Appendix C: Supporting Documentation

Alignment and Coordination: System-wide

Current Situation

- Articulated courses (CAD, etc.)
- Some HS/CC connection; not so much OUS (not same across the state)
- OUS (4-yr) institutions have their own agenda, CC's independent of that at times, possibly the same with HS
- Agreements between CC/OUS $/FTE oriented
- There isn't really a statewide program mentality
- Thinking in terms of "blocks" – 2 years at CC, transfers, etc.
- Degree "completer" issues
- Inconsistent assessment
- Problem about unknown outcomes – focus on courses, not about knowledge and skills
- Curriculum not consistent between courses with the same number
- Competing territory (even private schools)
- But we are not at the bottom of the barrel as a state
- "Local control" prevents systemic design
- Students need consistency (don't care about local control)
- Shortage of resources to provide systemic coordination
- Disconnect between 2 year technical and 2 year transfer – not communicated to students
- Professional technical are not transfer courses
- Much of disconnect is a communication problem

Five Year Goals

- Outcomes "system" (skill sets)
    - Career paths: HS→CC→OUS→Grad→Research Institution or Industry
- 1st step – communication – mechanism that facilitates other goals
- Student awareness of choices early on and opportunities to become more specific as they move on
- Robust system to assess "student success"
- Successful transfers within 2 years
- "Step out and return" provision
- Graduates are life-long learners with skill acquisition that discourages industry outsourcing/ off-shoring
- Advisory and industry input integral to program/ system design
- Consistent predictable funding
- Consistent policies, foci, initiatives

Strategy Statement prior to the Gallery Walk: Statewide K-20 Engineering and Applied Science Coordinating Group OR Commission or Council

- Develop policy recommendations

- Complete skill set development including relations to global conditions
- Implement Career Pathways model for program and system assessment (student success)
- Create "Engineering for All" systems – exposure, internships, job shadows, projects
- Analyze and communicate Engineering Career Paths, Identify decision points and appropriate curricular choices
- College level course coordination (C.S. example)
- Speak with a clear, unified Engineering and Applied Science voice to the Legislature, public, private systems – institutions

Debate over Coordinating Group vs. Commission or Council *(group later voted on this issue and came to the decision to include both strategic and tactical groups as part of their strategy; there was disagreement whether this would be handled by one larger group/ strategy or handled by two separate groups. Hence, the main strategy with supporting strategy)*

- Commission or Council
    - High level policy
    - Governors office
    - Could evolve from ETIC
    - Execs, Deans
- Coordinating Group
    - Policy recommendations to boards and governors
    - Budget recommendations to governor and legislature
    - Workforce development task force
    - Specific agencies at institutions
    - Faculty, engineers
- Trade off: High level execs vs. those who have specific expertise
    - Idea: specific expertise required
- Issue: Family Wage Jobs vs. High-level skills
    - Ideas: Study other states' best practices, Initial 5 year life
- Issue: What about other sectors (e.g. Tourism)?
    - Idea: Pilot

Comments from Gallery Walk:

- Muddled Voices K-12
- Existing Groups
- Maintain diversity
- Define partners – how is group organized, OMSI?
- Inclusive title (Math, Regional, Funding)
- Common Graduate Outcomes?
- Oregon Innovation Network
- Need Faculty
- Flexible
- Cultural Items
- Industry
- Community Partners
- Definitions
- Lessons of CIM/CAM levels

Discussion of Questions 6, 7 ,8 ,9 in guide

- Regional Consortia
  - Relationship to Statewide standards/ outcomes/ model/ processes?
  - Implementation within existing or new partnerships
- All groups seem to require or suggest some type of statewide coordination (marketing, standards, etc.)
- Coordinating group could ensure best practices
- Initially coordinating group work is short-term: 3-5 years?

