



Mentoring at APL

M. Constance Finney

The secondary school Mentor Program at APL provides internships for qualified high school students who are placed one-on-one with a Laboratory staff member to either complete a science project or gain work experience for school credit. Through school partnerships, APL helps students reach achievement levels in mathematics and science that will better prepare them for today's competitive world.

THE CHALLENGES

According to the National Science Foundation,

[T]he national need for a larger, more science-and-computer literate, skilled, and diverse workforce is ever greater as we progress toward an increasingly technological job market and a scientifically complex society.¹

The National Academy of Sciences, at the request of Congress, created the Committee on Prospering in the Global Economy of the 21st Century to analyze the long-term challenges, opportunities, and needs facing the next generation of scientists and engineers. Their report² of October 2005 contains recommendations that are relevant to mentoring programs, namely, to

- Increase America's talent pool by vastly improving K-12 mathematics and science education
- Sustain and strengthen the nation's traditional commitment to long-term basic research
- Make the United States the most attractive setting in which to study and perform research to develop, recruit, and retain the best and brightest students, scientists, and engineers from within the United States and throughout the world

APL has developed mentoring programs to help meet these challenges.

MENTOR PROGRAMS IN HOWARD COUNTY

In the early 1980s the Howard County Public School System (HCPSS) began to realize that technology was outpacing classroom education. To fill the technology gap, schools turned to business advisory committees to help develop programs that would exploit opportunities for students. Partnerships were initiated between businesses and schools that later were formalized into the Gifted & Talented (G&T) Mentor Program. The HCPSS soon created other partnering opportunities such as science research projects, practicums, internships, and work experience placements. All eventually were placed under the Career Connections umbrella of the Maryland State Department of Education.

Private schools in Howard County and public and private schools in other nearby counties developed similar programs, and APL partners with many of them.

"It is not possible to put a price on the value of the partnership between APL and the Howard County Public School System. For more than twenty years, APL has given tirelessly of its human and in-kind resources. Innumerable students and staff have had state-of-the-art educational experiences that have helped to place Howard County as the number 1 ranked school system in the state of Maryland."

Paula Blake (Superintendent's Liaison for Educational Partnerships, Howard County)

"I have had a dozen high school interns work directly with me, some for short summer periods and others for up to a year. We have maintained contact as they have furthered their education at schools such as Cornell, CMU, Duke, and MIT. The additional energy required as a mentor is truly rewarded in multiples. These students are bright, enthusiastic and motivated. They are able to contribute to the team effort here and it is truly exciting to work with the next generation of engineers and scientists."

Ann Darrin (APL staff)

"We are deeply appreciative of your immeasurable contributions to the school system and the children of this county."

Howard County Board of Education's Friends of Education Award presentation remarks

"My experience with our high school mentoring program has been personally rewarding and a worthwhile investment for APL, with payoffs in both the near and distant future."

Jim Brown (APL staff)

"As both a mentor and a mentee, I've found the mentor program to be an outstanding opportunity."

Bill Blackert (APL staff)

"My student's project was to design the network backup system for SSD's desktop computers. At first I felt a little guilty presenting the student with such a challenge, but in retrospect I think my approach was right. Give them real-world problems with real-world challenges and expect excellence!"

Dave Thayer (APL staff)



Mentor student Daniel Scheinerman and Jonathan Gehman examine a snapshot generated by their radar pulse model. By computing and adding together continuous-wave solutions at many different frequencies, they are able to accurately model the evolution of a radar pulse as it moves through Earth's atmosphere.

Because students must drive or be driven to their placement sites, location is often a deciding factor in participation. Each of these programs carries a set of guidelines and rules and has as its purpose the enhancement of career education and the promotion of educational opportunities outside the classroom for its students.

The guidelines of partnering programs in all schools are fairly standard. Students receive science credit or academic acknowledgment for the successful completion of a required number of hours in the internship. They also keep journals of their work, which are evaluated by the Internship Placement Coordinator at their school. The journals, evaluation forms, and final presentations are the basis of the grade received. Students are not paid for interning. At APL all of these programs are under the umbrella of the APL Mentor Program.

The HCPSS's G&T Program holds an annual High School Student Learning Conference at the end of the school year at APL's Kossiakoff Conference and Education Center. Students in the G&T Intern-Mentor Program and G&T Independent Research courses are selected to present their projects to their peers, mentors, and other educators. Approximately 400 students preregister to attend student presentations on various topics (from drama to physics). Many student projects are submitted to local science fairs and national contests such as the INTEL Science Talent Search.

