

Note: This information was presented at “Breakout Session A”, Sept 6, 2003.

PKAL assembly Sept 5 – Sept 7 2003: Motivating students to pursue careers in STEM fields.

Title: This research experience helps me to understand that I do not wish to continue in this field.

Institution: Grinnell College (contact: David Lopatto. email is lopatto@grinnell.edu)

Abstract

One enduring question about the connection between undergraduate research opportunities and a later career in science is what accounts for student decisions not to go on? Does it have to do with dissatisfaction about some aspect of the research experience? For three summers we have been collecting data from undergraduate researchers who have spent their summer working on a science undergraduate experience at one of four liberal arts colleges¹. Among the many questions posed to the students are some concerning their plans for postgraduate education and how the undergraduate research experience has affected those plans. The first two years of surveys yielded 384 respondents in the sciences. Of those, 27 respondents reported that their undergraduate research experience helped them to understand that they did not wish to continue in that research field. Quantitative analysis of survey data reveals a few differences between these students and students who do plan to go on, however, similarities between the groups are more frequent than differences. Qualitative data in the form of written comments offers insights into the decision-making processes of students who do not continue. It is suggested that programs for undergraduate research experiences may be judged successful while producing some students who decide to end their involvement with scientific research.

Method and Results

Support for undergraduate research experiences in the sciences is widespread. One measure of a UR program is the number of students who continue with their education in science or related fields. A simple hypothesis regarding the relation between UR programs and graduate education is that successful UR programs yield a large number of graduate students. Extending the logic, one might worry that a UR program was not functioning well if students participated in the program and then chose to spend their lives doing something else. Thus, a close examination of students who do not continue in science might reveal some criticisms about the quality of the UR program.

The data presented here do not support the hypothesis. In the course of two years of survey data from four liberal arts institutions, I have found 27 respondents (out of 384, or 7%) who reported that they did not plan to continue in the sciences. Nineteen of these students had indicated that they were interested in graduate school, while eight may not have intended graduate school.

¹ This research is supported by NSF/ROLE grant REC0087611

The instrument for collecting information about the students' experiences was created by the author. Informally called the ROLE survey, the survey was a comprehensive instrument that included questions on student demographics (class year, sex, major, ethnicity), career plans (graduate school, professional school, job, etc.), dynamics of the experience (student input, work hours, contact with mentor, structure of schedule, working in teams, etc.), satisfaction with the experience (with input, with mentor contact and availability, with groups, and overall), and perceived gains on 45 potential benefits. In the summer of 2001 the survey was distributed to undergraduate researchers at four liberal arts colleges. The following spring (2002) the students were contacted for a follow-up survey that again asked about postgraduate plans as well as perceived benefits. The general procedure was repeated in the summer of 2002 with a follow-up in the spring of 2003. Thus, a student might indicate plans to attend graduate school at the end of the summer of research, but change his or her choice in the follow up. In both the original survey of 2002 and in both follow-up surveys the student was provided with a text box to write briefly about his or her reason for continuing or not continuing in science.

A comparison of the quantitative variables from the survey showed no statistically significant differences between the 27 students and the remainder of the cohort. Of interest was a slight difference in overall satisfaction. All students rated their overall satisfaction with their summer experience on a scale of 1 (very dissatisfied) to 5 (very satisfied). The 27 students who did not continue scored a mean of 4.26 on this question, compared to 4.45 for the rest of the cohort. As the disconnection between satisfaction scores and the quoted remarks show, overall satisfaction varied among the 27 students and did not predict their continuing with science education. Their written comments show the diversity of reasons for not continuing as well as the decision's independence from the student's appreciation of the experience. Some of these students may in fact be considered "successes" although they do not continue in their research field. The qualitative data both clarify the reasons why the students will not go on in the sciences and question the use of narrow criteria for judging the success of undergraduate research programs. In the examples that follow, the quotation is paired with the student's answer to the question concerning overall satisfaction (1 to 5 scale).

At first, I wasn't sure if I was interested in studying the sciences or the humanities. Now I know for sure that although I find science interesting and exciting, I am very sure that I am going to attend law school.

Satisfaction = 4

This research experience has made me decide not to pursue any sort of job in astronomy. Astronomy was only my minor and never my main academic interest, but I had toyed with the idea of pursuing a short term job in astronomy prior to this summer research. I now realize that I don't think a job in astronomy will be very satisfying for me.

Satisfaction = 2

The monotony of research does not appeal to me. I will not pursue a career in research.

Satisfaction = 4

It has confirmed my feeling that I do not want to go to graduate school in the sciences.

Satisfaction = 3

I don't want to do research like this where I stay in a lab doing minute things all day long.

Satisfaction = 4

At times research this summer became monotonous as it was for 4 of 10 weeks repetitive and mindless labor. This was discouraging and frustrating and many times I swore I would not do research again. Other times, however, were enjoyable and stimulating. Still undecided about life after graduation.

Satisfaction = 3

Although I do not wish to pursue a career in research, I feel it is very important that I was able to gain experience in the field.

Satisfaction = 5

I enjoyed my research experience immensely, however, experimental physics is not for me!! Too much time alone in a dark lab!! I'd rather be teaching.

Satisfaction = 5

I have learned that I don't want to spend all my time in the lab, and that although lab chemistry is a lot of fun, I really want to spend a chunk of my time doing outside field studies as well.

Satisfaction = 4

I want to go to work after graduation at least for 1 year to pay back loans, then go back to school. Undergraduate research gave me an eye-opening experience. Although very significant, doing research has helped me realize that I can do research (confidence) but not all day every day (self-education).

Satisfaction = 4

During research I witnessed a presentation that opened my eyes to another possibility of specialization in grad school.

Satisfaction = 5

I have gained knowledge on the range of my discipline and independently decided not to continue in the research field as a career.

Satisfaction = 5

I don't know.

Satisfaction = 3

I worked two years doing research, first in nuclear physics and recently in solid state physics; I am a Classics and Physics double major, but I am going to graduate school in Psychology, specifically studying developmental psychology and linguistics. Thus, while I certainly consider conducting research will help me in my future studies, it is the core methodological experience and not specifically the field in which I studied that I will benefit from.

Satisfaction = 4
