



ETIC 07-09 OPAS RFP

Trip Report: McNary High School

Site Visit May 29, 2008

Grant #2008-07 –

“Keizer Engineering & Applied Science Pathway”

Ken Cone and Jo Oshiro visited Doug Stuvenga at McNary High School during an Introduction to Engineering (IED) class. Doug is the Project Contact for ETIC 07-09 OPAS Grant 2008-07 to the Salem-Keizer School District. IED is the first class in the Project Lead The Way (PLTW) curriculum sequence. Mark Geren of Health and Science High School (HS2), Beaverton School District and Principal Investigator on ETIC 07-09 OPAS RFP grant #2008-03, met us there. The goals of the trip:

- Build connections and collaboration.
- Introduce Mark to an experienced PLTW teacher who is willing and able to provide some guidance and advice and have some time to discuss questions and issues with the implementation of a new PLTW program.
- Perform a visual check of class demographics, rigor, student engagement, and discuss particular challenges related to the grant, the PLTW program and local conditions.
- Talk with an experienced teacher about the pros and cons of the PLTW curriculum, and capture details on issues and barriers to inform the work of the OPAS Prepare Workgroup.
- Learn more about how to do a site and classroom visit to determine their feasibility and limitations, given that we have heard from multiple sources that the best method of grant evaluation is an extended site visit.

McNary High School

McNary has an established Industrial Education department teaching Drafting and Design; Engineering; Manufacturing Technology and Mechanical Technology. Facilities include an automotive shop, a foundry, metals shop, and a design/prototype shop. Computer-based graphics is taught in the art department. Doug was instrumental in getting some design lab equipment funded through Meyer Memorial Trust, NEA, and Perkins funds. The building is old but spacious and well-kept; Doug’s classroom is especially large with several tables for group work at one end, several rows of individual computer workstations at the other, and ringed by equipment, sinks, and storage. This configuration enhances his ability to switch the class focus away from computers and software to teamwork, design and manual sketching. Program highlights:

- Doug teaches CAD I using industry-standard Rhinoceros 3D CAD “Rhino” software (<http://www.rhino3d.com/>), and also uses it some in his PLTW IED classes. CAD II students use AutoCAD. CAD III and IV students use Solidworks and Inventor. CAD I – IV are each one semester in length.
- Girls often do well in drafting, but it is rare to have more than 5 in a class, and even more rare for them to continue in the sequence. The automotive teacher has the same experience; both note that the girls who do continue make great students.

- **Both teachers are interested in how to come up with assignments and projects that interest girls.**
- Tightly articulated to Chemeketa Community College CAD classes, although the dual enrollment \$25 per credit hour cost is hard to meet for many of his students. Chemeketa does not offer much in Manufacturing; Doug is talking with Portland Community College about articulating/dual crediting with their manufacturing program. (He notes that Chemeketa, like PLTW, uses the Autodesk software; Chemeketa has been “great about dual credit” by being “outcome-based not software-based”).
- Few students enroll in CAD as seniors, but Doug believes that each year 5-6 McNary seniors who have previously taken his courses go directly to college engineering programs; he has not been explicitly tracking students longitudinally.
- McNary’s “critical enrollment” is about 30 students; that is, if class enrollment falls below 30 the class may be cancelled.
- Doug is researching rocketry as some students have expressed an interest in a TARC rocketry team. He finds the competition team model very powerful; more of these culminating events are needed, where kids get to meet students with similar interests from other schools. He hopes to field a team and find them an engineer mentor for the 2008-2009 academic year (*Jo sent email to SpaceGrant at OSU, July 1, 2008*).
- McNary uses an AB class schedule; so IED classes are two semesters, 1.5 hours every other day with 8 classes rather than 6 in the schedule. Doug likes this – more flexibility for students to complete their homework and for him to follow up on their requests.
- Doug values manual sketching; he feels students are less likely to stick with their first idea and less likely to be distracted from the lesson by the mechanics of the software.
- The original purchase of the CAD classroom computers was leveraged with Perkins funds, but the Salem-Keizer School District left the planning and budgeting for replacement and update of classroom computers to individual buildings. McNary had a plan in place that would have replaced old machines at about 5 years of age, half a classroom at a time. District policy then changed, disbursing funds to buildings for computer equipment. Competing mandates within the school assigned the funds to the library for testing stations, because the more often students take standardized tests, the better they do. The McNary administration has been very supportive of the Industrial Education Department and Doug in particular, but what gets measured and prioritized gets serviced; some of those priorities are not under the control of teachers and principals. Doug notes that it is harder to get replacement computers than to get 3D printers and similar equipment through grant sources. An additional hurdle for CTE classrooms is the more powerful computer configurations (e.g., graphics cards, additional memory) required for the computational and image manipulation demands of industry-standard CAD and design software, beyond the capabilities of most computers configured as student workstations.

