

STRATEGIES TO OVERCOME ENROLLMENT CHALLENGES FOR PLANT SCIENCE PROGRAMS

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Background

The foundation of the current Division of Plant Science and Technology (DPST) was laid, when in 2005, four former independent departments (Agronomy, Entomology, Horticulture, and Plant Pathology) were merged into the Division of Plant Sciences. In 2021, after a structural realignment within the College of Agriculture, Food and Natural Resources (CAFNR), the Agricultural Systems Technology (AST) Program was integrated into DPST. DPST serves, with its faculty and staff members, all three missions of a land-grant university - providing accessible educational opportunities for undergraduate and graduate students (Teaching and Advising), conducting applied and basic research (Research and Scholarly Work), and delivering unbiased research-based information to enhance the quality of life and economic well-being of all Missouri citizens (Extension). The main educational programs in DPST include two BS degree programs in Plant Sciences and in Agricultural Systems Technology, and a MS and PhD program in Plant, Insect and Microbial Sciences. Our programs, for example, compete in Missouri with an Environmental Plant Science program at Missouri State, and an Associate of Science program in Agricultural Engineering Technology at Ranken Technical College for students.

The Problem Defined

Agriculture in the 21st century faces multiple challenges, and this will require a growing number of scientists, who are trained in agriculture, and who have the required interdisciplinary skill set to address critical problems in agricultural productivity and food security. In addition to the current student recruitment challenges that each unit on campus faces as the result of a steep decline of high school students who enroll in traditional 4-Year college degree programs (higher tuition costs, pandemic effects, minority and higher-income to lower-income gaps particularly in STEM disciplines, stronger competition with professional schools and online providers), traditional plant science degree programs must overcome additional recruitment hurdles (see below).

Typical misconceptions

- Low tech, old-fashioned degree
- Relevant degree only when I want to work on a farm



Farming community

- The number of farms dropped by 7.8% to 88,000 between 2017 and 2024
- Reduction in net farm income
- Need to recruit more urban students



Increasing competition

- Associate degree programs
- Industry offers their own training programs and hires high school grad.



Other challenges

- Low start salaries
- Plant Science is not a feeder program



Particularly the student numbers in the plant sciences are declining, due to a greater preference of students for animal and medically based degrees, disengagement from plant science at school, and narrowing of plant-based undergraduate curricula (Levesley *et al.*, 2014). According to the USDA, only 61%

of the expected 57,900 average annual openings can be filled with new U.S. graduates with expertise in agriculture or related sciences, and it is expected that for college graduates with a bachelor's or higher degree, employment opportunities in soil and plant sciences will grow by 8% from 2021 to 2031, faster than the average for other occupations (U.S. Bureau of Labor Statistics, 2023). Students from urban areas often have misconceptions about agriculture, and see the agricultural industry as antiquated and unsophisticated, and farming as old-fashioned and low tech. Particularly the more applied plant science areas are vulnerable, due to a clear preference in the research focus of plant science graduate students towards molecular biology/genetics/biotechnology due to better postdoctoral and career opportunities after graduation. An additional challenge is that the number of farms in Missouri have decreased, and this also reduces the number of potential students, who traditionally would have chosen a plant science degree program. In contrast to plant science, animal science can more easily compensate student losses from traditional student markets. Animal science is a feeder program that is specifically designed to prepare students for higher-level programs, such as veterinary school degrees or biomedical degrees. Another challenge is that the entry level salary after a BS Plant Sciences degree are still low, and for many students, the potential salary after graduation plays a key role for degree choice. Key to address these enrollment challenges is to transform our more traditional plant science curriculum towards a curriculum that is attractive for rural and for urban student populations and to expand or reshape our undergraduate and graduate degree programs (see plans below).

