YEARLY SUMMARY: 2003-2004

From the Director: Thanks to all Project Fulcrum Year 3 participants. We are thrilled at the positive outcomes from this year and thought we’d share some of the year’s highlights with the Fellows, teachers, principals and everyone else who helped make this a success.

A. The Stats. Table I summarizes 2003-2004 participants.

<table>
<thead>
<tr>
<th>School</th>
<th>Yr</th>
<th>Fellow</th>
<th>Field</th>
<th>Lead Teacher(s)</th>
<th>Cooperating Teachers</th>
<th># classroom contact hours</th>
<th># students</th>
<th># student-hours</th>
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<td>Clinton</td>
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<td>Suanne Au</td>
<td>Math</td>
<td>Deirdre Walton, Jolene Walker</td>
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<td>Culler</td>
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<td>Kendra Schmid</td>
<td>Statistics</td>
<td>Alyssa Haack</td>
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<td>382</td>
<td>4373</td>
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<td>Beth Piersel, Suzanne Kelley</td>
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<td>Diane Swartzlander</td>
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<td>Humann</td>
<td>(E)</td>
<td>Tim Perrin</td>
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<td>Linda Splichal</td>
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<td>Corinna Ross</td>
<td>Biology</td>
<td>Dianna Knight</td>
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<td>9786</td>
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<td>Sarah Gergen</td>
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<td>Angela Zabawa</td>
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<td>612</td>
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<td>Park</td>
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<td>Dave Schmitter, Melissa Dejarlais</td>
<td>Physics, Math</td>
<td>Theresa Rippe</td>
<td>8</td>
<td>148, 152</td>
<td>1004, 365</td>
<td>3203, 3455</td>
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<td>Gary Furse</td>
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<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td>45, 2355</td>
<td>5004, 62340</td>
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</table>

‘Yr’ is the number of years the school has been working with Project Fulcrum. ‘Cooperating Teachers’ are teachers in addition to the lead teachers. Unless noted by (E) all schools were middle schools.

✓ = second year
✓✓ = third year

It is difficult to get an accurate count of students because some students are in more than one class – for example, a math class and a science class – and may come into contact with the Resident Scientist multiple times. The figure of merit that we suggest, therefore, is student-hours, which is the produce of the number of hours a scientist spent in a class times the number of students in that class. These totals are shown in Table 1.
B. Projects in the classroom. Fellows found innovative ways to be school-wide resources, and their activities were not limited to science and math classes.

- Physicist Dave Schmitter brought his own lab notebook into the classroom to show the students how scientists must document their work. The students were surprised that he documented things that didn’t work in such detail, giving him an opportunity to talk with them about how scientists learn from experiments that work and experiments that don’t work.

- Chemist Christine DeVries started a ‘Curiosity Question Box’ at Lefler Middle School with her lead teacher, Sarah Gergen. Students asked questions about science or math and Christine helped them figure out how to answer their questions.

- Students in Diane Swartzlander’s class at Goodrich Middle School raised a question that set off an entire inquiry project: How can you weigh a pumpkin if it’s too heavy to lift and put on a scale? Physicist Luis Rosa helped the students devise methods that could be used to determine the mass of the pumpkin, thus strengthening the students’ ability to plan and execute experiments.

- Linda Splichal, a teacher at Humann Elementary, planned with her scientist Tim Perrin (a computer scientist) a year-long emphasis on the scientific method. This served as an underlying concept that was reinforced throughout the year in all science activities and left the students with a better functional understanding of how to apply the scientific method.

- Teachers developed and documented two projects. The first focused on broadening student images of science and scientists. Projects ranged from discussing what types of skills scientists had and then determining whether popular television figures (Dexter, Steve Irwin, etc.) were scientists, to having students interview local scientists and make a poster comparing the similarities and differences between different types of scientists. Some teachers made the activity more personal for the students by having them compare their own interests to those of the visiting scientists. The second project was an inquiry project that helped teachers incorporate more inquiry into their classroom teaching. Teacher projects again varied, with some teachers focusing on specific concepts and others focusing on developing their students’ process skills.

- The number of volunteers participating in PF continues to increase. This year, over 20 scientists from the University of Nebraska, Nebraska Wesleyan, and local technology companies visited schools as part of the PF activities. Many served as examples for the image of science/scientists program, but some also helped enhance specific content areas by bringing their expertise to the students.

