



**Association of  
American Medical Colleges**  
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September 22, 2017

Layne Scherer  
Study Director, Committee on Revitalizing STEM Education for the 21<sup>st</sup> Century  
Board on Higher Education and Workforce  
The National Academies of Sciences, Engineering, and Medicine  
Washington, DC 20007  
[lscherer@nas.edu](mailto:lscherer@nas.edu)

**Re: Call for Community Input on National Academies of Sciences, Engineering, and Medicine  
Committee on Revitalizing Graduate STEM Education for the 21<sup>st</sup> Century**

Dear Ms. Scherer:

The Association of American Medical Colleges (AAMC) is pleased to have this opportunity to offer comments to the National Academies of Sciences, Engineering, and Medicine's Committee on Revitalizing Graduate STEM Education for the 21<sup>st</sup> Century. Founded in 1876 and based in Washington, D.C., the AAMC is a not-for-profit association dedicated to transforming health care through innovative medical education, cutting-edge patient care, and groundbreaking medical research. Its members comprise all 147 accredited U.S. and 17 accredited Canadian medical schools; nearly 400 major teaching hospitals and health systems, including 51 Department of Veterans Affairs medical centers; and more than 80 academic societies. Through these institutions and organizations, the AAMC serves the leaders of America's medical schools and teaching hospitals and their nearly 167,000 full-time faculty members, 88,000 medical students, 124,000 resident physicians, and thousands of graduate students and postdoctoral trainees in the biomedical sciences. Our comments reflect input from many of these constituents, primarily our Group on Graduate Research, Education, and Training (GREAT) and Council of Faculty and Academic Societies (CFAS).<sup>1</sup> Our comments emphasize PhD education, which is the GREAT Group's major focus. Several AAMC constituents who serve as graduate student deans have been involved in discussions with other organizations, such as the Council of Graduate Schools, on core educational elements of master's degrees.

The AAMC is pleased that the National Academies has reached out to the community for input.

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<sup>1</sup> The GREAT Group is AAMC's professional development group for graduate school deans, MD-PhD program directors, and postdoctoral program directors who have responsibility for biomedical PhD, MD-PhD, and postdoctoral training occurring within medical schools and teaching hospitals. CFAS is AAMC's council comprising faculty representatives appointed by medical schools and academic societies, providing a voice for academic faculty within the AAMC's governance and leadership structures.

The following is a summary of AAMC's recommendations, described further below:

- Career exploration and professional skills such as communication (oral and written), teaching, management, and teamwork should be a core part of PhD education in order for students to be successful in 21<sup>st</sup> century careers;
- Successful outcomes from graduate studies reside in a variety of career paths, and exposure to multiple career paths should occur early in graduate school;
- Effective mentorship is a key component of training and mentor training should be made available;
- Mentors should be trained in recognizing unconscious bias as we work toward achieving equity in the research enterprise;
- Institutions should have a built-in evaluation and dissemination plan for their training programs, to ensure that best practices and outcomes are widely and rigorously shared with the community; and
- Developing and sharing institutional models of data collection and dissemination would help institutions to adopt their own collection efforts.

### **Core Education Elements: PhD**

The AAMC would like to call attention to skills in several areas, some of which we called out earlier in our response to the National Institute of General Medical Sciences (NIGMS) request for information on modernizing graduate education. Professional skills such as communication (oral and written), teaching, management, and teamwork should be a core part of PhD education in order for students to be successful in 21<sup>st</sup> century careers. These skills are routinely taught in professional schools such as medicine, business, and law. AAMC suggests broadening the communication element beyond discourse about a study or body of work, to more general communication, to audiences across multiple fields and disciplines.

The Association encourages adding career exploration as a core element of PhD education. PhD program graduates are entering a wide variety of job types in multiple sectors. Programs should urge their trainees to engage in career exploration throughout their training.

The AAMC is also supportive of the core competency around collaborative and team work. The AAMC encourages graduate programs to not only create environments for trainees to develop in-depth discipline-based expertise, but also teach skills needed to effectively conduct or lead research in teams, and understand the full spectrum of biomedical research.

The AAMC is pleased that the core elements emphasize aspects of the conduct of original research which is a vital component of PhD education. Quantitative skills and a comprehensive knowledge of statistics, experimental design, and data analysis are frequently cited by institutions as necessary for training and to maintain rigor and reproducibility in research. It is also important to supplement these skills with an acknowledgement and understanding of responsible conduct, situational ethics, and judgment. AAMC encourages the committee to explicitly add these skills as core elements.

The AAMC emphasizes that training programs should be based on competencies achieved rather than the training exercise itself. Some trainees may come into a program already well-versed in the areas listed above. Also, programs should have flexibility in deciding how to implement skills development and balancing this need with the length of graduate training.

### **Professional Development and Recognition of Multiple Careers**

As noted above, professional development should be a core element of PhD education. Graduate programs should broadly implement this type of skill development, and also dispel the notion that these skills are only for those that want to pursue a career outside of academic research. Some constituents suggested that programs can identify ways for trainees to get recognition or documentation to indicate that they participated in professional skills training. Offerings should be available in graduate school; however, the depth and duration of these offerings should be varied, flexible, and determined by the training program. Programs should also be encouraged to partner with existing opportunities on their own campuses. In addition, programs should engage employers to ensure that they develop programming to align with skills desired for employment opportunities. Sharing successful practices, such as the dissemination through the NIH Broadening Experiences in Scientific Training Program (BEST), will also be beneficial for the adoption of career development professional development skills training at additional institutions.