Alignment and Coordination: Curricular and Co-Curricular

Current Situation

- (document 5.1, robotics conference., i.e.) academic/ organization – based "motivation" → +
  - Students do better on tests, class performance *(w/ caution)*
  - Team projects (i.e. MESA projects) part of proficiency assessments
  - Goal (?): contacts/ conferences need to be assessed and better communication/ marketing in schools
- Co-curricular organizers need to communicate with district teachers
- Co-curricular implies coherence without redundancy
  - Goal (?): field trips turn into projects
- Co-curricular curriculum enhancements

What's Underway

- Field trips/ projects as "incubators of ideas" for dissemination of pedagogy
  - Goal (?): correlate "access" students have to co-curricular opportunities in urban vs. rural communities
  - Goal (?): Partner with industry to fund pedagogical paradigm shift

What do we know?

- "Digital natives" – students, "Digital migrants" – teachers
  - Goal (?): student-centered and team-centered learning
- Educate, orient to transform system
  - Goal (?): systemic intervention needed to address data and attitudes- bring down barriers
- Could create disjunction in classroom between students who participate in co-curricular activities or who self-select
  - Goal (?): Industry could do better "marketing" to pull students/ teachers into shared experience
- What's required to move beyond where we are now, what we know now?
  - Goal (?): Answer: Why do students drop off (Engineering) radar in 4th grade? (See Apple Research, re: delivery as vehicle for engagement)

Summary of Current Situation

1) Co-curricular/ curricular → communication, participation
2) Systemic attitudes/ will → currently a barrier
3) Pedagogical/ Political/ Cultural shift is HUGE to coordinate
4) Funding follows vision and will
5) Assessment of current programs needed to provide data

Five year goals

1) All students should have opportunities to participate in STEM co-curricular activities with targeted invitations and intervention strategies at 4th grade
2) Coordinate and advocate for statewide co-curricular and curricular learning activities – project based and input with industry K-14
3) Create open-source model for sharing technology and information statewide
4) Ongoing OPAS data analysis of co-curricular and curricular alignment (also assess constraints)

Possible Strategies

1) Growth strategies of co-curricular agencies related to STEM curriculum and use of distance education technologies to connect communities of learners to applied co-curricular activities/ events/ expertise
2) a) Annual STEM summer institutes to bring educators (K-20) and co-curricular agencies together (ETIC funded or grant-funded.
   b) Provide info on co-curricular activities to participants
   c) Create network for exchange of information/ Best Practices including database "virtual ecosystem".
3) Systems change and support of student success and connect to professional development
4) Establish within K-14 AND teacher education STEM Curricula, higher visibility and use of co-curricular partnerships

Actions

- Strategy 1 and 2: Regional Consortia (accept responsibility for creating template model for making strategies work on a local scale)
  - Lead: OMSI and OSTA (Oregon Science Teacher's Assoc)
  - Who Involved: higher ed, K-12, Industry Reps
- Strategy 3: Statewide Consortium (P-16 Council Model, see Kentucky, Illinois, Washington)
  - Lead: Industry Sponsor (INTEL)
  - Who Involved: Morgan Anderson
- Involve K-20 Administration in coordination/ communication bridge in co-curricular activities in classroom
  - Lead: OMSI as initial LEAD prepared to promote other informal science ed opportunities
  - Who Involved: OMSI (Initially) and other leaders in co-curricular and K-20 administration and educators

Career Pathways

Goals/Strategies Considered:

- Clarify the variety of different pathways (confusing and disconnected)
- Clarify a focused pathway/s ← Take advantage of web-based connections
- Create a customizable pathway framework
- Common framework, local customization
- Allow for flexibility
- Continue current pathways efforts statewide. Adopt best model
- Research best practices from other states
- Create/build in sustainability
- Assess what works well – eliminate the rest (quality control
- Consistency within state/ ed levels ← Take advantage of web-based connections
- Improved communication/ educate our consumers
- Create strategic multi-faceted marketing of framework that informs all stakeholders :
    - Media
    - Web
    - Speakers
    - Networks
- Include business/ industry
- Assess what works well with stakeholders
- Start younger
- Advising improvements needed (whole system)
- Identify and convene reps from pathways stakeholders group

