

Comments from the American Psychological Association in response on the development of a Strategic Plan for Research Training from the National Institute of General Medical Sciences (NIGMS)

1. What constitutes "success" in biomedical research training from the perspectives of an individual trainee, an institution, and society?

"Success" should be considered in graded terms. Some outcomes may be "good," some "better," and some "optimal." Thus, NIGMS might want to consider levels of accomplishment.

For trainees, NIGMS should make some distinctions between predoctoral and postdoctoral training outcomes. It should also consider tracking success in terms of the proportions of individuals who achieve various levels of success as opposed to any single definition or level of success (with the possible exception that obtaining a high-quality postdoc could be a clear "success" for a predoc).

For predoctoral students, a failure would entail failure to complete the degree. 'Good' would include movement from "T" grant support to an 'F' award, obtaining a good postdoc, and publishing as first author. 'Better' is obtaining a mentored research award and/or an independent research position. 'Excellent' could include obtaining independent research support; and 'Outstanding' would be ultimately obtaining repeated independent support, multiple influential publications, plus training others who hit the marks of 'good', 'excellent,' or 'outstanding.'

For postdoctoral scientists, a failure would mean failure to complete the postdoc, or having completed it, entering a career outside of science or scholarship. "Good" would mean movement from a "T" or "F" award to a "K" award, and publishing independently or as first author. "Excellent" would mean attaining NSF or NIH R01 or R03 funding. 'Outstanding' would mean earning a second R01 or equivalent funding; major publications that alter research emphases or approaches in a field; and/or a record of training scientists whose performance is good, excellent or outstanding.

For the *Institution* success may be:

- Improved recruitment and retention of trainees and faculty;
- Improved specialty training in the area of the training support;
- Spillover to trainees not supported on the training mechanism (e.g., courses and seminars in the service of a T being attended by non-trainees, especially those ineligible for current support mechanisms such as foreign nationals).
- Improved success rates in obtaining R and P support.; Higher levels of recruitment, retention and graduation rates of non traditional and underrepresented students in basic science disciplines.

For *Society*, success may be:

- Progress on serious health problems where scientific progress has been slow (e.g., pancreatic cancer, ALS, severe mental illness)
- Maintaining US preeminence in biomedical and behavioral research;
- Better distribution of health-related research expertise based upon health priorities and scientific opportunities;
- Increased math, science and biomedical/behavioral literacy among youth and young adults;
- Increased quality and quantity of pre-baccalaureate teaching and education in those areas;
- Increased diversity in the biomedical/behavioral faculties and workforce;

- Findings that promise direct implications for more diverse segments of the population.

## 2. What can NIGMS do to encourage an optimal balance of breadth and depth in research training?

Some ways of encouraging this balance include:

- Require that each F, T and K application have sections on the “breadth” component and “depth” component; and a rationale for how they are balanced;
- Provide clear guidance to applicants on what constitutes breadth and depth;
- Encourage advanced coursework across disciplines, as appropriate, at doctoral and postdoctoral levels;
- Provide clear review criteria on balancing breadth and depth to reviewers;
- Ensure that this issue is highlighted in relevant PAs/RFAs.

NIGMS is currently promoting inter- and multi-disciplinary research and research training. This trend should be strongly encouraged and expanded. Strategies for doing so might include:

- Encouragement at the predoc level of mastery of a field or specific technique/skill (e.g. imaging, nanotechnology, mathematical modeling) to complement specialty training.
- Encouragement of collaborations among scientific societies/associations to support inter-/multi-disciplinary research and research training strategies.
- Integration of research practicums and internships into inter-/multi-disciplinary research projects.

## 3. What can NIGMS do to encourage an appropriate balance between research productivity and successful outcomes for the mentor's trainees?

- Make it clear that trainees' successes are considered in evaluating the mentor's productivity.
- It should be possible for mentor's track records for training to be assessed as outstanding even if his/her research productivity is less than outstanding.
- Alternatively, an outstanding research record should not be considered prima facie evidence of a good training environment. Training potential needs to be established independent of research productivity of the mentor;
- Develop a system of tracking of mentor contributions that goes beyond trainees' tenures in the program as some trainees are slow starters and produce research after leaving the lab (with the credit going to their next institution).
- Encourage development and formalization of the skills and duties of a “research administrator” (e.g., responsible for human resources/materials/technology/equipment/ procedural management) as an integral part of the research team. Such a position (preferably occupied by a trained researcher) is increasingly required as research becomes simultaneously more technologically-based, more inter-/multi-disciplinary, more complex (e.g., multiple trials, multiple populations) , more expensive, and more accountable. Under the direction of the Principal Investigator, the Research Administrator would organize and oversee all research training.
- Encourage development and formalization of tiered models of trainee mentorship ( see Q 4 and 7 below).

4. What can NIGMS do through its training programs to promote and encourage greater diversity in the biomedical research workforce?

NIGMS has been an exceptional national leader in promoting diversity in the research workforce. But there is still much to be done. The suggestions below derive from federal reports, training/mentoring research in psychology, and the experiences of the APA/NIGMS Project — a 13-year T-36 MARC Ancillary project.