C. Projects Out of the Classroom. An important part of Scientists’ experiences was developing opportunities for students who wanted additional experiences.

- Mathematician Suanne Au started an afterschool club for students at Clinton Elementary school focusing on math and statistician Kendra Schmid started an afterschool science club at Culler Middle School. Both activities allowed students who were interested in science or math to engage in more intensive hands-on experiences.

- Fellows visited each others’ schools to judge science fairs and assist with science nights and clubs, and served as judges at the district science fair. These activities allowed us to reach students from schools not formally affiliated with PF.

D. Fellow and Lead Teacher Preparation and Support. Getting Fellows ready to work in the K-12 classroom is an ongoing process. Most Fellows have little experience working with
students or teachers at the elementary/middle school level. We have intensive initial preparation coupled with ongoing, focused intervention. Preparation activities included:

**D.1. The Summer Institute:** Fellows and teachers attended a week-long Summer Institute (SI) prior to starting the school year, where they learned about education theory, state and district rules and regulations, and team-building. The SI handbook summarized core information, and past participants shared what they learned from the project. Case studies addressed differences in teacher and scientist communication, examples of classroom activities and classroom management issues. An area of continuing emphasis is the question of communication differences between scientists and teachers, and how to overcome those differences. This is fundamental to forming a strong partnership between the Lead Teacher and the Resident Scientist.

**D.2. Group Meetings.** Resident Scientists shared experiences and resources at a weekly group meeting. Questions from scientist journals formed the basis of group discussions, which included the effect of standardized testing on the ability to include inquiry, how to deal with the lack of motivation among students, how to effectively work with other teachers to become school-wide resources, how gender affects students’ participation and interest in science, and how scientists can tell whether they are having an impact. Lead Teachers previously took a 3-credit graduate course with co-PI Buck focusing on teacher research; however, we moved this year to having teacher group meetings that follow a similar pattern as the scientist meetings. Discussion topics are driven by their journal entries, and by the two projects mentioned above. Many of the topics discussed were common with those that the resident scientists expressed interest in such as how to do inquiry when standardized tests emphasize vocabulary and how to motivate students, but teachers also wanted to discuss how to most effectively utilize their scientist in the classroom, and how they could enact change within their schools. These meetings were very important to the teachers: many noted in their journals that they didn’t previously ‘sit down and talk about teaching’. The teachers at these meetings form a community of practice that enables them to support and encourage one another, share resources and, in the words of one participant, “that forces me to sit down and reflect on what I’m doing instead of moving on to the next crisis.”

**D.3. All Hands Meetings.** Monthly ‘All-Hands’ meetings brought together all program participants. Fellow/Lead Teacher pairs presented successes and challenges they have experienced. Toward the end of the year, we asked Resident Scientists to present short, general talks about their research areas and these were received with great enthusiasm by the teachers. We plan to continue this activity at next year’s meetings.

**D.4. Grade-Level Meetings.** We piloted an idea to replace one weekly meeting per quarter with a meeting in which the Resident Scientists and Lead Teachers working in a specific grade would get together and share ideas about the upcoming unit. The initial attempt was moderately successful, although all parties asked for more guidance in how to organize the meeting and what the expected outcomes were. We anticipate that these meetings will continue in 04-05.

**E. PF Kick-Off Event.** Project Fulcrum was fortunate to be one of Professor Lawrence Krauss’s stops on his busy public speaking tour. Professor Krauss, Chair of the Physics Department at Case Western Reserve University, and author of seven popular books, was they keynote speaker at the Project Fulcrum kickoff event on September 9, 2003. Project participants, teachers, graduates, undergraduates, faculty of the university, and members of the Lincoln community all came to attend his popular talk, “The Physics of Star Trek”. Krauss discussed the basics of his research as a theoretical astrophysicist and how they apply to modern physics and
popular culture. In a room filled with Trekkers and non-Trekkers, using a balloon, Krauss described how a warp drive found on the “Starship Enterprise” would bend space to decrease travel time from place to place rather than cause a ship to travel faster than the speed of light. Krauss discussed several other references to space and space travel in pop culture. The questions from the audience continued late into the evening.

In addition to his talk, Professor Krauss had dinner with PF participants and several University and LPS administrators. At dinner he was able to answer several questions and discuss his background and career path. Many teachers were interested in his background, and why he ended up addressing popular culture in regard to his research. Through his conversations he made it clear he does not think that, “…science is just for scientists. We don’t have to be artists to appreciate art, or musicians to appreciate music.” He hopes he can contribute to making science accessible to anyone who is interested. He definitely accomplished this as our second Project Fulcrum kick-off speaker.

