

# **Proposal to Engineering & Technology Industry Council by Oregon Pre-engineering & Applied Science Biennium from July 1, 2009 to June 30, 2011**

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**Date of Submission:**

## **Summary of Proposal:**

Increase secondary school student's motivation and preparation to pursue a college Engineering Degree program by enabling compelling out-of-school time engineering challenges for both students and faculty.

## **Vision Statement**

All Oregon High School Students have the opportunity to Letter in Engineering by actively participating in after school engineering challenges.

## **Long-term Goals**

School Districts prioritize funding for engineering challenge participation at the same level or higher than student athletics. Three to five statewide, volunteer driven, engineering challenge sponsoring organizations provide the infrastructure for organizing and hosting different types of engineering challenge, such as Engineering Design (e.g. Design Squad), Computer Programming, and Robotics. In 2015, after 6 years of seed funding by ETIC, a successful engineering challenge program will result in 100 high schools implementing engineering challenges, enabling at least 2000 students to participate in a small team engineering challenge. Additional teams coached and hosted by other interested parties will total at least 500 additional students per year. Contact hours per student challenge are expected to be a minimum of 150 hours for each student participant.

Schools will be encouraged to develop criteria for receiving a letter of engineering based on active participation in one or more engineering challenges plus some minimal course requirements. In year 2015 at least 1000 Oregon High School Students will Letter in Engineering.

## **Investment Description**

This investment will be used to seed an "outside school time (OST)" engineering challenge program. The funding is for an extra duty stipend to pay a head coach and any assistance coaches plus funds to purchase engineering challenge materials. School

districts are required to pay 50% of the costs for the first year, 75% for the second year, and commit to funding the coach at 100% for at least two additional years. Stipends for the head coach and assistants are budgeted at 10K per school based on similar stipends paid to other High School Coaches currently receiving such stipends.

Proposed seed funding will be for 30 schools for each year of the biennium. Total funding request is for 300K for the Biennium since the needed 10K per school is met with a 5K matching fund from school. The second year of the Biennium will be able to add 15 more schools as the funding for the first 30 schools is reduced from 50% to 25%. The next and subsequent Biennium will add about 20 schools per year as some schools finish seed funding, and others move to the reduced level their second year.

Seed funding to purchase engineering material is included with similar provisions. The initial year funding is 3K per school and is based on the current cost of purchasing 3 First Tech Challenge Robotic kits. The school and/or associated parent booster clubs is expected to pick up funding for the following years, although there will be some funding reserved for special needs situations. This special needs funding will also be available to help teams that are hosted and coached by other groups.

Proposed seed funding for engineering material will be for 50 teams capped at 3K per team, or 150K per year or 300K for the Biennium. Thirty of the teams receiving this seed funding will be the teams at the schools being granted first year engineering challenge seed funding. The remaining grants will be given to other teams with highest needs as determined by the organizations running the engineering challenges. ETIC will determine which organized challenges are most likely to result in motivating students to pursue the types of engineers in most demand to receive and then distribute this to the teams with highest scholarship funding needs.

Funding is not being requested for organizing and hosting engineering challenges as there are already several such organizations in place. Some examples are the FIRST organization with its First Robotics and First Tech challenges. The MIT Lemelson Foundation's current InvenTeam challenge. IEEE has developed a Design Squad program for local events based on the Design Squad TV show. The seed funding will enable High School Faculty to organize and coach teams to participate in these programs in the same way athletic coaches participate in sporting events, through extra duty stipends and team parent booster clubs. The engineering material funding will be used to help boost participation in the selected challenge organization through needs based scholarships grants by that organization.

The size of the extra duty stipend for the Head Engineer Coach needs to be significant enough establish the coach as a school champion for engineering, similar to the role a head football coach plays in championing that sport for the school. It is expected training and recruitment of assistant coaches and student team members, and the encouragement of a parent booster club will be assumed responsibilities of this position and covered by the extra duty stipend. Like the head football coach extra duty stipend, this extra duty

stipend will be performance based can even be awarded to a non-faculty member if no trained faculty are on staff.

