

Getting in the Groove: A Short Summer Research Experience Builds Skills and Belonging

**Stacie Swingle Nunes
State University of New York at New Paltz**

Birth of the SUNY New Paltz Summer Session Research Program

A program of academic support and enrichment was founded at SUNY New Paltz in the mid 1980's with the goal of increasing the retention of traditionally underrepresented and economically disadvantaged students with majors in the sciences, math and engineering. The program is known now as AC² in honor of the three programs that provide external funding; the Louis Stokes Alliance for Minority Participation (AMP) of the National Science Foundation, the Collegiate Science and Technology Entry Program (C-STEP) of the New York State Department of Education, and the Computer Science, Engineering and Mathematics Scholarships (CSEMS) Program also of the National Science Foundation. At the time it was founded, however, all of the external support came from C-STEP with a fiscal year of July 1 – June 30 and funding tied to the legislative process.

The early program included a summer bridge program for new students that was thought quite successful but was very difficult to run given the funding cycle. In those early years funding was by no means guaranteed and often not confirmed until shortly before the bridge program would have been scheduled to run. In 1993 - 94, when the annual funding for the program was confirmed only two weeks before the bridge program should have started the director requested permission from the New York State Department of Education to use the funds allocated to the summer bridge program to fund a summer research experience for returning students instead. The advantage to this being that the program could be offered in May and June at the end of the fiscal year rather than in July and August at the beginning. In this way there would be sufficient time to plan a quality experience once the funding was certain. Although the target audience would be returning students rather than entering students the argument was made that the goals would be similar. Approval was given and the summer session I summer research program was born. The four week span and the timing were imposed by the constraints of the grant, but we soon realized there were a number of advantages to this unconventional, short program. Over the years we have evolved the program to make the most of the advantages and to respond to feedback from our constituencies.

The Original Summer Research Program (SRP)

We planned that first summer program keeping in mind the benefits gained through the summer bridge program that it had replaced. The summer students spent a lot of time together studying and developed a community that enabled them to provide support for one another later

*"Proceedings of the 2003 American Society for Engineering Education Annual
Conference & Exposition Copyright © 2003, American Society for Engineering
Education"*

on. They also came to know the program staff well and this helped to develop trust. In the bridge program instruction served as the focus of the community, in the summer research experience the projects were to be the focus. The program was implemented during the early part of the national dialogue about research experiences for undergraduates in general and underrepresented minority students in particular that has led to published goals and the strong emphasis currently placed by funding agencies and the retention community on such experiences. At the time we simply felt that if students could see how science and math were used to solve interesting problems, it would be motivating.

The first summer research program was scheduled to meet during the first summer session at New Paltz in 1994. At the heart of the program were five faculty initiated research oriented projects. A request for proposal process that is described below was used to select the faculty mentors and projects. Each faculty mentor was asked to guide a team of two or more students as they worked on his or her project. Based on the summer bridge experience we felt that the students should live together in the residence halls and we provided those accommodations along with a meal plan. We also planned group social activities on weekends. In the fourth week of the program the teams were required to complete posters describing their work. On the final day of the program a luncheon was held and the groups presented their work to faculty and administrators. Afterwards the students were required to present their work at an annual state-wide poster presentation sponsored by C-STEP.

The request for proposal (RFP) process used to select the projects and faculty mentors began in the fall term preceding each summer program. An RFP was sent to science, math, and engineering departments outlining the summer program goals, the funding available and the application process. Applications from faculty were received in early spring, and then reviewed by a faculty advisory committee. The departments that were eligible to submit proposals were invited to select a faculty member to serve on the committee. The committee was asked to make recommendations to the Project Director and the Program Director who then made final decisions based upon knowledge of the student pool. Award letters were sent out mid-spring.

Once the projects were selected student application packets were made available to the C-STEP students. Students who wished to participate were asked to provide information about themselves, a letter of reference from a faculty member and then to choose and rank three projects. The Program Director and the faculty mentors then worked together to match interested students with projects.

