Science Societies

Mentoring graduate students to help them grow academically and personally

By Robert Horton

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Photo courtesy of Adobe Stock.

The column is brought to you by the Early Career Members Committee (ECMC), which serves members beginning their careers—new professionals and graduate students in agronomy, crop, soil, and environmental sciences. The ECMC consists of members from each of the three Societies who serve three-year terms. Learn more at **www.soils.org/membership/early-career**. This month, the Early Career Members Committee has invited Dr. Robert Horton to provide some perspectives for early career members on mentoring graduate students.

I am honored by the invitation to provide some advice to early career members. Many years have passed since my early career. I am now completing 40 years as a soil science faculty member, and during this time, I served as major professor for several M.S. and Ph.D. students and postdocs who now have established careers in soil science. More than 20 of my former students (that is, my academic "children") are currently faculty members who mentor their own students, and through them I now have more than 200 "grand-students."

Careful mentoring is essential because it has generational impacts. Therefore, it behooves us to think of mentoring graduate students more like familial relationships than like business deals. Just after I was hired at Iowa State University, I met Professor Emeritus Don Kirkham. I felt a bit intimated because Dr. Kirkham held enormous stature in the soil physics community while I was a new graduate just beginning my career. Dr.

Kirkham asked me who I had studied under, and I told him the names of my professors. He responded by saying that my M.S. professor was his former Ph.D. student, and my Ph.D. professor was a student of his former student, so he immediately identified me as his grand-student and great-grand-student. As we shook hands, my sense of intimidation vanished, and I immediately felt welcomed into his academic family.

Approaching mentoring as a rite of passage or entry port of students into one's academic family is far more rewarding and beneficial than viewing students as "worker bees" with a primary focus on short-term goals. Developing the mentoring relationship and serving students in a manner that helps them grow as people and scientists can bear healthy fruit—potentially for generations.

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My favorite part of my faculty job is mentoring graduate students and postdocs. My goal is to help each student grow as a person and as a scientist in preparation to successfully move to their next stage of life. I count it a blessing to have had the opportunity to mentor many outstanding people. I begin my mentoring advice by providing some background information on how I was mentored as a graduate student.

Authoritarian and Authority Mentorship

I studied for an M.S. degree in soil science at Texas A&M University under the direction of Dr. Cornelius van Bavel. Dr. van Bavel was a well-established, highly recognized expert in soil–plant–water relationships. I was a new graduate student with very little research experience. Dr. van Bavel provided me with a research assistantship to work on a project evaluating how well various mulch materials could help conserve fallow period soil water for the following crop. Dr. van Bavel was a no-nonsense adviser, and he expressed himself quite strongly in our relationship. We had weekly meetings at which I reported on my research progress, and he gave me directions on the next week's work. He carefully guided my research progress. If I progressed on the research, he complimented me, but sometimes there was yelling when I failed to fulfill the scheduled work. I refer to this type of mentoring as an **Authoritarian style**. The professor is the "boss" and the student is the "worker."

I studied for a Ph.D. degree in soil physics at New Mexico State University under the direction of Dr. Peter Wierenga. Dr. Wierenga had a somewhat hands-off approach in working with me. He told me that his office door was always open and that I could speak with him as needed. He also made it clear that he was not going to babysit me. As a Ph.D. student, it was my responsibility to select a research topic. He was not going to tell me what to do. He worked hard, and he expected me to work hard.

I refer to this type of mentoring as an **Authority style**. The professor is available to provide advice and guidance to the student while the student has quite a bit of freedom to explore, think, engage with, and take ownership of their research project.

On a personal level, I felt some interior shock (like, "Wow!") when I began my Ph.D. program because Dr. Wierenga's approach to mentoring was just about 180 degrees different from the approach used by Dr. van Bavel. In hindsight, I see that both styles were perfect for me in how each matched my own stages of development.

I experienced both styles of mentoring: Authoritarian and Authority. With the Authoritarian style, the mentor acts as a direct, hands-on leader. They know what needs to be done, and they direct the action of the student. This is more about telling a student what to do instead of asking the student what they think. This style is most appropriate when used for students who have little research experience. Because the student needs close guidance, this mentoring approach actually serves the student well during their early developmental stage. The downside of this approach comes when it is applied for too long. It tends to be controlling in nature and may not allow a maturing student the proper opportunities to grow and develop. More experienced Ph.D. students may feel oppressed by this mentoring style. The work environment takes on an uncomfortable, stranglehold feel—like a necktie that is too tight.

In contrast, the Authority style of mentoring gives a wide swath of freedom to the student. More experienced students usually welcome this approach because it provides them increased opportunities to grow and develop as seasoned scientists. An Authority-style mentor does not ignore their students; rather, they purposely step back to give the students an opportunity to take ownership of their research project. The mentor serves the student by acting as a resource of experience and insight and collaborates *with* the student on a project. Empowering students can build their self-confidence. This is a relational mentoring style that focuses on teamwork. It is important to understand that the Authority style encourages a student to think, make suggestions, and propose ideas and directions, but the student is not totally independent. To succeed, this mentoring style requires a healthy interdependence, which includes the kinds of talks, evaluations, and decision points that build deep trust in the mentor–mentee relationship.

"When matched well to the developmental stage of a student, both Authoritarian and Authority mentoring styles can effectively serve students."

The Reverse Funnel Approach

We are all familiar with how a funnel works. The neck of the funnel directs liquid from its mouth into another container. The “reverse funnel” mentoring approach starts with a horizontally positioned funnel.

Imagine a beginning student entering the funnel neck, and as the student gains research experience, they advance from left to right through the neck and out of the mouth. The funnel walls represent boundaries placed on the student while the space between the walls represents the range of freedom given to the student. Note that as the student advances out of the neck, the walls are further apart, so there is greater freedom.



“Reverse Funnel” mentorship sees a student move from the confines of the narrow neck of the funnel into the relative freedom of the funnel’s broad opening. Photo courtesy of Flickr/Mike Finn.

A new student with little research experience begins in the funnel neck. This indicates that the mentor creates tight boundaries for the student. The mentor must carefully guide and coach the student in the early stage, helping the student form good research habits and experience. Perhaps this represents a new M.S. student. With time, the student emerges from the neck as they grow in knowledge, skills, and experience. The tight research boundaries on the student’s research activities begin to loosen. In discussions, the mentor starts to encourage the student to be the first to express ideas and concerns about the project, rather than telling the student what to do and how to do it. As the student continues to advance, the boundaries continue to expand and the mentor affords the student more freedom to lead the discussion, planning, and implementation of research. This stage might include senior M.S. students and Ph.D. students. Finally, by graduation, the student is fully prepared to exit the funnel and move forward to the next stage of their career, including the possibility of mentoring their own students.

How I Mentor Graduate Students

Early in my career as a mentor, I acted as the boss of my group, like an authoritarian. I gave the orders, and I expected my students to obey them. As I gained experience in advising students, I chose to better serve my students by listening to them and empowering them, acting more like an authority and a resource. I am particularly drawn to the Authority mentoring style because at its heart, it flips the script that says the mentor should make all the research decisions due to their greater experience. Instead, the Authority-style mentor purposely chooses to serve the student by requiring the

student to express themself first before providing input.

The greatest joy of my career is working with graduate students and young scientists. I have learned that effective mentoring is a labor of love, and the fruit of purposeful mentoring is its positive impact on the next generation of scientists, which in turn impacts the following generation, all the way down the academic family tree.

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