Engaging Young Mathematicians:
An NSF Workshop on majors and the transition to graduate work

Abstract
For several decades, mathematicians have complained about the scarcity of undergraduate mathematics majors. Enrollment in upper division mathematics courses has steadily declined, fewer such courses are offered, and American undergraduates seem to avoid graduate school in mathematics or related fields. And those who *do* go on to graduate school often find the transition difficult.

In an effort to address these problems, some colleges and universities have experimented with new approaches to attract mathematics majors, to mentor them through their undergraduate work, and to help them through the transition from undergraduate to graduate work. Solving the problem of the major means wrestling with some tough questions: What does a major in mathematics mean? How flexible should a major be? How do we create honors programs that attract the best students? What is the role of research experiences for majors? What is the best way for undergraduates to move into graduate school? How do we prepare mathematics majors for graduate work outside of mathematics?

In an effort to promote broader interaction between departments trying to address the critical problems of majors and the transition to graduate work, four scientific societies -- the American Mathematical Society, the American Statistical Association, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics -- will host a workshop on these critical issues. The workshop is supported by the National Science Foundation and will take place August 12-13, 2005, in Washington, DC. Its focus will be on just two topics—the mathematics major and the transition to graduate school.

This workshop is aimed primarily at doctoral granting departments in the mathematical sciences. It will be a small workshop (fewer than 30 participants) and sharply focused, but with ample time for participants to share their ideas and concerns. The goal of the workshop is to stimulate departments to think more carefully about their major, the way in which graduate students enter their program, and the possible use of NSF workforce funds to initiate change.

Details
Begins: Friday, August 12 – 1 pm
Ends: Saturday, August 13 – 5 pm
Location: Embassy Suites Hotel, 1250 22nd St. NW, Washington, DC

Schedule

Friday, August 12

1:00-1:30 pm	Welcome and introductory remarks
1:30-3:00 pm	Session 1
3:00-3:30 pm	*Break*
3:30-5:00 pm	Session 2
5:30-7:00 pm	*Reception*
7:00-8:00 pm	*Dinner*
8:00-9:00 pm	Discussion [free-ranging]

Saturday, August 13

7:30-8:30 am	*Breakfast*
8:30-10:00 am	Session 3
10:00-10:30 am	*Break*
10:30-12:00 am	Session 4
12:00-1:30 pm	*Lunch*
1:30-3:00 pm	Session 5
3:00-3:30 pm	*Break*
3:30-4:30 pm	Session 6
4:30-5:00 pm	Wrap-up

Program

Sessions 1-5 are 90 minutes in length, with two institutions making presentations. Each presenter will be asked first to make general remarks about their own department and its programs, but then to focus on the particular topic mentioned in the title. This may be done by reference to particular programs or by a more general discussion of the issues. Presenters are encouraged to share concrete future plans as well as to speculate about far-fetched proposals.

Session 6 will give participants a clear picture of the original motivation behind VIGRE and the rationale for the new programs that grew from it. It will also discuss possible future directions of workforce programs at NSF.

Topics/speakers

Session 1: New views of the mathematics major
University of Alabama at Birmingham (John Mayer)
University of California, Los Angeles (James Ralston)

> Some departments have greatly increased the number of majors in recent years, in part by varying the definition of major. How much flexibility should there be in the major? What is the goal of the mathematics major? How do we craft a major that attracts the right students?

Session 2: Attracting more groups to mathematics
University of Arizona (William Velez)
University of Iowa (David Manderscheid)

> If the pool of talent from which we draw (majors and graduate students) continues to shrink, we have no hope of expanding the number of majors. A handful of departments have found ways to attract and to cultivate students from under-represented groups through innovative programs. Some of these are easily replicated; others are not.

Session 3: Cultivating graduate students in the liberal arts environment
St. Olaf College (Paul Zorn)
Harvey Mudd College (Lesley Ward)

> A small number of liberal arts colleges have produced top-ranked graduate students for many years. While the undergraduate environment is different in research universities, they may be able to learn valuable lessons by understanding how these few liberal arts colleges attract and mentor their best majors.

Session 4: Bridging the gap to graduate work
University of Chicago (Peter May)
University of Nebraska (Judy Walker)

> American undergraduates often find it difficult to make the transition to graduate work, partly because they are competing with talented (and experienced) international students. How do we accustom undergraduates to the new environment of graduate school? Can we learn from other sciences, who seem to do this more easily?

Session 5: Training majors and graduate students beyond mathematics
North Carolina State (Sastry Pantula)
University of Utah (James Keener)

> Mathematical sciences majors may go on to many areas in the mathematical sciences, including statistics or interdisciplinary work. Training majors for *all* areas of graduate work should be a high priority for mathematicians.

Session 6: Workforce programs at NSF: Philosophy behind and beyond VIGRE
Division of Mathematical Sciences (John Conway)

> For the past eight years, the Division of Mathematical Sciences has devoted much of its energy to workforce issues, first with VIGRE and then with RTG/MCTP. Much of the rationale for a greatly increased budget for mathematics was built on the need to address workforce problems. Workforce issues begin with the major and a successful transition to graduate school. What is the philosophy behind these DMS programs? What is their future? How do they fit within the larger framework of DMS funding for mathematical research? (This is not a discussion of the programs themselves but rather the underlying philosophy behind them.)