



# OPAS Initiative

## Learnings on Program Development & Accountability

April 21, 2008

### The OPAS Initiative

The **Oregon Pre-Engineering and Applied Sciences Initiative** (OPAS) kicked off in 2005 with a summit of stakeholders in the future of Oregon engineering, materials science, and computer science education. The **OPAS Mission** is to increase the number of work-ready engineers and applied scientists in Oregon through collaborations of education sectors, industry, and government stakeholders that ensure that all K-12 students have access to high quality education and career exploration opportunities that prepare them for postsecondary and workplace opportunities and success. OPAS works to motivate and prepare students, with appropriate supports and programs to ensure continuing success, by work at the policy level of state K-12 and higher education, dissemination of information to stakeholders, promotion of collaboration among stakeholders, and limited funding of select projects.

“Effective program design works to reach goals through the intentional structuring of activities, groups and events that are designed to reach the goals. Metrics both define the program goals as well as provide the needed program evaluation that improves the programming over time to better reach these goals.”

*Ryan Collay, SMILE, and David Coronado, MESA, for the OPAS Initiative, 2008*

Effective Programs Feature	Resulting in Students With	Who will achieve
<ul style="list-style-type: none"> <li>Physical and psychological safety</li> <li>Appropriate structure</li> <li>Supportive relationships</li> <li>Opportunities to belong</li> <li>Positive social norms</li> <li>Support for efficacy and mattering</li> <li>Opportunities for skill building</li> <li>Integration of family, school, and community</li> </ul>	Competence Confidence Connection Character Caring & Compassion [Curiosity]	High School Graduation College & Workplace Readiness [Motivation to seek & participate in further STEM education]

*Roger Rennekamp, 4-H, for the OPAS Initiative, 2009; [additions by Jo Oshiro, OPAS Initiative]*

### Logic Model: Connect Inputs, Processes, and Metrics to Results (Outputs, Outcomes, Impacts)

- The Kellogg Foundation on evaluation and Logic Model Development Guide -- <http://www.wkcf.org/default.aspx?tabid=75&CID=281&NID=61&LanguageID=0>
  - Note that the logic model tool can be applied at many program levels, from the plan for a single lesson to the establishment of a new non-profit.

## Metrics – the measurements that document results:

- **Quantity of Experience:**
  - Number of students served and their demographic info: age/grade, gender, ethnicity, other
  - “Touch factor” -- Number of contact hours each
    - Participants may be of several types with differing numbers of contact hours each; distinguish your visitors at an exhibition from your team members
  - Number of deliverers participating: teachers, volunteers, coaches, teachers
    - These people may be the students in a professional development program or professional learning community as well as program deliverers
- **Quality of Experience:**
  - Attendance and persistence in clubs and at events
    - If true longitudinal tracking is not possible, asking about previous experience in clubs and events shows part of the picture.
    - Define target attendance and persistence goals and their demographics
    - Consider persistence in pursuing STEM experiences across a range of opportunities, not just within one discipline or program (The OPAS “Hand Off, Hand Up” model.)
  - Increased knowledge of a variety of engineering careers and their roles in solving “real-world” problems
    - Pre- vs. post- experience/event testing/ knowledge assessment
  - Increased ability to define the role and engineering and research-based knowledge in addressing current public concerns and policy issues such as climate, transportation, energy, the environment, technology, and security.
    - Part of a problems-based learning activity applying skills and knowledge to a problem, assessment based on demonstrated understanding through a project or display.
  - Increased interaction with professionals as role models and career mentors in engineering.
    - Track number of visits by engineers or to professional locations; demonstrate delivery through targets appropriate to the program structure (e.g., for a club, 5-8 visits per year).
  - Increased interest and knowledge about engineering careers, skills, and opportunities in Higher Education.
    - Measure by surveys and information assessments.
  - Desire to pursue additional STEM educational experiences: classes, clubs, projects, teams, events, courses of study and careers.