F. Internal Evaluation/Research. The web database increased our ability to access, utilize and synthesize data. Resident Scientists and Lead Teachers utilize the database for many functions. Both groups input their weekly journals to the database, which allows us to import the journal data into a qualitative analysis program. Scientists maintain their schedules on the web, which allows the classroom observer to plan her schedule. Observations also can be entered into the database. Scientists also input a weekly log of hours, which allows us to monitor not only how much time they are spending, but how they are spending it, as they denote what type of activity they are engaged in. They also input classes and demographics so that we can report on how many students were affected for how many hours. This year, we systematized our resources into a database that is sorted by LPS topic. This allows teachers and scientists to find out what we have available, including background information, modules and equipment, from their offices. A reservations system is planned in the future.

The primary research project this year was investigating the effect of the GK-12 program on women graduate students. This was motivated in part because of the extremely high proportion of female GK-12 scientists not only at UNL, but nationally. We sought to determine why women were interested in the GK-12 project, whether their expectations were being met by their experience, and whether elements of the GK-12 project that they found helpful could be generalized to their home departments. Our findings (which have been submitted in a paper to JRST) include:

- The study participants needed to feel like they were contributing to society – doing something that would benefit others. They viewed their research as something that would hopefully pay off in the future, but was not satisfying this need at present.
- The study participants appreciated the explicit positive feedback they received from teachers and students. They felt it was important that students noticed if they weren’t there one day, and that the teachers were happy to see them.
- Analysis of the data showed that, although the actual time spent on GK-12 was comparable to the time that would have been spent on a teaching assistantship, the significantly different nature of the responsibilities (i.e. less direct supervision, working with an entirely different age group, having to travel to and from the schools, and the frequent last-minute changes in plans necessitated by the nature of K-12 schools) caused the scientists additional stress and a perception that the GK-12 fellowship took much longer. Scientists also reported difficulty “changing gears” from GK-12 back to their classes and research.
G. External Evaluation. Our external evaluators, Pat Dixon of the National High Field Magnetic Laboratory, and Dave Rodriguez from Augusta Raa middle school (both in Tallahassee, FL), visited at the end of April/beginning of May. They visited a number of schools and attended Dr. Leslie-Pelecky’s colloquium on the GK-12 Project to the UNL School of Biological Sciences. They held focus groups with teachers, scientists, LPS personnel and project management.

We made some significant changes as a result of last year’s evaluation. Among them were

- Having a group meeting for teachers instead of a course
- Increasing the frequency and depth of explanations about the evaluation: why we are asking questions, what we are doing with the data, and emphasizing that we are not evaluating the teachers per se, but are evaluating the program.
- Increased the frequency of feedback for scientists. The PI meets individually with each scientists about halfway through the semester to discuss their progress and set goals.
- To improve compliance, the teacher stipend was increased and tied to satisfactory submission of journals.
- Resident Scientists did a brief ‘training session’ with Sue Kirby at Clinton Elementary prior to entering their own classrooms.
- Our prior experience matching scientists and teachers has helped us take essential personality characteristics into account
- Our relationship with Lincoln Public Schools continues to grow stronger.

This year’s evaluation helped us identify a number of goals for AY 04, including:

- Investigate feasible models for part-time scientist/teacher pairings.
- Find ways to leverage the skills and abilities of ‘graduating’ Lead Teachers (those who have been with the project for three years). How do we develop new teachers at those schools? How do we involve the graduating teachers and appropriately compensate them for their time and experience?
- Determine the benefits for repeating Resident Scientists to the program and, more importantly, to the scientists. Evaluate whether there should be a limit on the number of years a graduate student should be allowed to be a full-time Resident Scientist.
- Clarify further the expectations for the image of science/scientists and the inquiry project. Incorporate the projects into the teacher group meetings so that they have additional support. Provide additional support for teachers completing their write-ups so that the results are broadly disseminable.
- Systematize PF resources so that they are more accessible without extensive training; have scientists write up successful projects to increase breadth of available materials.
- Improve the dissemination of PF findings via presentations at conferences and submission of papers.

On behalf of all the project management, thank you for a great and productive year. It has been a lot of work on everyone’s part, but I think you will agree with me that the results are well worth it. I look forward to working with many of you again next year.