



best practices

College Summer Programs for High School Students: Outreach, Recruitment, Enrichment

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Of the many considerations that motivate a college or a department to develop a summer program for high school students, a major criterion is to ensure a constant supply of the highest quality students for entry into college programs. This need is acute in the sciences, where departments compete nationally and internationally for interested and qualified students.

The College of Veterinary Medicine at Auburn University has sponsored high school summer programs for five years. Motivation for the program, funded by the National Center for Research Resources, was recruitment of minority students to careers in veterinary medicine and molecular biological research. However, the program described in this "Best Practices" paper can be modified easily to meet the goals of any science department at any college.

In order to structure a summer program, the coordinator must ascertain the number of faculty who are willing and able to serve as a host-investigator for a summer program participant. Host investigators typically have funded research for an ongoing project and have space in the laboratory for another person (see Table 1). Potential hosts should be asked if they can frame a specific portion of an experiment so that one person of limited technical expertise could complete the work in six to eight weeks. The coordinator must make clear to the host that participants in summer programs require close, ongoing supervision and a substantial investment of time before becoming contributors.

Incentives for faculty participation vary, but recognition from the administration of the institution, the minimum incentive that can be offered, is essential. If deans of the college do not support the program — particularly faculty's time commitment — few faculty can be expected to volunteer. Thus, communication to and from the

administration is crucial to program success. Faculty also may be motivated by the experience of serving as a role model or mentor for students interested in careers in faculty's specialty areas. Length of summer programs vary; at Auburn, the summer programs run for eight weeks, long enough for students to become skilled at a limited number of tasks and to demonstrate their accomplishments.

Table One
Titles of exit seminars reflecting
research interests of host-mentors

- Sequencing a Spliced, Autonomous Canine Gene
- PCR Techniques for Identification of a
New *Mycoplasma* of Ratite Birds
- Cloning Open Reading Frames 8a and 9 of
Channel Catfish Herpes virus

Summer-program participants are chosen from area high school students and teachers of science and mathematics. Participant selection should be based on several factors, including grade-point average, recommendation of science teachers, and interest in careers in the sciences. Special recommendations by teachers for students whose academic progress has been less than expected have yielded some excellent participants, but students nominated under these circumstances must be chosen carefully.

Inclusion of science teachers positively affects summer programs and long-term recruiting. Popular teachers attract enthusiastic students. Teachers who instill excitement about science and mathematics in their students will be recruiting long after the summer program is over. While contacts in the school system can recommend colleagues, teachers generally demonstrate interest in participating and present themselves as being engaged in teaching science to students. Other recommendations for colleges and schools interested in conducting summer programs:

- Arrange to conduct interviews with each applicant at the student's school. This saves the student from traveling and provides the interviewer (preferably the program director) with an insight and a reminder as to what is going on in high schools today.

- Inform the student's parents of activities and intentions at each step of the program. This increases parental involvement and interest and brings the support of the family to your program. A crucial communication is a letter sent to parents when the student is accepted that highlights the role of the program in the student's academic career and includes an introduction to the research and the professional faculty. Emphasize that this is not a job — it is a research program that will advance the student's chances of success at college.

• Spend the first one or two days of the program in orientation (see Table 2). Include a safety lecture and demonstration, an outline of the program, and a detailed explanation of what is expected of students. In our program, each student is given a notebook and a four-color pen. We suggest that students record laboratory work in one color and personal observations in another, creating a combination laboratory notebook and personal journal. Students record protocols and personal observations as a way of tracing technical and personal growth. Orientation is also a good time to give students a thorough tour of the college and to invite administrators to a lunch with students, which helps to encourage faculty interest. An orientation for parents is also helpful.

• Assign students to faculty host-mentors through several techniques. We use a matching forum: faculty make a brief presentation of their research at a reception and students express their desire to learn more about a given investigator's work. We have found that initial conversations lead to matches that are ninety-percent compatible.