DPST's strategies to address enrollment challenges

- ✓ **Recruitment of an academic advisor who also coordinates recruitment efforts.** Academic advisors play a key role in student success. Compared to regular faculty advisors, academic advisors are better able to help students to navigate academic requirements and career planning and can lead to higher student retention and educational success by fostering a sense of belonging. They can build positive relationships with prospective students and their parents and can significantly contribute to making degree programs more appealing. We were able to recruit an excellent academic advisor for our program, who clearly made a difference in terms of our recruitment strategies and the success of our advising program.
- ✓ **Establish a team of student ambassadors.** Student ambassadors can provide a much more relatable and trustworthy perspective for prospective students and contribute to student community building and overall student experience. Our student ambassadors have helped to get our students more engaged and to develop a stronger sense of belonging.
- ✓ **Use of relevant social media platforms to attract students.** We have grown our social media presence (Instagram, Facebook, TikTok) substantially. Social media can help to reach prospective students where they are and allow us to showcase campus life, and share successes and stories about our students, and the opportunities they will have when they are enrolled in our program.
- ✓ **Develop faculty into better program advocates.** Tuition and fees currently fund 62% of the University of Missouri's general operating expenses, while state appropriations and overhead only contribute 30% or 8%, respectively. This should illustrate to faculty why student enrollment plays a significant role for DPST's overall budget allocation. However, not all faculty members are equally engaged in recruitment efforts, and particularly some of our highly research active faculty members don't see student recruitment efforts as part of their job responsibility. Many factors contribute to this lack of engagement, for example inexperience, a lack in understanding how they can help, and a lack of involvement in our undergraduate programs. We hope to address this challenge by mandatory training and brainstorming sessions at our next faculty retreat, and by taking this service to the Division into stronger consideration for annual performance evaluations or merit salary increases.
- ✓ **Strengthening of partnerships with community colleges with relevant 2-year programs.** A stronger collaboration with community colleges is an untapped opportunity for DPST. Our program currently

does not have student credit transfer agreements with community colleges in the state, and transfer agreements would streamline the transfer process and can reduce the overall cost of education for students.

- ✓ **Certificate programs.** Certificate programs have advantages for students. Certificate programs allow students to gain industry-relevant skill sets through targeted 12- to 15-credit hour programs, to showcase these additional skill sets to future employers and help to set them apart from other applicants in competitive job markets, and to increase their earning potential. For DPST, certificate programs offer the opportunity to better market our programs, to improve the educational opportunities for our students, and to attract students from other disciplines into our program. We currently offer three certificate programs, Precision Agriculture Technology, Floral Artistry and Management, and Landscape Design. We will soon launch certificate programs in data science in the life sciences and urban agriculture, and certificate programs in plant biotechnology and enology and viticulture are in different planning stages. Particularly, our Floral Artistry and Management and Landscape Design certificate programs seem to be able to attract a significant number of students not only from plant sciences but also from other disciplines (e.g. hospitality management, and architectural studies).
- ✓ **General education courses.** We have increased our teaching efforts in general education courses. All MU students must take at least 9 science credits, and our general education courses were able to attract a significant number of students. Through general education courses, we were able to increase our student credit hour production and were able to introduce and to market plant sciences to many undeclared students and college students who are considering switching their major. Nationwide, about 20-50% of students start as undecided, and according to the Student Research Group, about 80% of college students switch their majors at least once, and about 10% of college students change their major more than once.
- ✓ **Strategic curriculum changes.** Every educational program must continuously adapt their curriculum to address changes in student and workforce demands. With the development of new certificate programs, we currently undergo more substantial changes in our undergraduate and graduate program. The goal of these curricula changes is to provide students with a better foundation in plant sciences, to bring previously outsourced courses back into the Division and to specifically adapt these courses to the needs of our students. To regain more control over our educational programs will also allow us to better assess the quality of our educational programs.
- ✓ **MS program in data science for life sciences.** We will soon launch an undergraduate certificate program in data science for life sciences. There is currently a high workforce demand for graduates with skills in data sciences, and while the number of data science programs in the U.S. have increased, there is still a strong need for data scientists who are truly interdisciplinarily trained and have a deep understanding of both disciplines. After the launch of the certificate program, we will continue to develop a non-thesis MS program that will be offered fully online with the goal of attracting non-traditional students who are currently employed in the biotech industry.
- ✓ **Accelerated 4+1 program.** Our next step is to develop an accelerated program that allows students to earn both a BS and MS degree in five years. To offer an accelerated program will help us to better market our program and will help our graduates to be more competitive in the job market also for higher paying jobs particularly in combination with the planned data science MS degree.