Documented demographic data was not readily available; Doug reports that McNary:

- is 20-23% minority (per NCES, 2005-06 is 25% non-white.)
- Has increased noticeably since he started teaching in the 80s.
- He believes his classes reflect the school population much more than when he started teaching.
- He believes that McNary, socioeconomically, is in the middle range of Salem-Keizer schools. Per NCES 2005-06, 36% of McNary students qualify for free or reduced lunch.

- Per the school report card, McNary has 5.4% of its student population as English Language Learners (ELL).
- McNary did not meet NCLB-mandated Adequate Yearly Progress (AYP) in 2006-2007 (last available on the website). Their Oregon rating is “Strong”.

PLTW

- Doug trained in IED at the OIT Summer Institute (STI) in July 2007, while Jeff Freeman, the physics teacher trained in Principles of Engineering (POE) which Doug characterizes as “applied physics”. William Bond, a math teacher, will train in Digital Electronics in July 2008, and. Keith Andersen, the manufacturing teacher, will train in Computer-Integrated Manufacturing. Both will teach a class starting Fall 2008.
 - Before attending the STI, Salem-Keizer teachers were given a one-day “pre-training” on the Inventor software by the local distributor, CVIS. Doug feels this was critical to the success of their teachers at the STI; the involvement of several schools in the district may have made the vendor more amenable to offering this service.
- Doug has one section of IED. Current enrollment is about 17 boys and 2 girls. McNary has some targeted remediation for students not doing well in their core courses; this often involve pulling them out of their elective classes, which has contributed to this semester’s low enrollment. The principal is supportive and did not cancel the class. IED enrollment for 2008-09 is forecast at 43 (two sections). Doug is teaching state of the art design techniques; students are using industry-standard 3D CAD tools and prototyping those designs on a 3D printer. Some students take prototype 3D printed molds to the high schools foundry facility to make prototypes in other materials such as plastic, resin, and metal.
- In comparing his CAD classes to the PLTW curriculum, Doug finds
 - the design components “are a wash”;
 - PLTW definitely has more engineering: packaging, cost, manufacturability. Doug does not feel that he has so far been able to really spark student understanding of what engineers do, especially on a day-to-day basis, especially in his CAD classes;
 - PLTW is great for supplementing a math/science curriculum more than for replacing an existing good CAD program.
 - The Autodesk Inventor software mandated for licensure by PLTW:
 - Is frequently more complex than many assignments need;
 - Has a slower ramp-up time than the Rhino software he uses for CAD;
 - He feels that for PLTW, as long as the license is paid, does not care if other software is sometimes used for the lessons.
 - The Salem-Keizer school district customized the Windows XP installation, which caused problems with the installation of Inventor.
- In implementing PLTW, once the first school in the district has pioneered the program, it gets much easier.
- In 2007-08, POE was paired with General Physics. They are not currently structuring PLTW courses with pre-requisites, although they may do so in future.
- The (editable) powerpoint slides furnished by PLTW are good, but Doug plans to customize them now that he has taught the class once.
- One of the largest expenses in a PLTW classroom is the operation of the 3D printer. McNary’s uses ABS plastic rather than a powder; printing times can be long, and the print base is small, about 8” x 8”. Vertical prints are much slower, and can take 8-12 hours.
 - The printer is slaved to the teacher’s machine.
 - Before printing, the student has an in-depth design review with the teacher.

- Usage is estimated at 3-4 cartridges per year at \$255 each. It does come in colors so he is able to let students do “McNary blue” prints.
- The ABS plastic is tough enough to make molds for the foundry.
- Doug would like to see the use of a laser engraver in the curriculum, which is much less expensive to operate, and uses cheaper materials. He showed us a 3D model assembled from flat pieces cut on the laser engraver. He has been talking with Vic Galleon of NW Technical Products about equipment; he thinks the Bright Star he got is perhaps “cheap” instead of inexpensive. Other brands are Epilog, VersiLaser (“I saw an awful lot of plastic and nylon inside it”), and Trotec.
- In the class we observed, teams were pairs of students.
- Doug suggests talking with Edith Gummer at NWREL about longitudinal tracking methods; perhaps the Person Education Plans (PEP) now required of students will help us shed some light on their college and career plans in ways not previously available to us.

Conclusions

- The site visit gave us some valuable perspective and information, from the perspectives of grant monitors and PLTW advocates.
- Working a visit around a teacher’s class schedule is challenging; this visit was much more valuable because we got to spend more than an hour talking with Doug after observing his class. We also got to talk with a student who came to work on his project during lunch.
- Mark Geren found this visit very valuable, even from such details as observing the physical layout of the classroom.

Respectfully submitted, Jo Oshiro, July 1, 2008