OPAS Initiative
Trip Report – February 29, 2008

SMILE Middle School Challenge

Oregon State University

The Science and Math Investigative Learning Experiences (SMILE) Program is the recipient of an Engineering and Technology Industry (ETIC) grant to stage a Middle School Challenge event to bring greater awareness of engineering processes, tools, and careers to middle school SMILE club members. The theme of this year's challenge was "Making Time for Music … On the Road to College". The challenge was "to compose and perform a piece of music on instruments made from 'found materials', with the purpose of supporting music world-wide."

The Challenge is held twice, on successive Thursday/Fridays, to keep logistics manageable. About 220 students total participate. Students and their club teachers and chaperones start with sponsored travel to Western Oregon University (WOU) in Monmouth, and stay overnight on-campus at the Oregon Military Academy, a National Guard training facility. They meet as teams with mentors and Oregon State University (OSU) Mechanical Engineering students. These ME students present their construct, made in response to SMILE's requirements for a concrete demonstration, as part of the introduction to the challenge, engineering constraints, processes, and practitioners. Team mentors are student volunteers who may be SMILE alumni, education students, or OSU students interested in education and outreach.

Thursday evening activities include work on the science of sound, identifying resources, limitations, and a timeline. Friday morning students are bussed to OSU where they participate in campus tours and activities before settling down to complete the challenge and share their results with each other and their mentors, teachers and volunteers. Some of these activities:

- Learning from the Austin Entrepreneurs' Program;
- Soldering a circuit board with EE faculty and students;
- Careers in agriculture sciences orientation;
- Visiting an amphibian research lab;
- Seeing the ME students' project, a mechanical auger-driven steel-ball xylophone, in action and programming a song on it.

I observed some of the challenge completion activities and participated in the closing ceremonies. Because the kids had a short timeline, I did not interact much. Highlights noted:

- Kids were largely on task in a fairly chaotic environment.
- Kids had or were creating a wider variety of musical instruments and instrument types than organizers expected.
- Kids used the "found materials" – pasta, beans, beads etc., a variety of plastic cups, containers, tubes, wood scraps, string, sand paper, nails – in different ways than expected.

- The OSU ME students enjoyed the SMILE project as creative and open-ended. The SMILE staff has been learning through this exercise in user-specification; this year one of the project requirements was that the construct must transportable by car.
- One teacher, new to SMILE, was very enthusiastic and made sure to tell me that SMILE has made a huge difference for one in particular of her students.
- One student, a boy, was apparently disengaged from the activity with the girls on his team. When I asked why his xylophone had rubber bands on the keys, he quickly and confidently said "So it vibrates better, and it's not just the sound of wood on wood [when the mallet hits]."
- A thoughtful, useful, small set of handouts for teams promoted focus on results and process while minimally constraining creativity.
- The event made extensive use of about 45 college student volunteers – chaperones, materials managers, team mentors –
    - 25 were Math and Science Education Master's students;
    - SMILE provides a short training on mentoring and the challenge project.

I saw three driving motifs from the organizers:

- Demonstrating to the students that they matter.
- Showing the students that college is a possible, known and worthwhile goal.
- Engaging the students in open-ended, problem-solving, product-producing, team-based activities with stated constraints of time, material, and requirements/rules.

I was surprised to note that the ritual of coming forward, receiving a certificate/award, shaking hands, hearing congratulations, and saying "Thank you" was not widely understood for this audience. The sense of entitlement to attention, resources, and politeness that pervades any similar gathering of middle class students was missing at both the awards lectern and the refreshment table.

Within the extended field-trip format of the Engineering Challenge, SMILE is doing good work fostering creativity and awareness of engineering as a process for solving problems and creating things. The delivery model is limited from the perspective of engineering education; some ways such a model might be extended to nurture greater innovation include more time, smaller teams, a wider choice of materials and tools, and some form of more formal exhibition within the community. The event format is excellent in allowing SMILE to deliver and reinforce all three of their messages, and the college campus visits are critical to two of them – that these students matter to the wider world, and that college is a possible part of their future. The participation by ME students is crucial in raising the middle school students' awareness of engineering disciplines and reinforcing the desirability of college.

SMILE club activities, at the middle school level, cost $220 per student. The SMILE Middle School Challenge costs $142 per student, based on 2007 costs. Most of the cost is in transportation, as the SMILE students are from small rural schools from such far-flung towns as Ontario, Nyssa, and Chiloquin. The event logistics I saw were very well organized, cost-effective and on-message.

Respectfully submitted,
Jo Oshiro
March 4, 2008