

Attracting and Retaining Minorities in the Biomedical Sciences Including Genomics: a Community-based Approach to Graduate Education

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Ed Smith on recruiting students in animal genetics R&D: if you look good, we look good' #wcgalp pic.twitter.com/royxLztEcg. Reply; Retweet Retweeted; Favorite Favorited.

ABSTRACT: Our doctoral minority research education program, the Virginia Tech Initiative for Maximizing Student Development (VT-IMSD), can serve as a model for facilitating the development and success of graduate students from diverse backgrounds, including international students from developing countries. The primary goal of VT-IMSD, a National Institutes of Health (NIH) competitively-funded training program, is the recruitment, training, and mentoring of minorities so they can succeed in the biomedical sciences. The training grant has enabled us to build both a critical mass of scholars and a supportive community that enhances students' opportunities. Seven scholars have completed PhDs and are pursuing postdocs or faculty positions. Our success suggests that a community-based approach to graduate education (it "takes a village") may be a viable option to recruit, retain, and successfully train diverse doctoral students including those who pursue science disciplines important to agriculture like genetics and genomics.

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Introduction

Training grants are a hallmark of most major medical schools and top 30 institutions. For example, training grants constitute about 5 percent of the research portfolio at Johns Hopkins, a top research university in the US. In land grant institutions, however, graduate research education continues to depend primarily on state funds and/or individual research grants. A training grant offers opportunities for organizing interdisciplinary team training of graduate students at land grant universities. Since 2006, we have successfully competed for three NIH training grants that have provided an annual average funding of approximately \$800,000. These training grants, the Virginia Tech Post-Graduate Research and Education Program (VT-PREP), the Virginia Tech Genome Post-Graduate Research and Education Program (VT-Genome PREP), and the Virginia Tech Initiative to Maximize Student Development

(VT-IMSD), were the first from the NIH. Our programs provide a roadmap for bringing together more than 50 faculty, from multiple departments and colleges, to focus on training underrepresented graduate students in the biomedical and behavioral sciences. These programs aid Virginia Tech in achieving two key objectives of its "Strategic Plan": increasing the number of doctoral students and increasing diversity. The trainees contribute significantly to VT research and the diversity of the campus environment. Specific benefits that can be attributed directly and indirectly to these programs include more than 10 doctoral students at Virginia Tech from groups underrepresented in the biomedical sciences (more than doubling Virginia Tech's total number of graduates in the last 4 years in departments considered "biomedical"), contributions to faculty research leading to publications and presentations, as well as employment at many levels. An institutional training program like the VT-IMSD requires that many, often unwieldy, parts of a university system come together and meld into a functional system that yields results considered by the primary funder as competitive. Faculty from across different departments must accept the student-driven nature of the program, since students may choose a different research mentor after doing lab rotations. Another constituent of the university needed for effective implementation of the training program are staff members who are patient and resourceful, especially in dealing with the non-traditional routes and activities that the VT-IMSD offers. Central to all of these components, and the real glue to implementation and program success, is administrative support across all units as well as the central administration. To continue to succeed, these programs need strong and resolute support from administrators. Institutional commitment to provide funds to hire staff and ensure job security permits growth of these grants as well as increases our competitiveness for grant renewal.

Materials and Methods

Theoretical foundation. An abundance of literature exists concerning possible reasons for the continuing low number of certain racial and ethnic groups in the sciences and

engineering. Many of these reports also provide information about how to increase underrepresented minorities in these fields. The National Research Council (NRC) for example, has published several of these articles and proceedings that underlie some of the ideas used in our Virginia Tech-Initiative for Maximizing Student Development (VT-IMSD). Two were particularly important for both the Graduate and Undergraduate VT-IMSD activities: *Addressing the nation's changing needs for biomedical and behavioral scientists* (NRC, 2000) and *Adviser, Teacher, Role Model, Friend: On Being a Mentor to Students in Science and Engineering* (NRC, 1997).

Institutional commitment. Essential for the success of the community-focused training plan is institutional commitment in both resources and time. For example, the College of Agriculture and Life Sciences' monetary pledge ranged from \$4,500-\$15,000/yr from its share of the overhead for recruitment and for activities designed to create a community for the IMSD scholars. This support is especially important for hosting speakers and for maximizing their interactions with our scholars.

Recruiting. Several factors exacerbate effective recruiting of minority students to Virginia Tech from non-farm backgrounds and urban areas. Top among these is the university's rural location. To overcome these factors, partnerships have been developed, particularly with Historically Black Colleges and Universities (HBCUs). Organized lectures and seminars in genomics and related sciences are some of the activities that cement these partnerships.

