreach and sustained engagement on your campus
- Facilitate the participation of key campus personnel in national efforts on K-12 STEM