- Researchers may, but do not necessarily, possess expert knowledge/experience in research training, especially of diverse populations. Consequently and inadvertently, researchers may be in a conflict-of-interest position relative to issues and decisions involving research training, wherein concerns for research funding supersede those for research training. Recognition of this possibility has significant implications for (a) the composition of expert groups advising the Institute about its training strategies and priorities, and (b) the composition of review panels related to research training funding, and their willingness to attend to and provide feedback related to research training procedures and associated evaluation/assessment procedures.
- Require that training grants should over time demonstrate institutional commitments to increase the diversity of the faculty.
- Research indicates the efficacy of departmental/institutional and multi-institutional partnership models for effecting systemic change to increase participation of diverse populations in research training. These models, distinguished by provision of research training funding to institutions (i.e., funding that is not individual -merit-based), serve to withstand the challenge of affirmative action opponents while providing departments/institutions incentives to provide trainee stipends and to effect changes in departments (e.g. related to advising, procedures, tutorials, targeted research skills training, mentoring, etc.) that lead to more supportive academic and social climates for diverse students and others. These models are significantly more cost-effective per student than individual-merit-based models, while evidencing similar “success” rates.
- The multi-institutional partnership models are distinguished by creation of academic research partnerships or pipelines – typically involving community colleges and 4-year institutions or 4-year institutions and major research institutions. The APA/NIGMS Project involved partnership among all 3 types of institutions, with the participating colleges and institutions having predominantly ethnic minority student populations.
- Tracking student participant data longitudinally is a powerful accountability/evaluation tool, but over time, it becomes a critical component for sustaining systemic/institutional changes in training processes and commitment to diversity. We strongly support NIGMS’s attempts to encourage use of trainee databases and further suggest that a percentage of training grant budgets be set aside for this and other assessment/evaluation purposes.

See Question #7 below for additional ideas.

5. Recognizing that students have different career goals and interests, should NIGMS encourage greater flexibility in training, and if so, how?

The increasing complexity of the scientific research enterprise and the associated proliferation of scientific roles, functions, and settings are clearly suggestive of the need for greater flexibility in training. One approach to addressing this challenge is to assess the emergent roles, functions, and settings and then determine the related required research skills, abilities, and experiences, and the training models through which these might be acquired. However, the NIGMS strategic plans can provide an overall framework for these training goals and models. If greater flexibility is made a goal, reviewers need to be trained on how to evaluate such flexibility.

6. What should NIGMS do to ensure that institutions monitor, measure, and continuously improve the quality of their training efforts?

- Competing continuations of Ts should have sections addressing monitoring, measuring, and plans for improvement from the prior funding period.
- Consider providing budget set-asides for these purposes, and include quality of these activities as a continuation grant review criterion.
- NIGMS should consider requiring institutions to develop individual plans for trainees that take into account their unique circumstances. Such individual plans could allow additional time or program resources for some underrepresented trainees who might be less likely to complete the program otherwise.

## 7. Do you have other comments or recommendations regarding NIGMS-sponsored training?

On mentoring diverse students:

Mentoring serves to enhance and re-enforce— not replace— quality hands-on research training. A number of important issues emerge in a review of mentoring research:

- Trainees seem to gain greatest benefit when they are exposed to a dual or tiered mentoring program involving the traditional research/laboratory mentor, but also a 'programmatic' mentor who provides more general advice/counseling/resources related to academic and career progression. Organized, systematic peer mentoring also has been found to be an effective retention strategy.
  - For some students it is valuable for mentoring to include a cultural/racial/diversity-specific component that explicitly addresses relevant aspects of a trainee's life experiences, and how these can be successfully integrated into one's academic and professional lives.
  - Mentoring is fundamentally relationship-building for purposes of skill-building, information-sharing, and personal growth. Thus it must involve fairly consistent, predictable and ongoing interactions. Although some people are "natural mentors," in most cases, effective mentoring – especially with diverse populations – requires some degree of mentor-training. Consideration should be given both to encouraging the inclusion of formal mentoring programs in all training grants – and ensuring that these mentoring programs include a mentor training component.
- Research on mentoring primarily has focused on (a) describing theoretical models and processes of mentoring; (b) reflections of mentees and mentors on their experiences and their perceptions of critical aspects of mentoring, and (c) empirical analyses of either mentoring program outcomes or differences in outcomes between participants and nonparticipants of mentoring programs. But very few empirical analyses have focused on the outcomes of specific variables or factors of mentoring. NIGMS and its training programs are uniquely positioned to champion an increase in the quantity and quality of assessment, evaluation, and research on mentoring. This is especially warranted given the current trend for "social networking" mentoring through use of technology, on which there is almost no existing research on impact or outcomes.
- NIGMS should identify programs with strong, successful mentoring for both minority and majority students and hold webinars for mentors that will educate them about effective mentoring at each level of training. To determine what works in mentoring will require an identification not only of the mentors but also of the supportive aspects of the training environment that contribute to success. This would help NIGMS define what basic supportive services, types of experiences, student-faculty ratio and other characteristics contribute to successful training particularly with nontraditional and racially/ethnically diverse students.