## Key Learnings from the OPAS Workshop 2009 & ongoing discussions

- Deliverers (teachers, volunteers, near-peers) must be trained; both content and pedagogy matter. Educators need ongoing professional development and continued support (Professional Learning Communities are one model).
- Local champions are necessary for founding and maintaining program.
- Support infrastructure increases program effectiveness.
- One must address the whole student in their own context – personal knowledge and interests, school, community, and family.
- A variety of ongoing, meaningful opportunities for youth learning are needed.
- Ways of knowing and incorporating Best Practices are needed.
- Document and measure at least these dimensions of programs:
  - Active – participants do more than look and listen
  - Problem-solving

- Student-centered
- Team-based (a key criteria for the OPAS Initiative)
- Use what we know to build and augment what is already out there; don't re-invent the wheel. Build on success; look for opportunities to expand, scale up, and export programs, resources and knowledge.

## Key References

- **OPAS White Paper: Fostering STEM Diversity**, Eda Davis-Lowe, 2006:  
[http://opas.ous.edu///Committees/Resources/Staff\\_papers/Fostering\\_STEM\\_Diversity.pdf](http://opas.ous.edu///Committees/Resources/Staff_papers/Fostering_STEM_Diversity.pdf)
- **STEM Diversity Benefits flyer**, OPAS Succeed Workgroup – revise at will to communicate with your constituency:  
[http://opas.ous.edu///Workgroups2007/Succeed/STEMDiversityBenefits\\_122107.doc](http://opas.ous.edu///Workgroups2007/Succeed/STEMDiversityBenefits_122107.doc)  
[http://opas.ous.edu///Workgroups2007/Succeed/STEMDiversityBenefits\\_122107.pdf](http://opas.ous.edu///Workgroups2007/Succeed/STEMDiversityBenefits_122107.pdf)
- **Encouraging Girls in Math, Science and Engineering** – a summary of barriers, interventions and strategies developed for Gender and Science (WS340) at OSU by Eda Davis-Lowe, with references:  
[http://opas.ous.edu/Workgroups2007/Succeed/DavisLowe\\_GenderAndScience.pdf](http://opas.ous.edu/Workgroups2007/Succeed/DavisLowe_GenderAndScience.pdf)
- **Talk Aloud Paired Problem Solving** – one method for collaborative teaching and learning --  
<http://www.utexas.edu/academic/cte/sourcebook/teaching3.pdf>
- **Why sTEM?**: slides presented at NWREL Workshop “What Research Tells Us About Encouraging Girls in Math and Science” April 22, 2009 -- [http://opas.ous.edu/Committees/Resources/Staff\\_papers/Oshiro\\_Why\\_sTEem\\_042209.pdf](http://opas.ous.edu/Committees/Resources/Staff_papers/Oshiro_Why_sTEem_042209.pdf)
- **BEST Program Design Principles**: Building Engineering and Science Talent (BEST) is a public-private partnership dedicated to building a stronger, more diverse U.S. workforce in science, engineering and technology by increasing the participation of underrepresented groups -- <http://www.bestworkforce.org/>. Their design principles as stated in their 2004 “What it Takes”:  
  - Defined Outcomes
  - Sustained commitment
  - Personalization
  - Challenging Content
  - Engaged Adults

## Exemplar Programs:

- **SMILE – Science and Math Investigative Learning Experiences, Oregon State University** --  
<http://smile.oregonstate.edu/>
- **PLTW – Project Lead The Way**
  - National non-profit -- <http://www.pltw.org/>
  - OPAS PLTW Advocacy -- [http://opas.ous.edu///PLTW\\_Advocacy/index.html](http://opas.ous.edu///PLTW_Advocacy/index.html)

## Additional Programs & Resources

- Curricular sTEM -- [http://opas.ous.edu///Workgroups2007/Prepare/Prepare\\_candidate\\_programs\\_050608.pdf](http://opas.ous.edu///Workgroups2007/Prepare/Prepare_candidate_programs_050608.pdf)
- Informal STEM Education Gazetteer-- <http://www.technosciencesupersite.org/>
- Free-Choice Learning -- <http://seagrant.oregonstate.edu/freechoice/index.html>

“In the OPASsphere” e-newsletter -- <http://opas.ous.edu///OPASsphere/index.html>

OPAS Master Resources List -- <http://opas.ous.edu/Committees/Resources/>