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Graduate Training vs. Industry Needs

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Success in plant breeding requires different skills in academia vs. industry.

Reducing barriers to education and training will diversify those seeking careers in plant breeding.

While changing the academic system for education and training will take time, some programs are already showing success in distance education options.

nations or who work with a startup company are less likely to have on-the-job training and support. These individuals need different training and skills to get projects off the ground. “Training should prepare people for the job they need to do,” Atlin said. That better preparation of students for careers in plant breeding will benefit both students and their employers. It would also benefit future professors to get training in management as they will need the skills to run their own lab, which includes managing budgets and people.

Rethinking Training

Talk to those who have gone through graduate school, and there will likely be similar stories of life on campus—spending hours in the library, late nights in the lab to run samples, and taking and teaching classes simultaneously. Most programs are structured so that graduate students take classes and do research on campus. For anyone who is already working full time, and not already living in a college town with a graduate program that meets their needs, life as a student on campus may be nearly impossible. However, with advances in technology, which make distance learning and collaboration possible, there is potential to remove the barriers that may have otherwise prevented motivated students from participating.

To encourage greater participation in education and training programs for plant breeding, some are rethinking education models. David Stern, President and CEO of the Boyce Thompson Institute and PI of the NSF-funded Plant Science Research Network (PSRN), has spent a great deal of time thinking about the education options for plant breeders. To overcome some of these issues by reimagining training options for plant breeders, PSRN has held workshops with academics and students. Ideas included decoupling funding from the university system and giving money directly to students or trainees, enabling students to work with a broader network of mentors of their choosing, and having training options that are not university based but still have credentials within the field of plant breeding. Mentors are a critical piece of customized training.

“We envision that a network of mentors would be accessed through an app or a database that serves a matching function,” Stern said. In this scenario, mentees would have a career mentor, with whom they would create an Individual Development Plan and a research mentor who would oversee the research component of their education.

These ideas would require universities to make major changes to plant-breeding education. “Most people would agree that institutional buy-in is a significant barrier,” Stern said, when asked about barriers to changing the training options for plant breeders. He points out that shifting funding directly to students, rather than funding through a university research lab would take money away from the university system. Some faculty may also feel that breaking away from the traditional research Ph.D. model...
will not produce skilled researchers. However, Stern feels that plant breeding education will benefit from, “a more diverse training cohort as the more trainee-centric approach becomes more visible, and is attractive to, underrepresented groups.” Overall, focusing on the needs of students, he said, would likely increase student motivation and prepare students for diverse careers.

The Distance Ph.D.

One example of making changes to graduate education is the distance research degree in plant breeding offered by Texas A&M University. “Maybe it’s because Texas is a big state, but we realized that essentially we have been delivering distance degrees for over a century,” said Wayne Smith, Professor and Associate Head of the Department of Soil & Crop Sciences at the university. “And so we had experience in directing and managing graduate programs and students who spent a considerable portion of their graduate student days away from campus conducting graduate research.” The Plant Breeding Distance Education Program, which was initiated in the spring semester of 2013, currently has approximately 20 students enrolled in the program, and eight have completed either an M.S. or Ph.D. degree in plant breeding. The degree program is available through both Soil & Crop Sciences and Horticultural Sciences departments and is currently the only distance research degree program offered at Texas A&M.

The program requirements are equivalent to those of on-campus students in terms of courses and credit hours. Distance students must also meet three additional requirements. The first is access to research facilities at their distance location where they can conduct their thesis or dissertation research. Second, they must have a research mentor and graduate advisory committee co-chair who is located close to or at the research facilities. And, lastly, applicants are required to submit a research proposal as part of their application to ensure that their project will provide the student with an appropriate research experience. With this remote support system, students do not need to relocate to take courses, which are online, or travel to participate in meetings and seminars through video conferencing.

This is an attractive option for individuals who are already well into their career and may not be in a position to leave a job and be a full-time student but want to further their education. Often, those in industry have some support from their employer to complete a graduate degree, just like any other relevant training or professional development activities. Smith said the program has met enrollment goals, so far but that the university would like to increase participation from international students. “We believe that this completely distance program in plant breeding has and will continue to impact the ability of Texas A&M University to contribute to reducing poverty and hunger worldwide through training plant breeders who will improve the yield potential and product quality of agronomic and horticultural plants.”

Corrie Hopkins, who works with the Discovery Program at Monsanto Company in Galena, MD is also a Ph.D. student in the Texas A&M distance program. Hopkins completed a master’s degree through a distance program offered by the University of Nebraska. She wanted to pursue a Ph.D. and found that Texas A&M was the only program with a distance option. Having a full-time job and being a student can be intense, but the flexibility to do the coursework remotely makes it possible for Hopkins, and students in similar situations, to advance their education and careers without putting their lives on hold.

Hopkins has an interesting perspective, being both an industry professional and student simultaneously. She said one of the big differences she sees in the mentality of students and academics compared with those in industry is feeling the need to “do it all” when conducting research. While it is valuable for students to learn experimental design, field and lab methods, and how to conduct analyses, individuals who go on to careers with global organizations may find that they are less involved in every step of the process. Hopkins feels that Ph.D. students in plant breeding would also benefit from training in how to work with a team, how to delegate tasks, and how to lead people.

The success of the Texas A&M distance program may serve as a model for other programs—not just plant breeding, but broadly across agronomy and environmental sciences. Higher education is already making changes in response to technology and may need to make additional changes to best prepare students for a wider range of employment opportunities. However, changing how education and research are funded would be a slow process and requires buy-in from researchers, educators, and administration. Discussions like the one at the 2017 ASA, CSSA, and SSSA International Annual Meeting in Tampa are a starting point for collaboration, and further dialog across academics, industry, non-profits, and students can help to develop new methods that benefit all stakeholders.