Training plan and implementation. Each scholar uses an Individual Development Plan (IDP) (<http://myidp.sciencecareers.org/>) to guide their research training, graduate coursework and professional development activities. Scholars receive individual attention in meetings with members of the management committee. Other activities central to the training plan include a grant writing course, bioethics training, and forums in which scholars present their research, hear presentations by other scholars, or hear presentations by guests who address professional development topics. Scholars have opportunities to network locally, regionally, and nationally. Our research education training activities include the traditional seminars presented by invited guests with an enhancement. The enhancement involves a personalized interaction between the scholars, at breakfast or lunch, with the scientist providing a reflection about his/her career in what we referred to as "Getting Into and Succeeding in Science: A Retrospective." Other activities included in our training program involve "student peer

mentoring." The peer mentors are both IMSD and non-IMSD doctoral students.

Results and Discussion

Over 20 doctoral students have entered the IMSD training program since 2007. The students were diverse in ethnicity and regional and national origin, as well as in discipline. All but two were retained at VT in graduate school. Three students did not succeed in the qualifying exams, but two of those students went on to complete a Master of Science degree. One student was lost due to medical reasons.

Central to the training plan described here is the development of a critical mass. This critical mass has been achieved in part through our biweekly forum. We routinely attract 35 scholars ranging from current to recently completed trainees. Evident in the scholars is confidence and appreciation of the institutional support each receives and a resolution toward completion of the degree program.

One benefit of establishing a successful graduate training program focused on minorities is the increased competitiveness of VT for training grants other than R25s. For example, one of the Co-PDs moved to another unit in the university where he engineered the first T32 and T35 grants at VT. Our competitiveness was due in no small measure to the experience in executing the R25 objectives as well as the relationships established to recruit at HBCUs. Another result is the effectiveness of "peer mentoring," especially the close relationships that developed between mentee and mentor beyond graduation. Some mentors remained "friends" of the program even as they (two at last count) used their association with our training program to seek and secure faculty positions at Research I universities. Their "successful mentoring" of an IMSD scholar is a strong indication of their ability to mentor and train future Ph.D. students.

From the narratives of invited scientists, both local and from outside, our scholars became familiar with the realities of graduate school, the challenges confronted by scientists at different stages of their career, and the realities of juggling family and a demanding scientific career and profession. One memorable interaction involved a very successful geneticist at a land grant institution who, as a grad student, had a family and was juggling family responsibilities with her studies. Her situation was very similar to one that one of our scholars was facing at the same time. A meeting between those students is credited to not only the retention of that scholar but also her subsequent growth, completion, and continued success in a faculty position. Our scholars also have access to advisory committee members and peer mentors in guiding their response to issues and challenges. Occasionally when funds are available, we facilitate regular, informal lunch meetings between 1-3 scholars and each member of the advisory committee. These lunches offer the scholars more opportunities to learn about diverse career paths and dealing

with career challenges. The regular monthly lunch or dinner between peer mentor and scholar is especially important in helping our scholars navigate the “town and social” issues any student confronts in a rural university, a characteristic of many land grant universities. Peer mentors also play a central role in the academic development and progress of our mentees. For example, they organize and lead mock interviews for those near completion, organize study sections for scholars preparing for candidacy and preliminary exams, and organize practice sessions for scholars preparing for a dissertation defense.

A component of the training grant, funded by the NIH, is program evaluation. This component focuses on program direction, scholar progress and “happiness,” and institutional support and effectiveness in implementing training plans. The primary mission of the evaluators is to assist the leadership team in their efforts to improve, meet, and exceed the program goals and milestones set in the grant proposal. The independent evaluation has repeatedly shown program effectiveness but has also identified areas that need improvement. Transparency, for example, is always an issue with a community program and was an issue with our training program as well. The challenges of implementing a large training grant are many. Since the IMSD represented one of the first NIH-funded training grants at VT, every issue was new to the traditional structure that exists at a land grant institution. Routine issues often required either calling the NIH grants/program officer or dealing with university officials beyond the home department of the principal investigator. The conflict in reporting for a training program like this one is considerable: is the department head of the PI or the graduate school dean the primary institutional leader? Added to this challenge is the role and input of the NIH required advisory committee. In addition to this conflict with traditional institutional structure, trade-offs of an extensive training program like this are many. Since NIH awards, for the most part, training grants to institutions and to PIs that continue to be active scientists with significant records of achievement, often there is a concern about balance. Despite these challenges, the community-focused training program presented here has shown, at Virginia Tech, results that may hold promise for other land grant institutions especially in their desire to increase minority participation as well as attracting NIH funds in traditionally non-NIH departments. The training program is consistent with innovative approaches to STEM graduate education (Kinola et al. 2012) that are transformative.

Literature Cited

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