These coaching stipends are expected to compliment and extend the impact of the in class room engineering courses and faculty training programs. Teachers receiving this classroom instruction training and materials are expected to be good candidates for head engineer coach or an assistant coach for that school.

## **Private and Federal Support**

As mentioned above, several private organizations are already sponsoring engineering challenges of various types. They are supported by a collection of participant fees and foundation grants. The requested seed money is expected to greatly increase participation in these events by compensating high school teachers to recruit and coach teams while developing a sustainable program around these challenges. No additional explicit private or federal funding is required, but it is expected a successful OST engineering challenge program will cause additional funds to be channeled through the sponsoring organizations.

## **Results and Benefits**

### Short-term

After two years of funding, a successful program will have seeded 45 Oregon schools with engineering coaching programs that will have directly impacted about 800 students with 150 additional contact hours of experiencing engineering through a team challenge. In addition, 40 non-school hosted teams will have received scholarships for needed engineering materials to participate in these challenges adding an additional 600 students with the same level of contact hours.

These students are expected to attract more scholarship dollars for attending college based on these challenges as well as to have increased conviction to pursue an engineering degree in college. Since these engineering challenges are public events, they will increase general awareness in engineering as a career for parents, school counselors, and the community in general.

### Medium and long-term

Three rounds of biennium funding will have established engineering coaching programs for around 100 High Schools, slightly less than have of all high schools in the state. Longer term, the program may be adopted by additional schools as public interest and awareness of its benefits influence school budgets to include extra duty stipends to fund an OST engineering challenge program along with a letter of engineering for actively participating students. Based on studies done by FIRST for students who currently participate in these challenges, this is expected to result in a more constant supply of motivated and prepared high school graduates pursuing engineering degrees.

## **Future Plan & Resources**

As this seed program is currently envisioned, 600K is needed for each of the next 3 biennium's to establish self-funding OST engineering challenge teams at about half of Oregon's high schools. Continued funding of schools serving predominately minority and rural areas may be required to help with material provide scholarships for students, whose parents are not able to afford participation fees. This could be modeled after current athletic team support from the same schools.

Before finalizing proposed funding numbers, this draft funding plan needs to be reviewed by several school districts to determine if the proposed figures are reasonable and schools willing to adjust budgets to add an outside school time engineering challenge team lead by a head engineering coach. In preparing this draft only one school board chair has been consulted. This person was already a supporter of increasing engineering content and felt the funding level required of the schools was doable. The person did have concerns about union reactions. More ground work needs to be done to ensure the target numbers in this proposal are valid and the necessary effected party endorsements are obtained.

Since this is not a proven concept, the program needs to be assessed after each biennium to determine if schools are able to meet their commitments to fully fund these engineering coaches after their seed money ends. Adjustments will be made based on needs and how successful the program is in preparing and motivating students to pursue engineering degrees. Adjusts could range from early termination to having to increase the level of seed funding to jump-start the program.

