VCEPT/GATEWAY 2000 PARTNERSHIP PROJECT – ADVANCED SCHOLARS PROGRAM

H. JOHNSON
Henrico Public Schools,
Virginia Commonwealth University, Richmond, Virginia 23284

During the summer of 1999, the Virginia Collaborative for Excellence in the Preparation of Teachers (VCEPT) and Gateway 2000, funded by Richmond Public Schools through a National Science Foundation grant, provided a three-week Advanced Scholars Program at Virginia Commonwealth University (VCU) for forty middle school students. The Advanced Scholars Program was modeled after the Young Scholars project that VCU, with National Science Foundation (NSF) support, organized from 1991 to 1997 for rising seventh graders from the Richmond metropolitan area.

The Advanced Scholars Program was designed to meet the needs of rising seventh grade students with a high potential and/or interest in mathematics and the sciences from populations traditionally underrepresented in these fields, including African-Americans, Native Americans, females, and students from economically disadvantaged backgrounds.

The goal of the program was to nurture the interest of the Scholars and provide them with appropriate information and encouragement, so that a large percentage will prepare for careers in mathematics or science. The program featured career exploration, group research projects, and enrichment topics in mathematics and physics, as well as technology not usually included in the standard school curriculum. Special attention was given, however, to some of the components in the Virginia Standards of Learning.

Secondary and middle school teachers, who serve as "clinical faculty" in the Richmond Area Mathematics Teacher Professional Network, joined with VCU faculty in providing instruction for the five components of the program: mathematics, physics, statistics/calculator, research, and career exploration.

Mathematics

Math instruction featured cooperative learning through group logic puzzles, the development of deductive and inductive reasoning skills using puzzles, and the use of graphing calculators. Also, students collected many different types of data, expressed it in a table format,

The Journal of Mathematics and Science: Collaborative Explorations Volume 3 No 2 (2000) 47-52

founded a rule (formula or equation), and graphed the data when appropriate. Some of the mathematical content included: order of operations, discovering patterns, deciphering messages, Origami, Sieve of Eratosthenes, and fractals.

Physics

Because the idea of physics has a daunting reputation for students, the formal physics instruction was focused on investigative, hands-on approaches. They were too busy exploring static and current electricity to be intimidated. Through clear and specific activities designed to illustrate the basic principles, students gained a more thorough understanding of:

- How sockets work or fail to work in an electrical arrangement;
- How to construct and use an electrical device for testing whether or not materials allow electrical charges to move through them;
- How to identify which kinds of materials are conductors and which are nonconductors;
- And, how to determine which materials can be electrified and which cannot.

Statistics/Calculator

The first goal of this component of the program was to instruct students on how to use the graphing calculator to perform algebraic calculations, create a coordinate system, construct a function table, trace and zoom on a graph, and enter, sort, and sum data. The second goal was to show students how to interpret data by using different types of graphs; such as, bar graphs, circle graphs, line graphs, stem and leaf plots, box and whisker plots, and scatter plots. When appropriate, students were also taught how to create these graphs using the calculator.

Research

Assisted by a teacher, the students worked in teams of eight to ten students on a group research project. These projects focused on statistics and were modeled after projects developed in the Quantitative Literacy Program. With the support of advisors, the groups were responsible for the design of the experiment, for carrying out the experiment, and for preparing written and oral reports.

Career

On Career Day, students were divided into two groups—one group visited VCU'S Medical College of Virginia and the other group visited the Virginia Department of Transportation. Accompanied by the staff, participants spent the day with a mathematician,

statistician, computer scientist, engineer, draftsman, doctor, nurse, and/or research scientist. These professionals showed students their workplace and explained the nature of their jobs. Students then interviewed their hosts using an instrument they had developed to solicit information on educational requirements for the job, career path, career satisfaction, and job frustration. Each group made an oral presentation of their visit to the other students.

A typical program day consisted of the following events:

9:00 – 9:05 a.m.	General announcements
9:10 – 10:10 a.m.	Mathematics class----------Groups 1 and 3
	Physics class----------Groups 2 and 4
10:15 – 11:15 a.m.	Mathematics class----------Groups 2 and 4
	Physics class----------Groups 1 and 3
11:20 – 12:15 p.m.	Statistics instruction and/or graphing calculator instruction
12:15 – 1:00 p.m.	Lunch
1:00 – 2:50 p.m.	Work on group research project and/or career exploration
2:50 – 3:00 p.m.	Prepare for dismissal

Ronald Bradford, Mathematical Instructional Specialist, and Cynthia Gentry, NSF Grant Coordinator, organized the recruitment for Richmond Public Schools. Forty students were selected; each one received free hot lunches, a stipend, and a graphing calculator. During the final week of the program, the Scholars were invited to bring their parents to a banquet where the program activities were highlighted.

