

OPAS Investment Sub-Proposal

DRAFT

Segment:

Pre-engineering Curricula and Professional Development – Classrooms

Contact Name:

Dick Knight, Chair, OPAS “Prepare” Committee

Date of Submission:

January 23, 2008

Vision Statement:

All Oregon students will have access to rigorous, content rich classes in which they can explore the concepts, skills and careers associated with engineering and applied science. These classes will be designed and coordinated with other programs to prepare students for post-secondary education and to provide students the opportunity to earn credit toward graduation and higher education when they demonstrate mastery of the course material.

Long-term Goals

The long term goal of this initiative is to dramatically improve the accessibility and quality of pre-engineering education in Oregon’s schools with the intent to double the number of students who are prepared for and choose professional careers in engineering and the applied sciences. It is estimated that such programs are currently available in less than a quarter of Oregon high schools and a much smaller fraction of middle schools. This initiative will focus on doubling the current number during the next 5 years.

Investment Description

The following are key areas for investment proposed for support by OPAS

- Start-up support for high quality pre-engineering programs in high schools. Support will be directed to schools that demonstrate a commitment to establishing and sustaining a high quality program. Expectations will include use of a high quality externally validated curriculum, a strong focus on preparation of students for post-secondary education, formal assessment of results, and a commitment to professional development and mentoring for the teachers. Delivery: competitive matching grants administered through OPAS for teacher development, curriculum, and equipment.
- Middle schools links to high school pre-engineering programs will be developed through support for introducing pre-engineering modules into the curriculum of middle schools which “feed” into high schools with pre-engineering programs. This education “cluster” approach will allow students to explore and identify possible career interests early and provide linkage to relevant high school academic options. The expectation is to motivate increased academic relevance, encourage students to make wiser choices in selecting classes, and promote post-

- secondary success through improved preparation. Delivery: competitive matching grants administered through OPAS for teacher development, curriculum, and equipment.
- Expansion of number of highly qualified teachers will be supported through teacher development programs and mentoring resources targeting: a. experienced pre-engineering teachers setting up new programs or expanding current programs; b. math and science teachers who wish to expand their qualifications in pre-engineering; c. teachers-in-training with math, science, and engineering backgrounds; and d. industry professionals who are making a career transition into teaching. Delivery: intensive teacher development workshops, networks of teachers using common curriculum, subsidy for master teachers to serve as mentors.
 - Initiatives to engage underrepresented populations will be encouraged. Special attention will be given to identifying and recruiting participation by schools which serve these populations and which wish to implement innovative approaches to engaging their students in pre-engineering and applied science. Included as examples of the types of programs that are anticipated in this category are special magnet programs in schools with high underrepresented populations, single sex classes or magnet programs, or programs that provide supplementary language support for English-language learners. Delivery: subsidized start-up expenses for incremental, innovative program elements required by the nature of the student population (ex: language support).
 - Communication and community engagement will focus on two areas: a. making schools aware of the value of a strong pre-engineering program and encouraging addition or expansion a pre-engineering program, and b. encouraging companies and professionals in the local community to actively support pre-engineering programs that are started or expanded in their area.
 - Evaluation will be a mandatory element for all schools which receive funding, and the ability of their proposed program to provide relevant evaluation of quality of program delivered and student learning will be a critical element in evaluation and selection. The overall approach to evaluation will be based on the compilation and analysis of the evaluation data from the participant schools.

Private and Federal Support

Opportunities exist to use the proposed funding as a leadership tool to leverage other investments from federal, state and private sources. At the state level, once a program is established by a school and incorporated in its core budget, sustainability will largely come from on-going operating budgets. Federal funds are also routinely accessible for programs of this type, especially in the form of Perkins grants. However, the proposed funds have the potential to significantly influence the type and quality of programs which schools adopt as part of this federally funded program. Federal NSF Math Science Partnership Program funds have played a very important role in allowing OIT to pilot many of the ideas contained in this proposal, and further funding from this source will be sought where available. Private funding will be most attractive as a matching source in response to requests from local schools to their community businesses and private

individuals in the community they serve. Since the proposed program requires cost sharing by the participating schools, private donations will be a necessary and important part of this initiative and securing such donations will be one of the key responsibilities of the participating schools.

Results and Benefits

Short-term: The funding requested for the 2009-11 Biennium will include the program elements described above. The intended impact is to implement new and significantly improved and expanded pre-engineering programs in 10-15% of Oregon high schools and begin to create clusters of middle school pre-engineering programs supporting these high schools. This will result in new or expanded pre-engineering programs in at least 25 additional high schools and the launch of 5-10 middle school clusters with one year of start-up assistance and transition support for a second year as the schools move to a locally sustainable model. At the end of this Biennium it is anticipated that there will be pre-engineering programs in approximately 40% of Oregon's high schools.

In the medium and long term it will be important to ensure that the gains made through this initiative are sustained and extended the reach to all suitable schools in the State. Some schools are not candidates due to their focus on a specific magnet area (ex: arts, medicine). During the first two years of this program assessment of the Oregon environment and results of the first two years will be used to set a quantitative long range goal and investment plan. At this point it is anticipated that a long range goal should be to further double the impact with the expectation long term of participation by 80% of Oregon high schools and eventually a comparable number of middle schools.

In total, these results will approximately triple the number of Oregon students with exposure to pre-engineering and applied science. This should be expected to make a significant impact on the pipeline of students interested and prepared for careers in these fields. Oregon will benefit by an expanded technical workforce and much greater opportunity for Oregon students to have high paid careers in the technology industry.

Future Plans and Resources

This program is envisioned as a 5-6 year initiative to fundamentally reshape the nature of pre-college engineering and applied science education in Oregon. The specific future goals will be shaped by successes and challenges encountered during the first two years. At this point it is anticipated that the program cost and structure will be similar during the next 4 years. However, it is also expected that a larger fraction of resources will shift toward developing the middle school clusters once programs have been introduced into 50% of Oregon's high schools. Also, it is expected that innovations in delivery will need increased focus as effort is increasingly focused on smaller and more rural schools.

Measuring Results

Metrics which will be supported specifically through this proposal are basic summative measures which will focus on growth, sustainability, and student mastery. These metrics are chosen as most critical for this stage of the program. The following are metrics which are planned for inclusion:

- Growth
 - Number of participating schools
 - Number of participating students
 - Number and type of classes offered
 - Number of teachers trained (by type, background)
- Sustainability
 - Retention rate for school programs
 - Retention rate for trained teachers
- Student mastery
 - Performance of students on appropriate normed tests

It is desirable that partners be recruited to do more fundamental education research in conjunction with this proposal. Topics of great interest include formative impact on students' academic outcomes and career choices, formative impacts and opportunities for participating teachers and other such information which could guide further development of this program. Such work is expensive and often difficult since it requires access to restricted data and may require longitudinal studies. We have only included funding for a core evaluation using key metrics. We will encourage partners to seek additional funding and perform additional education research in conjunction with this proposal.

Proposed Investment

Leadership, administration, and reporting	\$120,000
Start-up support for high quality pre-engineering programs in high schools (25 schools)	625,000
Middle schools links to high school pre-engineering Programs (10 schools, 5-10 clusters)	150,000
Expansion of number of highly qualified teachers	200,000
Initiatives to engage underrepresented populations	120,000
Communication and community engagement	25,000
Evaluation	60,000
<hr/>	
Total	\$1,300,000