## **Measuring Results**

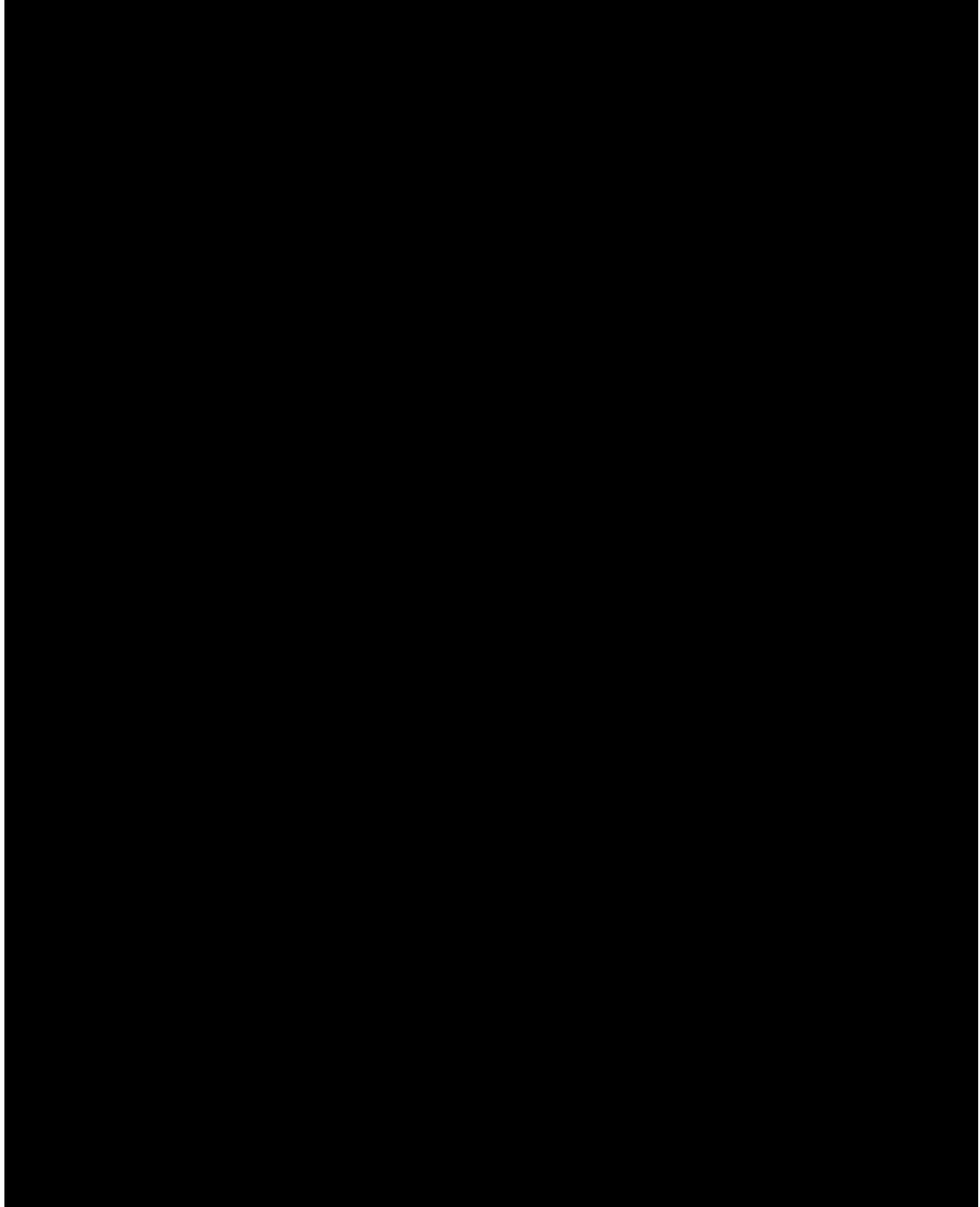
It is straight forward to tally the number of schools agreeing to match funding terms and to monitor their participation in engineering challenge events. A yearly report from the head engineering coach of each school will be required that tracks the number of students and contact hours resulting from their engineering challenges. These reports will be sufficient to measure the specific numerical goals of this seeding program. While these reports will be easy to collect when additional stipend dollars are at stake, another carrot or stick will be needed to collect this information in subsequent years. One possibility would be to create a state wide Engineering Coaches Council to monitor progress and suggest ways to improve the program and engineering challenges.

Other metrics to be collected are the student scholarship dollars received by students that have received a letter in engineering. This data would be harder to collect, but should be doable by generating a report on data already collected by the school. This data collection could be done by the same group that is collecting similar data on the success of the classroom engineering education.

The Organization that currently sponsor engineering challenges already have in place mechanism to collect and track student progress in college. These already published

reports will be monitored by the OPAS office to ensure these challenges continue to prepare and motivate team members for engineering careers.

## Proposed Investment and Private Support Forecast (\$M)



**Metrics Forecast (for programs covered by this sub-proposal):**