Diversity

Current Situation:

- OSU – 12% women undergrads, 25% women grads (Engineering only); includes international students, gross 10% among domestic students
- NSF study – 95% freshman women in engineering will graduate in engineering in 5 years (Some doubts expressed) => 50% retention
- OSU ~50% men & women
- Very low female participation at high school level
- OIT – full participation up to trigonometry, then big drop-off
- 10^{th} graders meeting math standards
    - African-American, Hispanic < 20%
    - About half the rate of whites
    - One third the rate of Asians
- Poverty culture is common point
- Boys get better test scores, girls get better grades
- SAT doesn't correlate, but sends a (discouraging) message
- Women through college and into career – less self-confidence

- Out-of-state tuition makes African-American recruiting harder
- Out-of-state schools are recruiting Portland minority students
- Minority students often have socioeconomic obstacles including high school preparation
- Qualified female and minorities do not choose engineering
- Different perception of school setting

Key Goals:

- Better understanding of role and effects of poverty in attracting, preparing, and retaining under-represented groups.
- Plentiful role models who don't appear to abandon culture or other life roles
- "Classroom" beyond the walls
- Face of engineering more like face of Oregon
- Narrow performance gap at al levels
- Engineering principles integrated across all levels and subjects P-20
- All Oregon students will have access to the pre-requisites necessary to pursue engineering as a career goal
- De-mystify engineering pathways (marketing)
- Allow multiple entry points and paths

Possible Strategies

Use models to target specific groups.

- How to encourage minority groups/ females/ more people:
    - Tuition (free)/ scholarships
    - Guarantee jobs for engineering majors
    - Mentor in community as payback (arrow from tuition)
    - Corporate tax breaks to provide jobs/scholarships
- Face of engineering more like face of Oregon (only 5 years)
    - Narrow performance gap, including instructors
    - De-mystify engineering pathways (*'d)
    - Active recruiting of minority students and faculty (includes female) – face of global market
    - Engineering instructors
    - School websites – promote inclusion of students with disabilities
    - Include female (50%)
- Reduce racist/ sexist undercurrents that exist in Oregon
    - Teaching acceptance (rather than tolerance)
    - Modeling
    - Promoting self awareness
    - Celebrate diversity
    - Professional development to train K-20 educators in cultural competence
    - Using nonformal education to support diversity
- All Oregon students have access to the pre-requisites necessary to pursue engineering as a career goal (course work)
    - Physics needed in high schools

    - Flexible
    - Multi-age learning groups
    - Distance learning
    - Support all students/students with disabilities
    - All HS have engineering track
    - Limit tracking → prohibits potential
- Narrow performance gap at all levels (by raising performance of under-represented groups)
    - Intervention strategies
    - Parent education
    - Mentoring (peer, professional)
    - Building relationships
    - Promoting cohorts/ advocacies
    - Maintain high expectations
    - Celebrating success/ incentives
    - Learning communities
    - After school programs/ supplemental programs

Parent Education (Action):

- Internships for students
    - Clause – parent involvement increases pay rate
    - Schools support parent education
- Learning communities for parents
    - Partnership with local organization (Boys and Girls Club, church, soccer fields …) go where parents are
- Parent Education at Back to School night
- Personal testimonies from engineers for encouragement, under-represented role models
- Industry mentor

Notes from the Gallery Walk:

- More emphasis on attracting females/ under-represented groups
- Who will ensure this all happens?
- Utilize community colleges and recognizing importance in role of diversity
- Cartoons
- Invent sitcom to exploit engineering – as CSI has done for forensic science
- Get males into K-* education
- Reality TV – "You're hired"
- Service – EPICS – to promote engineering
- Target "pre-school"
- Teacher preparation prior to license
- Middle level engineering awareness
    - Physical science into to engineering
    - Systems model to understand
- Christine Cunningham BMOS (Books) OMSIDistinguish between socioeconomic status

- Introduce engineering that is relevant to female/ under-represented groups

Instructional Professional Development

Goals Considered:

- Better model for professional development
- Ongoing – ideal 5-10 day summer workshop + 3-4 day/half-day in-services
- Accountability for in-service that provides professional development back to the district
- Regular state-wide in-service days, 3-5/years, distribute evenly
- District or regional focus
- More collaborations – K-12 schools ←→ post secondary
- More professional development/ resources for engineering and applied science integration
- Business model would support institutionalized professional development
- Improve teacher participation rates

Other Strategies considered:

- Problem-solving/ process standards replace some of the current content standards
- Develop concrete examples of curricular pieces – MESA, University, Co-curricular, engineers, professional organizations.
- Summer immersion experiences for teachers. Supported by industry/foundations
- More motivational (peer-driven) materials for students
- Involvement of professionals and industry partners in education
- Develop pooled resources for teaching engineering/ applied science
- Collaborative cross-discipline teaching
- Support marketing
- Provide NSTA and NCTM position statements to faculty/teachers
- Summer workshops and peer-led cadres (university and industry led)
- Engineering/ applied science instruction resource clearing house
- Software Association of Oregon (SAOF) (Super Quest)
- Professional development for counselors/advisors so they understand engineering/ applied science
- Cultural competence and diverse learning styles training for cadre leaders
- Mainstream Co-curricular Professional Development tools
- Provide k-8 pre-service project-oriented methods instruction

Marketing Engineering & Applied Science Careers

Current Situation:

- Promoting engineering education as a vehicle to get to do what you want with your life (not currently occurring in Oregon)
- Showing relevance of kids interests and how that can translate to careers
- Uncoordinated marketing efforts (no single "brand" – diffuse message)
- Recruiting: schools <u>outside</u> of Oregon are doing this
- Type of information – not understood by kids

- Competitions market to the kids

Problems

- Motivating students to be interested in science and technology
- Preparation so can pursue it (prepared with math and science)
- Stereotyping by media turns kids off
- Students aren't aware that there actually are engineering/ science and technology jobs in Oregon
- Understanding and awareness = don't know what engineers do/ how fun it is and need for them/ relevance to all people's lives

Key Strategy 1: Engage professional marketing firm to create a multi-tiered program for building awareness of opportunities and career possibilities *(side note: Group from OPAS approaches professional firm, such as Wieden and Kennedy to create plan)*

- Promote engineering/ science/ math in rural areas
- Target different markets (K-6, 7-9, 10-12, universities/colleges)
- Target especially underserved minorities/ girls
- Parents and teachers and counselors position engineering as relevant and as "cool" and as "heroes" or "idols"
- Develop co-curricular guide and website listing all available opportunities for parents and teachers and advisors
    - Must be intuitive/ not designed by engineers!
    - OPAS
    - Bilingual
    - Paper-based
- Under marketing: develop a web-based presentation about engineering opportunities (find existing and distribute it)

Key Strategy 2: Leverage and/or replicate existing models/ best practices (i.e. Junior Achievement)

- Explore in person and web-based "ongoing conversations" between practitioner and classroom
- Have highly successful teachers train other teachers in intensive 1-week summer course (i.e. SuperQuest, SAOF/CSTA)
- Role models and mentors connecting consistently with kids *relationships*

Key Strategy 3 (*notation suggests that this strategy was combined with 4 in final draft)*: Formalize state/ industry partnership to promote engineering/ science/ technology (and provide incentives to increase the number of kids pursuing these) *side note: Joint Industry-Advisory Boards*

- Invite them to join us in this statewide effort
- Identify the appropriate groups to engage
- Find a model to follow (what other states are doing)
- Invite practicing engineers (esp. women and minorities) to speak to classes/ engage students (Business-Education Compact) (*ETIC*)

- Teacher/ counselor/ administration visits to industry (*Regional Coordinators i.e. Pavtec, ETIC)*

Key Strategy 4 (*combined with 3 in final draft*): Establish seamless connection between education system and Oregon's network of industry clusters (associations)