All costs of the summer research program at that time were covered by the C-STEP grant. For each project a total of \$2000 was allocated for the faculty mentor(s), room and board and a small stipend (originally \$1000 complete) for each student, and \$250 for supplies. Additional program costs included weekly fieldtrip funds and the presentation luncheon. The first program involved four faculty mentors and eleven students working on four projects. The total cost associated with the projects was \$20,000. There is no mention of staff time because we did not hire additional staff but rather included the planning and administration of the program in the regular duties of the half-time Director and her staff. In 1993 – 94 the staff consisted of a half time secretary and a student assistant.

For many years the format of the program remained essentially as described above with some improvements in detail as explained later, and additional funding from the NSF LSAMP program. In 2001, the Program Director was able to find a way to expand the program to 5 weeks and still satisfy the fiscal constraints of the C-STEP grant. About the same time the campus increased summer session to five weeks so that the coincidence with summer session was not altered.

Advantages of the Short Program

Although the format was imposed by external constraints it has turned out to have a number of wonderful logistical advantages. Arrangements for on campus housing and meal plans are straightforward because of the coincidence with summer session. Student participants are able to complete the program and still get in the job market around the same time as the high school students (rather than later) or to stay on at New Paltz and take courses in the second summer session. Faculty mentors are able to combine their participation with teaching a course in summer session 1 if they wish and then they are free for the remainder of the summer to pursue other interests.

Another major and unanticipated advantage was the great range of projects that were proposed each year. The four-week time limit is approached differently by different faculty mentors. Some faculty submit proposals for very elementary, introductory projects that can be completed readily in the short period and require very little background. These projects allow us to provide summer experiences for even first year students. Other projects require a much higher level of expertise and provide meaningful learning experiences for advanced students. Some of these focus on one specific technique and others consist of a small portion of a larger project. Often these projects prepare students for more substantial work later on and it is not unusual for the students who participate in them to continue to work with their faculty mentors during the academic year. In fact, since receiving funding from LSAMP we have been able to make a limited amount of student stipend money available during the academic year to support these further interactions.

This short program is not attractive to every faculty member. Some feel there is not enough time to get a serious amount of work accomplished. The faculty members who do wish to participate are often especially sensitive to issues of student development and are willing to work with students of different levels and abilities. We have more than one fairly regular faculty mentor, for example, who will submit a proposal with the idea of using the summer experience specifically to strengthen the background and the confidence of a particular group of students. Often the relationships that develop between faculty mentors and their students are long lasting and highly beneficial.

Providing Successful Experiences: A Combination of Advantages

The AC² program has always operated under the assumption that it is as important to graduate C students as A students and so we have never had a grade point cut off for participation

in the program. In fact, each semester we will have a handful of students who have clearly decided that they must complete a particular major for which they appear to have little real aptitude. We first try to convince them to find a more suitable major, but if that is ineffective we do what we can to help them to make it through. In keeping with this philosophy we have never required a particular GPA for participation in the summer research program. Information about the GPA is requested and taken into consideration in forming student teams but students are not denied because of a mediocre academic record. Even students with poor academic records are included in the program when there is a specific goal in mind and the faculty mentor is agreeable.

Since the AC² program is small, serving from 70 to 100 students, the Program Director or a staff member will have first hand knowledge of most of the students. When we put together teams we are able to include students with a range of abilities, needs and experience. Students are selected based on their having the prerequisite background for the project, evidence of motivation to work reliably at the project and sometimes when we know that working on the project will meet a particular need for that student. The faculty mentors are always fully involved in the selection process and thus are made aware of the strengths and weaknesses of the students selected to work with them.

