

# VIGRE at the University of Arizona

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## 6 Arizona metrics

Our 2006 VIGRE proposal included a set of specific numerical targets against which to measure our progress. An evaluation specialist was engaged to collect data for this purpose and, despite some turnover and difficulties with personnel and human subjects, we now have a very complete set of baseline data on graduate students. We expect to also have quite complete data on undergraduates, post-docs, and summer program participants before the end of the academic year.

Below we reiterate the criteria from our proposal and assess them to the extent possible using the data described above. Unless stated otherwise, we consider participants who entered our programs since the award of our first VIGRE grant in 2000.

### 6.1 Standards for Success

Progress towards our goals will be measured against explicit, quantitative standards. These goals were arrived at after an analysis of our performance over the last 10 years and in many cases represent significant improvements over national norms.

1. Effectiveness at training well-prepared students and post-docs is hard to measure directly, but there are a number of proxy standards which can be used:

- Participants will have a high level of participation in integration activities and a high level of satisfaction with the outcomes. This is essentially a measure of the experience participants while they are in the program.
  - all VIGRE-funded graduate students and post-docs will participate in at least one integration activity per funded semester or summer.

**All VIGRE supported graduate students participate in integration activities during the terms of their fellowships. During the first 2.5 years of this VIGRE grant, this means at least 76 distinct graduate students have participated in integration activities. A number of non-VIGRE-supported graduate students (e.g., foreign students) have also participated in these activities. All four of our VIGRE-supported post-docs have participated in integration activities.**

- at least 50% of graduate students and post-docs will have had a meaningful professional development experience (e.g., speaking at a conference, doing an internship, writing a joint paper with a faculty member) before leaving the program.

**We do not have complete data for this question, but if “meaningful” is defined strictly by the criteria mentioned here, this target is probably too ambitious. If “meaningful professional development experiences” include outreach activities such as workshops at local high schools, working with undergraduates on research, and speaking in local seminars, then essentially every graduate student and post-doc, and certainly every VIGRE-supported participant, meets this criterion. Further specification and data collection is in order before the end of the grant.**

- at least 50% of undergraduate mathematics majors will participate in a capstone, URA, UTA, or internship experience by the time they graduate.

**Of the 160 undergraduate majors who graduated since the 2006-2007 academic year, at least 43% participated in URA, UTA, REU, or internship experiences. This number does not include any who may have written honors theses or other capstone projects.**

- at least 90% of participants will find the integration activities, capstones, URAs, etc. they participated in to be valuable experiences.

**Satisfaction will be measured by various surveys being administered this academic year. For the summer program, we already have data: In 2008, in response to the question “I would recommend this Arizona Summer Program to others,” 61.5% strongly agreed and 30.8% agreed, yielding an overall satisfaction number of 92.3%. In 2007, 84.6% strongly agreed and 15.4% agreed, yielding a 100% satisfaction number. A much more detailed report about student experiences in the Summer Programs is included in the site visit packet.**

- A long-term measure of outcomes will be provided by career trajectories of participants. This is also part of goal number 2 (the “pipeline” goal) and is discussed more below.

**Our best graduates in recent years have been quite successful. For example, undergraduates have entered graduate programs in mathematics at Berkeley (David Brown), the ALGANT program in Paris-Leiden-Bordeaux-Padova (Chris McMurdie), Washington (Brendon Pawloski), and in Applied Mathematics at Arizona (several); also in other scientific fields such as Chemistry at Stanford (Rae Ana Snyder), Astronomy at Cambridge (Caitlin Casey), and Economics at NYU (Peter Gross); and in professional schools such as Michigan Law (Sandra Durkin) and Emory Law (Matthew Hall). PhD graduates from both programs have landed excellent jobs in academia, such as a VIGRE post-doc at OH State followed by tenure track at U Texas Pan Am (Virgil Pierce), Rice VIGRE post-doc followed by tenure track at Wesleyan (Chris Rasmussen), tenure track at Stony Brook (Lisa Berger), and U. Chicago and then Biochemistry at Wisconsin (Dmitry Kondrashov); as well as in industry, such as NRC/Naval Research Lab (Eric Forgoston), Northrup Grumman (Andy Linfoot), Los Alamos National Lab (Sam Schofield), and LSI Logic (Milos Ivkovic).**

2. A high percentage of participants will continue on to more mathematical training or careers in the mathematical sciences:

- at least 50% of entering PhD students will obtain a graduate degree in 6 years or less.