- "Clearinghouse" – ask all associations to put up a page allowing teachers to request speakers/ mentors/ judges for events (and have a resource for the speakers to see how to engage with the kids) *side note: Jr. Achievement and OHSU models, SAO/CSTA*
- For teachers: restore sabbaticals and allow teachers to practice a job in the real world for one year
- Teacher-business mentorship program (also teacher internships) – consortium of companies/ ETIC/ follow IBM's model/ Bus-Ed Compact

Comments from Gallery Walk:

- Strategy 4: how to get teachers to return after 1 year sabbatical?
- Strategy 2: include a stipend for the 1-week training to incentivize the teacher
- Strategy 1: concerned/ maybe wrong group to be doing it
- Strategy 1: emphasize the earliest grades/ target those the most
    - Also market to the advisors
    - And focus on parents: so they become aware of the possibilities for their children
- ASEE has a list of the opportunities: focus on disseminating this
- See Dream it/ Do it campaign
- Get materials and info to kids/ parents at the key decision points
- ETIC C.S. taskforce (see web)
- Strategy 4: "Partners in Science" program sponsored by Murdock (real research experience)
- Middle school level – LEGO Robotics experience opens eyes
- Goal is right on
- Strategy 1: see BEC pdx.org for listing of activities/ resources
- Strategy 4: have sabbaticals gone away?
- Strategy 1: educating parents is critical
- Marketing language: needs to be kid-friendly
- Strategy 1: market to legislature and have lobbyist and policy makers for engineering
- Engineering is a springboard to other "non-engineering or tech" careers as in legal field/ medical/ sports
- Multi-disciplinary
- All HS math/science/engineering/music classrooms have an engineering poster/ brochures
- Educate
- Strategy 1: part for the Hispanic population – vehicles that are oral (not web/ paper)
- Marketing needs to serve the teachers needs
- Use EWB

De-mystifying engineering in marketing plan (Action)
→ Unified Oregon Marketing Campaign for Engineering/ Science

- Focus on diversity (ex. male nurse campaign)

- Who → ETIC
- Break current stereotype of engineers
- Target audiences
    - K-12 educators
        - Use OEA, OSTA, OCTM, OCATE
    - College math/physics/chemistry. institutions
        - Use AMATYC
        - Treat as gateway to multiple career choices
    - Parents/ students
        - Target demographic areas

Standards, Courses and Curricula

Current Status:

- K-10 Content knowledge and skills standards
- Community colleges/ 4-year institutions, faculty institutions, no standards
- Each department views courses as a handcrafted product
- ABET – 4yr-2yr program outcomes- general

Goal:

- By 2010, we will have a K-20 proficiency-based set of standard outcomes that is responsive to a changing world, a common assessment, and a vertical alignment for a focused/ thread/ pathway of engineering and applied sciences.

Underlying Assumptions

- Entire model involves K-20 participants
- Delivery of outcomes and skills can happen at any (K-20) appropriate stage of the career pathway
- Intend to separate issue of age of student from outcomes and skills achieved
- Includes industry partners
- Similar outcome development will take place in areas of related to engineering, science, and math
- Includes private sector education partners

Comments/ What's Missing

- Pre-service teachers
- Targeted to 1 segment of the pipeline
- HS "engineering graphics" course should use the same #, course, outcomes
    - K-12 needs more of a focus to change standards to process-based system
- Math core needed to list(?)
- Improve student/ parent knowledge to selection of courses
- Computer science, ASOT in Computer Science
- Who is going to lead, facilitate the group?
- How does this help the student?
- K-20, what does this mean?
- Standards are breakpoints along continuum

- Bringing industry into classroom a standard
- Where do you need to be at different points of the spectrum?
- Engineering advisory committees
- Science core
- Need to happen more times out of year
- ABET may have course standard- check?
    - EC 2000 – eng from EAC
    - TC 2000 – criteria eng tech 4yr
- Other HS engineering orientation (tech prep/ dual credit) credit that could be brought down onto HS.
- ABET accreditation for CC
- Industry input into the creation of outcomes ASEE, ACM, IEEE
- K-12 technology standards AAAS – project 2061, ITEA – grade level K-12