We have configured teams in many ways and with different objectives in mind. Sometimes a more advanced student is placed with several lower division students on a project knowing that the upper division student will benefit from the role of teacher and that the less experienced students will benefit from working with the upper class student. We have at times included a community college student with plans to transfer to New Paltz in a team with returning students thus easing the students transition to the University. We have teamed one or more weaker students with a somewhat stronger student on a project specifically designed to strengthen their background and skills in anticipation of their taking a particular course in the coming fall. We hope that the habit of working together and supporting one another formed during the summer will continue to serve the students during the academic year. And we often include several first year students in the program. This can be particularly beneficial for our pre-engineering students who otherwise might not engage with the engineering community on campus until the junior year. Our ability to work with dedicated faculty mentors to select teams to achieve different outcomes together with the varied projects that are proposed for this short program is what has made this program most effective.

Continuous Improvement

At the conclusion of each SRP the students are asked to complete a set of evaluation questions. Afterward they usually continue to provide feedback informally as they progress through their degree program, present their work in other venues and then enter graduate school or the workforce. We obtain feedback from the faculty through the faculty advisory board, and more informally but regularly from the faculty mentors themselves. Of the twenty-three faculty mentors who have participated in this program over the years seventeen have participated from two to five times and both staff and students are in regular touch with many of them. We also pay careful attention to the observations of staff members and the administrators and others that attend the presentations. The Project Director and the Program Director meet regularly when

planning the SRP each year to consider changes based on the feedback from these constituencies and knowledge gained firsthand. Several examples of our response to observation and feedback are described below.

- *Building Community:* Based on our work with entering students we felt it would be important to house the students together and provide regular social activities in order to build the community that we desired. We soon found out that requiring continuing students to live together in the residence halls when many had already made other arrangements was not only not necessary but a hardship for some. In addition, they did not need the constant programming in order to succeed. We continue to include some social activities but not the constant programming that we strove for in the beginning. Instead our bringing the students together once each week for a research meeting that is focused on the projects helps to establish connections between the groups.
- *Presentation Skills:* Early on we observed that waiting until the project was almost completed to begin preparing the students to communicate their work did not lead to high quality final presentations. In response we instituted weekly meetings. The groups update one another on their projects at these meetings. The students get regular practice communicating scientific thinking and results in this way. As an additional benefit, these meetings broaden the experience for all of the students and provide a connection between the groups as mentioned earlier. The final presentations were improved but not to the extent that we had hoped. After some feedback from one of our Deans several years ago we took the additional step of incorporating some targeted instruction in poster preparation and oral communication to supplement the guidance given by the faculty mentors. The results this year were more consistent and student feedback was very positive.

Student Evaluation

The questionnaire that we ask students to fill out at the end of each SRP consists of six questions. The students are asked to rate the following:

1. Interaction with their faculty mentor(s).
2. Interaction with their team member(s).
3. Effect of their experience on their view of their own ability to do research.
4. Level of interest in the project.
5. Time available to do the project.
6. The program as a whole.

The average results of these evaluations for six of the years that we have offered the program are presented in Table 1. (For the years that are missing we either did not do the evaluation or did not keep the results.) For the most part these evaluations including the written comments have been overwhelmingly positive. The only question that has consistently shown some dissatisfaction with the program is number 5. A significant number of students each summer voice the desire to have more time, some very strongly, although the average response has always remained on the positive side of the scale.

Table 1: Student Evaluation of the Summer Research Program. The average responses to the questions listed in the text above and rated on the following scale: 1 = very positive, 2 = positive, 3 = neutral, 4 = negative, and 5 = very negative.

	2002	2001	2000	1998	1996	1994
Question 1	1.1	1.1	1.0	1.0	1.8	1.1
Question 2	1.2	1.2	1.1	1.2	NA	NA
Question 3	1.1	1.1	1.6	1.4	1.2	1.2
Question 4	1.2	1.2	1.4	1.4	1.8	1.4
Question 5	2.0	1.8	2.3	2.5	1.8	2.3
Question 6	1.1	1.1	1.2	1.1	1.0	1.0
Respondents	10	11	9	11	5	10

NA = not applicable, this question was not included in the earlier questionnaire.