One month after the program ended, a random sample of participants was surveyed by phone. More than half of those surveyed—nine out of fifteen—reported having learned "a lot," while the remaining students said they had learned "some." The physics component was a favorite among those interviewed; students enjoyed the hands-on activities, particularly the electric motor and the static electricity experiments. Instruction in the use of graphing calculators

was also quite popular. A handful of students remarked on the novelty of using the calculator: "It was new for me"; and, "It was the first time I ever used a high-tech calculator like that."

Half of those interviewed liked all the activities and found the three-week program helpful. Some students offered criticisms of the course, many of which dealt with the math component. Three students stated that most of the class was a review, and one student stated that they had already done most of the activities in the fifth grade.

Several Scholars offered suggestions for program changes. Among the suggestions were calls for longer hours, adding an extra class, and extending the program length. Other recommendations included conducting classes simultaneously, or having smaller classes in order to give more attention to individual students. Most noteworthy, perhaps, were two students who suggested adding new content and "harder, more advanced" work.

In conclusion, the Scholars were very positive in their overall responses to the survey. While physics emerged as a clear favorite, many students also enjoyed the mathematics experiences and the visits to the field sites. The notion of a more advanced curriculum with opportunities for Scholars to learn new content appears to be of interest to some students.

Budget

The total budget for the program in 1999 was $35,577. The budget was significantly lowered by the fact that the program model and many associated activities had previously been developed and refined through a series of NSF sponsored Young Scholars Programs. There were ten staff members, including a project consultant and coordinator, a daily project leader, two lead teachers, four "clinical faculty," secretarial help, and one student assistant. Salaries, wages, and benefits totaled $23,495. The total amount devoted to participants' support, including stipends, travel, meals, and graphing calculators, was $10,607. Other direct costs, such as materials and supplies, amounted to $1,475. VCU waived all indirect costs, provided all classroom and laboratory space, and supplied grant contract accounting—a total value of $11,036. ■

INTERVIEW WITH HENRY JOHNSON

Q: What career path did you follow to reach your present position? Is this what you originally aimed for, or were there twists that brought you here?

A: My original goal was to become a mathematician. When entering college, I majored in mathematics, with a minor in physics. Before going to college, one of my high school teachers, Mr. Earnest Parker, suggested that I consider teaching as a career, but I told him that I was not interested in teaching. After graduating with a degree in mathematics, I looked at several occupations. At that time, my career choices were limited in the Richmond area. Relocation to the larger cities in the northeastern or western sections of the United States was required, if I wanted to start a career that involved mathematics or science. I was about to make the move, when Mr. Parker called and asked if I would consider teaching for one year before I decided to relocate; I said yes. Although I had never taken any education courses or student taught, my first year of teaching was a wonderful experience. I had good role models in high school and college that provided me with excellent teaching techniques. After the second year of teaching, it became apparent that I love to teach, so I decided to take the necessary education and methods courses that would allow me to obtain a teaching certificate.

Q: Have you been involved in similar programs before? Was there a particular moment or stimulus that caused you to begin this project?

A: During my teaching career, I have been involved in programs such as the Upward Bound Program and other programs that help high school students, as well as elementary teachers, to become interested in mathematics and sciences. Later, I got involved with the Young Scholars Program. Because of the success of that program and the positive experiences obtained by the staff and participants, the Advanced Scholars Program was modeled after the Young Scholars Program.

Q: Have there been any unique or unexpected consequences for you resulting from your project?

A: While working with the Young Scholars and the Advanced Scholars Programs, I realized that middle school students were fun to teach. Also, by working with teachers from various backgrounds and with different teaching styles, it was easy to realize that no matter how long you have been teaching, you can always learn something from your peers.

Q: Are you able to identify the greatest lesson you have learned and the rewards you have gained through working on the VCEPT/GATEWAY Advanced Scholars Program? What is the greatest benefit you see coming to students—and teachers—through their engagement with this project?

A: We were able to reach the students while they are impressionable and still enjoy mathematics and science. Although they came from different schools, the participants benefited by learning to work as a team, and they realized that mathematics and science can be fun subjects.