Table Two
Topics covered in student and teacher orientation
for summer laboratory experience program

- Laboratory Safety
- Scientific Notation
- Dimensional Analysis
- Weights and Measures
- Metric Conversion
- Chemistry Review (Moles and Molarity)
- pH
- Computer Searching and Scientific Reference Recovery

Students work in laboratories for the better part of a forty-hour week. The program description from the National Institutes of Health sponsor requires an unspecified enrichment component. Early efforts at Auburn were varied and extensive, but faculty complained that the strong enrichment program was a significant detractor from the work experience. Our enrichment program now focuses on academic topics: careers in the health professions, college admissions, college financing, and use of the Internet for medical references. Students also make special requests for introduction to the pre-med advisor or time to "shadow" a clinical specialist in the college.

Groups of summer students who form cohesive groups prove to be the most successful. Although dynamics vary from group to group, seven to nine students seem to be the minimum number for a

"critical mass," a group that socializes and reinforces the experiences of its members. Frequently, students meet for lunch and socialize outside of work; these groups seem to enjoy the experience most. The program director should try to maintain contact with each student every day for the first week, several times during the second week, and then at least weekly throughout the summer. Directors should contact faculty hosts regularly as well; e-mail is a valuable communication tool. Students and faculty both respond to the expression of interest in their work.

As the program draws to a close, plans must be made for exit seminars, a requirement stipulated by the NCRR. The initial step might be to hold a session on how to give a seminar and invite both students and mentors to attend. Once times and places have been established, administrators and parents should be invited. Administrators are pleased to see the progress the students have made, and parents will appreciate the difficulty and sophistication of the work their children have been doing. After the seminars, we present certificates of participation to each student and try to provide a reference text, such as a medical dictionary, as an additional reward for performance.

The 1995 Summer Laboratory Experience Program at Auburn had space for twelve students and four teachers. Our 1996 continuation application requested an additional master's in science student in science education to work in a laboratory and to serve as the administrative assistant, handling scheduling and programming. This enables the program director to spend more time on program content and less on mechanics. Subsequently, administrative roles have been divided among participating teachers with satisfactory results.

Overall, the summer laboratory program is satisfactory for all parties. Students acquire hands-on training and college administrators see the benefits to these students. There are, however, situations with faculty mentors which must be addressed: hosting a student takes a great deal of time and resources. This time commitment can be reduced by selecting only students who have completed chemistry and who can prepare solutions and reagents. In addition, faculty must be recognized by the program director and the administration for their individual efforts. Such recognition can take these forms: a letter of support for promotion under the categories of teaching or outreach, a letter of appreciation copied to the department head, or, if possible, a token gift such as a certificate at the bookstore.

As of September 1997, 100 percent of the program alumni had entered, or intended to enter college. With the exception of one student who entered a psychology degree program, all of the program alumni entered programs in the "hard" sciences. After five years of summer programs, Auburn is beginning to see the first applications and acceptances from program participants for admission to AU's professional curriculum. There are many motivations for undertaking a summer program. Faculty at Auburn

have found the interaction with high school students to be rewarding and worthwhile. More importantly, students who have participated in the program found motivation to enter science degree programs in college. We hope these highly motivated, technically initiated students will return as graduate or professional students, and soon enter the ranks of scientists employed in industry and education. ■

Author's Note: The National Center for Research Resources is a one of twenty-four institutes and centers of the NIH. NCRR has four charges: infrastructure to include facilities and personnel, clinical research, comparative medicine, and biomedical technology. The Science Education Program (SEP) is authorized under infrastructure in order to keep a supply of well-trained students prepared for careers in the health sciences. More information about NCRR can be found at <http://www.ncr.nih.gov/html>. (For copies of student and teacher outlines, contact nusbake@vetmed.auburn.edu).

About the Author

Kenneth E. Nusbaum serves as coordinator of recruiting for the College of Veterinary Medicine at Auburn University. In addition to the Summer Laboratory Experience Program, Nusbaum conducts application seminars for students interested in admission to professional and graduate curricula, and outreach programs for students in grades four through seven. His professional research centers on infectious diseases of food animal species.