Program Format

There has been consistent pressure from some faculty to increase the length of time available for the SRP. The results of the student evaluation clearly indicate that many students would prefer a longer program. We have always kept this feedback in mind, but have been resistant to an overall lengthening of the program even if we could have found the funds to support it. We are convinced that there are some benefits to the shorter program that would be lost in a longer one. One possible solution seemed to be to add one or more 10 week projects to the summer program. Last year we finally had the opportunity to do that. The new Dean of the School of Science and Engineering is a staunch advocate of research experiences for undergraduates. He allocated additional school funds for the summer research efforts and prevailed upon the Provost for additional money to support supplies and student travel. As a result last summer we invited two of the faculty mentors to extend their summer projects to ten-weeks.

We redesigned the SRP for 2003 to include three project formats. Faculty will still be able to elect to offer a project with the intention that it be completed in five-weeks. There will also be an option to offer a five-week summer project funded as described but with additional funding allocated up front for student stipends to support continued work in the following fall term. The third option will be a ten week summer project with commensurate increases in the support for faculty and students. We anticipate funding two projects in each category. In this way we plan to expand the SRP so that it will meet new objectives while at the same time preserving those characteristics that have served our students so well in the past.

Summary

The SUNY New Paltz Summer Research Program has evolved considerably since its first offering in 1994. It has been important to pay careful attention to the feedback of students and faculty, and to our own observations of the effects on students and the science community at the University. As our experience has grown both faculty and administrators on campus have become

“Proceedings of the 2003 American Society for Engineering Education Annual Conference & Exposition Copyright © 2003, American Society for Engineering Education”

increasingly aware of and involved with our students. We believe these relationships have changed the climate for many of our students. A growing reputation has helped us to attract additional resources, first externally and then on campus, and these additional resources have allowed us to reach for additional objectives.

The list of students who have participated reveals many who have gained obvious benefits from their participation in various ways. Some students have developed a real interest in research. They continued to work with their faculty mentors or with other faculty and have gone on to graduate school or to work in industry. There are a considerable number of engineering students who worked on projects that developed into their senior design projects. This has been especially beneficial for some of the weaker students. In some cases, the summer experience students have had with faculty members who teach gatekeeper courses has lessened the trepidation with which they approach those courses. Community college transfer students included in the program have more quickly been brought into the New Paltz community. A number of students have presented their summer research at job interviews and told us that they believe the work contributed to their being hired. There are very few students on the list who have not expressed in the evaluations or informally to staff an appreciation for the summer research experience. Some cite the presentation practice, others their relationship with their faculty mentor or their team members, some the learning and others the introduction to the research process.

This program has succeeded in providing many of our top students with an introductory research experience that in many cases has led to more substantial experiences. Some of the students have gone on to do this more substantial work with their summer faculty mentors and others have participated in off campus internships or in research programs through the SUNY AMP or at NSF funded REU's located at other universities. These students have benefited from this introduction to research on their home campus, but many of them were already good candidates for these other substantial programs. What we think is especially valuable about this program and just as important, arguably even more so, is the opportunity it has provided for average and even weak students with tremendous perseverance to strengthen skills and resolve and build relationships with faculty and other students. In many instances the relationships that these students have formed with faculty and other students have made it possible for them to successfully meet some of the many difficult challenges inherent in earning an undergraduate degree in these fields.

STACIE SWINGLE NUNES

Since 1992 Dr. Nunes has been Project Director for the SUNY New Paltz C- STEP/AC² program, a program of academic support and enrichment for traditionally underrepresented and economically disadvantaged students majoring in science, math and engineering. She is currently an Associate Dean in the College of Liberal Arts & Sciences and an Assistant Professor in the Physics Department at New Paltz.