Student Success

Definition of Student Success

- Quantity of interested, qualified students
- Persistence and success

Current Situation

- Science Literacy – 40-50% drop out between Freshman and Sophomore college years
    - Reasons
        - different expectations
        - work load
        - math preparation
        - infrastructure of preparation, retention, access (socioeconomic)
        - family, community, culture
        - motivation – community, parental expectations
        - achievement gaps begin in 4^{th} – 6^{th} grades
        - teacher expectations
- When education is a priority at home students are motivated
- Engineers who teach are effective community mentors
- Good scientists = Good citizens
- 25% of adults in OR hold BA/BS – communities vary, some communities as low as 4%

Identifying perceived barriers to access

- The way science is taught
    - Teacher morale
    - Teacher resources
    - Class size
    - Teacher prep
    - 8 minutes a day at elementary level
    - ½ HS & MS math classes taught by teachers uncertified in these areas
- Motivation of women/ under-represented
- Rural/ urban access

- $$
- Student ability vs. K-12 preparation
- Perceptions of students confidence in ability
- Preparation (includes motivation, challenge, jobs)
- Goal: Preparation and Support will equip all students in math, science, and engineering

Five Year Goals

- Increase graduation numbers of underrepresented groups with degrees in Engineering and Applied Sciences
- All qualified applicants can afford to get a degree in Engineering or Applied Sciences
- Double the number of graduates in Engineering and Applied Sciences from Oregon Universities
- All high school graduatess are qualified to have an opportunity to enter engineering or applied sciences program
- Implement reforms that will affect all students.

Strategies

Identifying motivation strategies that will inspire students to pursue engineering and applied science education:

- Improve K-12 motivation about engineering
    - Provide co-curricular activities/ mentoring targeted at women and minorities
        - Role models
    - Implement academic, social, and cultural support programs for students from groups underrepresented in E &AS
    - Standardize freshman coursework
    - Make system work to keep and support students in pipeline
    - All-girl math and science in middle school
- Make engineering programs more attractive and relevant to the lives of students
    - Increase outreach activities by universities to motivate/ recruit
    - Attract qualified students to Oregon universities by providing unique experiences
        - Involve industry
    - Integrate project-based/ service-based learning activities into the classroom
    - Periodic mailing to students beginning in 8th grade to explain careers, programs, and what actions students can be taking to prepare
    - Oregon business community needs to support engineering education K-18 with $ and resources
    - Provide professional development opportunities for E&AS faculty and administrators to support reform in courses and retention services
    - Increase ETIC funding by a factor of 4.
    - Universities should increase program space
- Make engineering programs more attractive and relevant to the lives of students (2nd draft)
    - Financial & Scholarships
    - Co-curricular & Support
        - Quantity
        - Accessibility
        - Coordination

- Modify curricula to increase engagement
  - Need council – who?
- [On post-it notes surrounding above bullet points]
  - Increase mentors (engineering/ applied science) in K-12
  - Provide targeted co-curricular programs (contests, clubs, mentoring, camps, classes)
  - Provide all students with opportunity for mentoring and experiential activities in Engineering and Applied Science
  - Address cultural barriers
    - Family education
    - Adult role models
    - Co-curricular activity targeted at families
  - Oregon Industries Collaboration for Pre-Engineering and Applied Sciences Education
    - Sponsorship
    - Mentors
    - Access to resources
  - Increase the use of transitional learning communities in engineering
  - Separate genders for middle school math and science courses
  - Offer service based learning to make engineering relevant to more students
  - Provide scientific discovery activities at an early age
  - Build scholarship programs targeted at engineering/ applied sciences; involve industry foundations
  - Increase industry support of internship programs
  - Tax-credits for level and type of intervention
  - Business gets tax incentives to provide near-peer mentors to high schools that have low science/engineering college graduation rates

