

Theme Discussions

Attendees were asked to participate in discussions about the five overarching themes for the conference, and to identify what was working in each area and what was needed. Listed below are the items that delegates thought were needed. The list of “What’s Working” items are included in Appendix B.

Preparation

Helping students prepare for advanced work in engineering by assuring the right high-quality courses and facilities are available to them.

What’s Needed:

- More math at every level
- Applied math rather than math for math’s sake
- More funding for summer institutes at university campuses for teachers and students
- Teacher preparation and professional development
- Expand applied sciences courses
- Change instructional practices, cognitively guided
- Higher levels of graduation requirements at K-12 level (for all? Some?)... for appropriate students
- More holistic definition of preparation needed
- Broader definition of math preparation
- Statewide exposure of science and engineering at the elementary level
- Dissemination of co-curricular activities/ programs, statewide
- Professional development for facilitators of programs
- Math training every year in high school prep and make a case for it to students and parents
- Applied physics for all students
- Focused curriculum with built-in motivation
- Soft skills development
- More math/ science certified teachers
- More federal funding for summer institutes for teachers and students on university campuses
- Beginning in K-6 must engage students on path to succeed in math (a higher percentage of advanced math students)
- : More attention to transition years with math instruction to avoid “flame out” in middle school,
- Change way instruction is delivered, cognitively guided instruction
- Getting engineering into consciousness of teacher certification program
- More collaboration needed between high school and community college curriculum
- Expand applied science courses
- More funding for pre-engineering
- At university level – more recognition for excellence in teaching

- On-demand learning in math
- Require math in senior year to avoid gaps
- Application of math concepts to other areas
- Integration of math with other subjects
- Increase capacity of ALL schools
- Distance learning targeted at high school students including teacher training
- More “generalists” in K-8 (e. g., learning math from science teachers)

Diversity

Assuring that opportunities are available to students regardless of gender, race, or economic background.

What’s Needed:

- Include persons with disabilities in definition of diversity
- Clear definition of diversity, including culture
- Educate families about engineering
- Remove stigma that math is the gatekeeper to enter engineering
- Opportunities for students to change their perceptions of science/math
- Dispel the stereotype that technologists are second-class citizens
- Measure of community college student success
- Relevant role models – gender, ethnicity, cultural
- Catch girls before 10 years of age
- Exposure to Engineering subjects/application
 - Hands-on tinkering/exploration
 - Don’t label engineering
- Provide resources, mentors, tools, opportunities
- Smaller school environments
- Focus on today’s girls
- Professional Development for Teachers K-20
- Update media – texts, pictures, language
- Financial support for the student who is part-time or needs more time to complete
- Find way to increase participation of students of diverse backgrounds--connect community resources, families, etc.
- Separate gender learning at elementary school in math/science/engineering.
- More than lip service
- More role models available in each field
- More opportunity to learn about possible careers
- More women & minorities choosing engineering, applied science
- Parental involvement ...
- Start early: elementary school, middle school.
- Acknowledgement of different ways of learning
- Improvement of learning climate/culture
- Better understanding of advantages of diversity among working engineers
- More effective methods available to teachers and others
- More mentoring

- Industry structuring jobs that work for women (e.g. part-time encouraged, rewarded, communicate the attractiveness of roles)
- More information to support informed choice
- More proactive outreach to minority groups at OUS level.

Motivation

Motivating students to become interested in technical careers and take the courses required to prepare for these careers.

What's Needed:

- Common dialogue
- State funding
- More partnerships
- Corporate leadership
- Right people to represent industry to students ;consider mentor/presenter training
- State level advocacy
- Clear definition of engineering at K-12
- Teachers don't know what engineers do
- No focused voice on Oregon Business Council
- Greater knowledge of engineering as a whole
- Engineering kits for elementary and middle school
- Corporate leadership – better marketing to K-12
- Personal connection to engineering outside of the classroom
- Relevance to students (student's perception of relevance)
 - In class, out of class
 - Systematic change to reach all kids – “Engineering for all”
- Science News publication for classrooms
- Self-efficacy in terms of math and science
- Informal / co-curricular connections with classrooms
- Reduce intimidation
- Cultural change
- Marketing
- Project Based Learning
- Recognition
- Community involvement
 - Mentoring, recognition
 - Involve non-engineering parents
 - Support infrastructure
- Non-competitive/ collaborative learning
- Fun, problem solving, engaging, service-based learning, relevant, fulfilling
- Tinkering – teach young kids to tinker
- Variety to appeal to all students
- Engineering as a way of thinking/ life skill
- Role models
- Peer groups

- Professional development for teachers
- Analysis of teacher effectiveness based on teacher preparation/ training
- What works is also what's missing
- Math instructors don't talk about engineering in context of teaching problem solving
- Teachers have a major influence on students
- Too much content to cover to have time to deal with application – high stakes testing drives out application

Retention

Assisting students in succeeding at each level and remaining motivated to continue with the path they have chosen

What's Needed:

- Define retention target
- Clear guidance about engineering – definitions
- More preparation
- Incentives identified
- More talented instructors
- Student support systems
- Finances
- Clear Pathway K-16 in Engineering and Science
- Standard “bar” for each transition Oregon-wide (process)
- Flexibility at all levels
- Flexibility in applying standards
- Leverage resources
- Mentoring and job experiences
- Cohorts and relationships
- Industry engagement
- One voice
- Clear expectations
- Reduce breadth, increase depth
- Eliminate the “weed-out” mentality
- Better tutoring/ mentoring
- Multiple entry points
- Identify success of students throughout program
- Informed advisors – supportive, empathetic, knowledgeable
- Freshman/ Sophomore internship
- Rewards/ recognition

Transfer

Increasing the ease of moving from one level to another and one institution to another while retaining credit for courses taken and making continuous progress towards well-paying jobs that contribute to Oregon's economy.

What's Needed:

- Better advising of students on transfer between institutions
- Statewide engineering degree
- ASOT degree in engineering/computer science
- Transfer agreements need to be with all institutions and programs
- More articulation agreements
- Articulation, standardization of course outcomes
- Common course numbering
- Reduction of territorial issues
- More institutional collaboration
- OUS/CC/K12 needs to behave as one entity
- CC-university interaction – improve ‘cultural’ preparation of student
- Faculty needs to be included in transfer articulation
- Increased flexibility within engineering programs
- Student tracking system to evaluate what’s working and what’s not for students
- Funding to support student transfer interests
- How do we address the needs of the non-traditional learners?
- We make it too hard for students to get an education
- Recruitment assistance - Awareness
- Sophomore level engineering courses
- Measuring success (transfer metrics)
- Systemic development of high school curriculum to prepare through high school to university/community college (not just senior year)
- Increased career counseling in high school career info in the curriculum
- Engineering Tech/ Engineering Transfer
- Better Advising – for program vs. courses
- Systemic advising
- Peer mentoring (high school and university)