**Averaged over the last 10 years, the fraction of matriculants who obtain a PhD has been about 40%, but retention numbers in the last five years have been significantly higher: for students entering in 2007, 2006, ..., 2003, the number who are on track for a PhD (or have already graduated with a PhD) is 91%, 81%, 50%, 63%, and 65%.**

- at least 85% of PhD graduates will leave the program with employment in the mathematical sciences.

**Allowing for a one-year window past graduation, 100% of our graduates in the last five years have obtained employment in the mathematical sciences.**

- at least 90% of PhD graduates will publish a paper related to their dissertation in a reputable journal (to be defined in the evaluation phase) within three years of graduation.

**We currently only have data going back five years. Of the nine graduates of the Math program in 03-04 and 04-05, eight of them (89%) have published a paper related to their thesis. For the seven graduates of the Applied Math program in the same period who have academic positions, three (43%) have published.**

- at least 25% of undergraduate mathematics majors will continue on to advanced degrees in mathematics, science, engineering, or the professions.

**Of the 160 graduates in 06-07 and 07-08, 40 (exactly 25%) have gone on to graduate or professional school.**

- at least 50% of Arizona Summer School participants will enter graduate school in the mathematical sciences.

**44% of the participants in the 2007 summer program who have graduated have entered graduate school in mathematics. Another 22% have taken mathematically significant jobs (teaching and NSA) and another 11% (one of nine) is considering graduate school after a one-year break.**

- at least 80% of post-doctoral fellows will obtain a position in a US university or a mathematically-intensive job in industry or one of the national laboratories.

**All of our VIGRE II post-docs are still employed at the University of Arizona. For VIGRE I, 100% of our post-docs (six of six) are employed in the mathematical sciences.**

3. On female and minority participation:

- on average, at least 33% of PhDs will be awarded to females; this would be near the top of the national range.

**Between 2003 and 2008, 13 of our 53 PhD graduates (i.e., 25%) have been female. Although this does not meet our target, it is near the top of the national rankings.**

- on average, at least 10% of our PhDs awarded to US citizens will go to minorities; this is about twice the average rate nationally.

**Unfortunately, the actual proportion over the last five years is about 4%. However, we currently have 10 students in good standing from underrepresented groups in our PhD programs: five hispanics, three African-Americans, and two Native Americans.**

- on average at least 40% of participants in the new summer program will be female and at least 25% will come from under-represented minority groups.

**Ten of the 25 participants (40%) in the two summer programs have been women. Three of the participants (12%) and several of the graduate student mentors were underrepresented minorities.**

- every effort will be made to recruit female and minority post-docs. This is not a quantitative goal—the global numbers are simply too small to set quantitative goals.

**Two of our four VIGRE II postdocs are women.**

- on average, at least 35% of undergraduate degree recipients will be females and at least 20% will be underrepresented minorities. A variant of this goal, currently equivalent, but perhaps better for long term comparisons, is that the percentage of minorities among our undergraduate degree recipients will be greater than the percentage of minorities in the overall University of Arizona undergraduate population.

**For the academic years 2005-2006 through 2007-2008, 29% of undergraduate degree recipients were female and 13% were underrepresented minorities.**

- on average there will be at least two visits per semester by experts on diversity, recruitment, and retention issues, or by high-profile minority or female mathematicians. These visitors will lecture in one of our three weekly colloquia. A further, non-quantitative goal is that these visits will have an impact on our programs and policies.

**We have been fortunate to have many high-profile female mathematicians speak in our colloquia, for example Jenny Harrison, Trachette Jackson, and Raman Parimala. The numbers more than meet the standard mentioned above. The activities of the new Institute for Mathematics and Education headed by Professor Bill McCallum have brought many experts in mathematics education and diversity to Tucson.**

4. The standards for our post-VIGRE plan are evident: we will implement the plan described above and in Section 9.

**The main elements of our post-EMSW21 plan described in Section 9 of the proposal are on track. The broad professional development of graduate students made possible by VIGRE fellowships will continue under the matching fellowships committed by the University of Arizona. We have begun a transition to research-grant-based funding of REU projects and we have pursued opportunities for corporate and private funding of the UTA program.**

We emphasize that these are not predictions of the future—they are standards against which our efforts will be measured.