THE APL MENTOR PROGRAM

The Mentor Program at APL is an opportunity for qualified high school students to intern with members of the Laboratory's staff. Its origins are in the Industry Education Alliance of Howard County, incorporated in 1981 to promote and encourage communication and cooperation between industry and schools and to help



Adam Sumei gives a presentation on producing an implantable chloride sensor for monitoring the chloride ion concentration in concrete. He worked on this project with mentor George Murray.



Dave Dunham and student Jessica Yuan determine the size and shape of the asteroid (238) Hypatia from an analysis of their observations of an eclipse ("occultation") of a star by the asteroid recorded in California on 23 February 2005.

improve the educational program in Howard County. APL was asked to join the alliance out of which the Adopt-A-School Program and a mentoring relationship between APL and the HCPSS began. APL is a partner at-large in Howard County, i.e., the Laboratory partners with all schools to some extent, but the main focus is on high school.

In Howard County, a sophomore or junior interested in the APL Mentor Program must plan the next year's schedule of classes to include an off-site placement. This must be done with the school Partnership Coordinator as each student must have the grades, ability, and interest to qualify. To apply, the student prepares a full packet of information that includes

- A contract with parental signature
- A letter of interest
- A resume, including special interests, talents, and awards
- Letters of recommendation from teachers
- A security form

The school Partnership Coordinator submits this information to the APL Program Coordinator, and a determination is made for an appropriate placement based on the student's interests and qualifications as well as mentor availability. The student then interviews with an APL staff member, and possibilities for a research project are discussed. The program can be completed during the school year or the summer. Once the student and mentor agree on the work to be done and set up a schedule, the student must maintain a journal of the work, as noted above, and meet every week with the school coordinator, who checks on progress and addresses any issues. Interim and end-of-program evaluations are completed by the mentor. The project, journal, evaluations, and final presentation form the basis on which the school awards the science credit.

The final presentation of the student's work is given to the school class. Usually the student is also invited to present the project to the APL mentoring group. APL awards a certificate to all students completing the program, and staff who mentor students receive a certificate of appreciation.

Graduating seniors are sometimes hired by APL for the summer after completing their mentoring project. This allows them to continue the work they have begun for the mentoring group. Graduates can also be transitioned into the APL Summer Internship Program and may be able to continue to work at the Laboratory part-time during college.

Enrollment in the APL Mentor Program over the last 6 years is indicated in Table 1. Out of this group, six former mentor students are now on the permanent APL staff.



Jim Brown and mentor student Alex Boule discuss developing extensions to software frameworks used for generating 3-D graphics for the Advanced SEAL Delivery System Simulator and other modeling and simulation efforts.

Table 1. Participation in the APL Mentor Program.

	Year					
	2000	2001	2002	2003	2004	2005
Number of students	18	39	31	45	48	36

and participation on school-related advisory boards. These activities, while valuable, do not have the impact on the student that the one-on-one mentoring program does. In addition to the high school-level program, college students who select an independent study class for credit

CONCLUSION

Talented high school seniors are valuable to APL staff in their roles as assistants, researchers, designers, programmers, and sometimes co-authors of papers. The successful one-on-one mentoring model has achieved excellent results for both students and mentors. APL participates in other educational outreach activities, such as the Summer Space Camp, tours, mock press conferences, career days, “shadowing,” speaking at schools,

can also intern through the APL Mentor Program. Many administrators and mentors continue to express strong, positive sentiments about the program.

REFERENCES

- ¹*New Formulas for America's Workforce, Girls in Science and Engineering*, EG NSF 00-327, National Science Foundation (2003); <http://www.nsf.gov/publications/ods/>.
- ²“Executive Summary, Recommendations,” in *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, National Academies Press (Oct 2005).

THE AUTHOR

M. Constance Finney is a member of the Senior Professional Staff at APL in the Communications and Public Affairs Group. She received a B.A. in American studies from the University of Maryland and a B.S. in education from The Johns Hopkins University. Since joining APL in 1981, she has been involved in community relations on behalf of the Laboratory. When the Kossiakoff Center was built she became Supervisor of the Conferences and Exhibits Section and was involved in the planning and coordination of community events and technical symposia held there. For 15 years, educational outreach has been a community involvement focus of APL, and Ms. Finney has forged strong partnerships with local school systems and private schools. She sits on many local and state educational boards and committees, including the Howard County School Superintendent's Advisory Council on Business Education Partnerships. She is President of Maryland Partners in Education and a member of the Governor's Workforce Investment Board's Aerospace Summit Committee. Her e-mail address is connie.finney@jhuapl.edu.



M. Constance Finney