The Association affirms that successful outcomes from graduate studies reside in a variety of career paths. Exposure to multiple career paths should occur early in graduate school. The AAMC agrees with the Academies' recommendation in the report, *The Postdoctoral Experience Revisited* that states that having a postdoctoral experience should not be viewed as the default step after graduate training. This requires a cultural change at academic institutions.

The AAMC is encouraged that institutions and funders are expanding their definition of success to broad careers beyond those as academic researchers. Institutions should engage individual faculty in conversations around this broadening definition and encourage their trainees to explore multiple career paths. The AAMC supports holistic review of training programs as related to their impact on trainees, institutions, and society, and educating reviewers to define success more broadly than pursuing an academic research career.

Strong mentoring, including career advising, is needed throughout the program. Mentor training should be made available at institutions. Tools, such as the individual development plan, help trainees consider and assess diverse paths. Students should seek multiple mentors such that advising can be tailored to the individual trainee. Regardless of funding sources, institutions and mentors should provide scientific guidance and access to professional development opportunities in order to support career development. For example, those trainees funded on research grants should have the same guidance and access to career development opportunities as those funded on training grants. Many institutions have workshops and help facilitate internships during graduate school, including those in non-academic settings, which encourage career exploration. Such experiences are valuable. Program funders could encourage this exploration by providing guidelines on its training grant, fellowship, and other research awards as to the expectations of the institutions, advisors and trainees.

In recognition of the importance of defining and sustaining the commitments necessary for a high quality training experience, the AAMC developed and endorsed the [Compact Between Postdoctoral Appointees and their Mentors](#) and the [Compact Between Biomedical Graduates and their Research Advisors](#). These documents provide program directors, administrators, and faculty with models to help initiate discussions at the local and national levels about the trainee-advisor/mentor relationship. They also recognize the institutional commitment to establishing and maintaining high quality training programs.

### **Increasing Diversity**

Despite numerous efforts over many years to build pathways for diversity in the biomedical research workforce, barriers persist. AAMC applauds the NIH Diversity Program Consortium, including the National Research Mentoring Network, Building Infrastructure to Leading Diversity Program, and the Coordination and Evaluation Center, and their emphasis on diversity and inclusivity. There continues to be a lack of knowledge and effective sharing of practices around building diversity, and we hope that dissemination of strategies from these programs along with approaches identified through the NIH Office of the Director's Pathfinder Awards to Promote Diversity in the Scientific Workforce, NIH Research on Casual Factors and Interventions that Promote and Support the Careers of Women in Biomedical and Behavioral Science and Engineering, and other efforts will help to narrow that knowledge gap.

Effective mentorship is a key component of achieving diversity and can be learned. As one component of such training, AAMC recommends that mentors are trained in recognizing unconscious bias as we work toward achieving equity in the research enterprise.

Informing a diverse set of individuals about PhD programs is one method of potentially increasing the diversity of trainees. The AAMC GREAT Group Communications Committee has developed a website for those considering entering PhD programs and hosts various local and national workshops to inform individuals of PhD programs, how to prepare for entry, and scientist careers.

### **Metrics**

Programs should be encouraged to undertake a holistic review of applicants, giving a balanced consideration to experiences, attributes, and academic metrics when considering candidates. PhD programs may be able to learn from the experiences of medical schools, many of which have enacted holistic review as part of their admissions process.

As noted above, mentorship should be a key component of graduate training. Programs should employ strategies such as regular check-ins, identifying key milestones throughout a program, and utilizing individual development plans to ensure that trainee progress is tracked. Holistic review of applicants, effective mentorship, and tracking milestones may result in reduced program attrition.

Attention should continue to focus on ways to accelerate (as appropriate) time to degree or to establish independent or fully functional careers in science. All programs should have strategies in place to help their students to reduce time to degree. However, AAMC believes that time to degree as a metric for evaluating programs should be less emphasized; instead, more focus should be

placed on completion rate, training quality (including knowledge, skills, and abilities acquired during training), and career outcomes. Programs should be expected to provide justification for those trainees who take longer than 6 to 7 years in a PhD program. As noted above, the incorporation of new program elements must be balanced with the length of graduate training.

Any measures of success for training programs should be revised to include diverse career outcomes and pertain to any careers that utilize scientific competencies. Measures of training program success should include high student diversity, demonstration of scientific productivity during and post training, student or alumni satisfaction, and successful transition into a broad spectrum of scientific careers. Institutions have a built-in evaluation and dissemination plan for their training programs, to ensure that best practices and outcomes are widely and rigorously shared with the community.

### **Outcomes Data**

There continues to be a lack of accurate and complete data on program graduate career outcomes. The AAMC has long supported tracking and reporting of career outcomes. AAMC, in collaboration with the GREAT Group, conducted a [study](#) to identify how institutions are collecting research trainee information, including career outcomes data, in order to help institutions develop and enhance their own data collection systems. Biomedical workforce data are vital for understanding the careers that trainees are entering, aligning training with those needs, and educating trainees about these career options.

The AAMC is encouraged by the many ongoing conversations by multiple organizations around career outcomes data collection. Developing and sharing institutional models of data collection and dissemination will help institutions to adopt their own collection efforts. The AAMC acknowledges that the resources available for data collection and dissemination may be limited and would affect schools differently.

The AAMC appreciates the opportunity to comment. Please contact me or my colleague, Jodi Yellin, Ph.D., Director, Science Policy ([jyellin@aamc.org](mailto:jyellin@aamc.org)) with any questions about these comments.

Sincerely,

A handwritten signature in blue ink, appearing to read "Ross McKinney, Jr., M.D.", with a stylized flourish at the end.

Ross McKinney, Jr., M.D.  
Chief Scientific Officer