

## Support, Managing, Philosophical

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Group 3 discussed challenges inherent in promoting undergraduate research that fell into three broad categories: support (both funds and people), managing REU programs, and philosophical or attitudinal.

### Support (funding)

Jim reports that the typical NSF grant to run an REU does not stretch sufficiently far to cover salaries for graduate assistants or expenses and stipends for local students. His solution is to seek outside funding to supplement NSF funding; he mentions that he has developed a relationship with a helpful person in his university's development office. The group discussed other potential sources of funding, as follows:

- the local community
- the alumni of the institution
- local industry
- the Howard Hughes Medical Foundation (focus on supporting students, in particular 1st and 2nd-year students from minorities underrepresented in mathematics and the sciences)
- writing other grants (e.g. research grants) so as to allow 1-2 undergraduate students to "piggyback" on these other grants to pursue undergraduate research
- NSA (funds REUs directly under the right conditions)

Cautionary tales of approaching outside entities without the blessing of the appropriate entities within the university were told, with the moral of working within the system to avoid causing headaches (for project directors and for others).

### Support (people)

Some group members indicate that they had trouble convincing colleagues and/or graduate students to make the time commitment necessary to participate in summer undergraduate research programs. This difficulty reflected both the perception that the funds available to compensate faculty for their time were insufficient as well as that faculty - particularly at RI institutions - prefer to pursue their own research and plans during the summers. A second difficulty in recruiting student mentors

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seems to be that some potential mentors are intimidated by the thought of guiding undergraduate students through research projects.

### **Managing Undergraduate Research Programs**

The workload - particularly the administrative and even clerical details - can be overwhelming. When one group member referred to the work of merely managing an REU as "a full-time job" most of the group nodded knowingly. Facets of this job include administrative work, finding funding, recruiting students and mentors, maintaining websites, carrying out program assessment, tracking program graduates, etc. With the reminder that the goal was to provide opportunities for undergraduates to do research, the question was raised as to whether REUs might not be the best model for reaching this goal. How do we systematically change the way that undergraduate mathematics is taught and learned in the U.S.? "Out-of-the-box" thinking is needed. Examples such as that of BYU's providing small grants to make it possible for 1 - 2 students to work closely with a faculty mentor over the course of an academic year were mentioned. One caveat to this particular alternative is the need to have department chairs and/or administrators recognize the significant time commitment that quality undergraduate research demands of faculty, and to recognize such activities as part of the faculty member's work load.

### **Philosophical/ Attitudinal**

In spite of all the progress achieved in the last twenty years, many mathematics faculty simply do not believe that undergraduates are capable of carrying on research in mathematics. A cultural change is required, but not yet accomplished. This change may be evident at some non-RI institutions.

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