Identify strategies to increase student confidence in their ability to succeed

- Improve high school educational experience
  - Improve high school teacher skill to motivate students to learn the science/ math/ CS needs for science/ engineering success
  - Develop a consortium of partners to deliver high quality formal and informal learning experiences that build aspirations, preparation, and entrance into higher education.
  - Implement engineering/ applied science programs consistently from K-12
    - Math
    - Science
    - Require in curricula
    - Problem solving
- Raise high school math/ science requirements--communicate expectations of engineering schools
  - Clearer guidance to students on university expectations beginning early in high school
  - Further increase graduation requirements from Oregon high schools

- Schedule high school students with minimum requirements to be accepted into community college or university out of high schools
- Increase math and science requirements for all high school grads
- Require an engineering experience for graduation such as a capstone project or senior project
- Raise math and science requirements for graduation to better prepare students for rigor of college
- Make engineering a higher priority in middle and high schools – have more flexibility in curriculum and scheduling
- Make pre-engineering a requirement at the high school level instead of an elective

Identify retention strategies that will inspire students … and support these students in completing this education

- Raise the quality and level of high school education in preparing students for college engineering/ AS degree programs
  - Reduce class sizes
    - How to
    - Benchmarking
    - Look at RPI methods vs. class size experience
  - Standards and Classroom Delivery
  - Community Involvement
  - [On post-it notes surrounding above bullet points[
    - Expand number of high schools offering computer science classes
    - Reform K-12 standards from content to conceptual instruction
    - Review and comment on the proposed new high school graduation requirements proposed by the Oregon School Board
    - Train teachers in engineering or creative problem solving
    - Have more high school programs that will help define the engineering programs and make them more attractive
    - Create and expand programs that get parents with young children to participate in science exploration activities
    - Increase funding for schools
    - Increase parent awareness – parent education so they see the need for math and science
    - Reduce class sizes for all classes
    - Provide peer groups of students who plan to go to college
    - Create incentives for professionals in technical fields to become high schools and elementary teachers
    - Raise graduation requirements
- Improve foundation/ industry/ government funding for engineering/ AS students
  - Make cost of college more affordable by scholarships or paid tuition by potential employees
  - Provide double tax break for endowment gifts to E&AS scholarships
  - Increase Oregon Opportunity Grants
  - Work with foundations, agencies, and business/industry partners to develop an E&AS career assistance “fund”

- Create tax incentive for scholarship endowment funds from individuals and corporations
- Loan forgiveness programs when jobs occur – paid ½ by industry, ½ government
- Voluntary "bounty" on each OUS Oregon engineer hired
- Scholarships based on degree choice
- Help students make better financial choices
  - High school students see college financial impact of choices (high school classes, CC, Army, scholarships)

Learned in Gallery Walk – refinements

- Broad controversy – much cross-over
- Need: ongoing communication and coordination
- Goal: all to have option to choose EAS
- Goal: students to make informed choices
- Diversity: issues and solutions not very clear
- Lack of knowledge of existing systems and resources
- Training and tools for teachers

Resources Needed *(A=additional, E=existing)*

1a) Class size
- Funding (A)
- Quality education model
- Belief: OR is past limits for effectiveness

1b) Standards and Classroom delivery
- Stakeholders to work (E)
- Industry, K-20, STEM competency
- Could output (performance) goals shift discussion
- Who/What:
  - Need to create process for change (can deliver different result)
  - Output recommendations to ODE curriculum group for implementation
- Risk taking!
- PASS Standards: useful participant and model, IB also a useful model

1c) Community involvement (parents, mentors, …)
- Some districts using community advisory boards
- Families
  - Science nights and events
  - Need resources to facilitate (sometimes by universities)
  - Treat outreach like extension source: Example 4H tech wizards

2a) Scholarships/ Financial Support – not developed because of time limitations

2b) Co-curricular support
- Coordination initiative
- Small seed funds (A)

2c) Integrated Curriculum – 2b, 2c get worked together