

WHAT WORKS

WEAVING MENTORING INTO TEACHING,
RESEARCH, AND SERVICE



John Cabra, Julia Figliotti, and Andy Burnett

knowinnovation

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HOW DO YOU USE THIS BOOK?

This book is really two books in one. The first part of the book consists of stories that our interviewees have told us about what worked for them. The second part of the book comprises the nuggets that we extracted from the stories. We have organized them into broad categories, just to make it easier to find useful starting points.

We see the book being used in two different, but complementary ways:

1. As a source of inspiration, and motivation. The stories are organized alphabetically, so you can dip in anywhere. The key point is to find a story that resonates for you.
2. As a guide to improving some specific situation. Have a look at the categories, pick the one that you think best fits your situation, and read some of the advice.

As you go through the book put a Post-it next to the mentoring ideas that stand out for you. Then, start with one that would be easy for you to implement. For example, perhaps you like the idea of having a mentee co-present a poster session with you.

And, just because we can't limit ourselves to only two ideas, we offer you one last thought. An entirely different approach to using this book would be to take stock of what you already do well to mentor others. Let the ideas listed in the book serve as grateful reminders of what you are already doing well. Then, challenge yourself to find ways to do those things more frequently, or ways to do them even better. There are so many ideas that you can easily shift or adjust so they fit perfectly in your mentoring approach. We ask that you keep open and let the ideas from your peers spark your imagination!



“AS YOU GO THROUGH THE BOOK PUT A POST-IT NEXT TO THE MENTORING IDEAS THAT STAND OUT FOR YOU. THEN, START WITH ONE THAT WOULD BE EASY FOR YOU TO IMPLEMENT.”



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INTRODUCTION



Imagine, if you would, traveling to another country. You enrolled in an exchange program with a university located in Nicaragua. This is your first trip to another country. You are excited, yet nervous, for so many reasons.

One, a family, with whom you will be staying, will meet you at the airport; you have never met them before and they do not share your language. Two, the norms that are followed by Nicaraguans are not similar to yours. In fact, you are accustomed to a way of life that is more prescribed and linear, while over there, the customs are more idiosyncratic. Three, you are used to having people close to you provide you direction. Not over there. You are on your own to figure out administrative details concerning school, transportation, and bill payments, just to name a few examples. A few weeks into your trip and the inability to understand the new way of life begins to ignite disorientation. Frustration settles in, as the liberties that you enjoyed at home are not the same. Your Spanish “proficiency” turns out to be nowhere near the level you need to get by. All at once, you begin grieving the loss

of your home. Your confidence is derailed because you just don't appear to have the life skills and resources to succeed in this new world, which, of course, stirs fears and anxieties.

Some readers may think this example is too exaggerated to fit in an academic context. We would counter this view by suggesting that the feelings new students encounter when transitioning to university life, from high school life, is really not too different. We would argue that for minorities, more often than anyone would like to think, the feelings are more acute; that one's thinking is overwhelmed by emotions in a manner that undermines effective decisions and progress towards meaningful academic goals.

Complexity does not need to stem from an experience overseas. The source may very well originate from issues related to a student's home environment. Regardless, countless stories have made their rounds in social media and in autobiographical accounts of economically disadvantaged individuals who credit a mentor for making a critically important difference in their lives.¹ Does this read in a familiar manner to you? Does this help you to recognize the role you have played in students' lives?

¹ Lefkowitz, B. (1986). *Tough change: Growing up on your own in America*. New York: Free Press.

Does it make you want to do more with the students that you may not realize are timidly awaiting your help?

We produced a body of knowledge that would help individual faculty members answer the question, “What one thing could I do - immediately - in my lab or class that would help to broaden participation through mentoring?” Individually, these changes would only have a small impact, but implemented across the nation, they could play a significant role in making STEM programs a more diverse community.

We interviewed faculty members with experience mentoring underrepresented minorities to find out what worked for them.

The specific output of this book comprises:

- 1.** a list containing the best practices identified by the participants who shared their stories with us;
- 2.** a reason to bring together faculty and staff that work on the front lines who are willing to engage in conversation about how to broaden participation further; and
- 3.** a springboard to expand the list of best practices.

For many institutes of higher education, however, the challenge to enhance underrepresented student engagement has become overwhelming. There are so many different and interlocking pieces of the problem that the issue can appear to be almost unsolvable. And yet, every day, people are actively engaging in activities that are broadening participation in the sciences. These people include faculty members, prospective and actual students, society representatives, high school teachers, and a myriad of other stakeholders. Some of these people are engaged in systemic change, but many are working on their own, and have developed approaches that work within their specific community or unit. The limited size and nature of their actions means that they are rarely transmitted beyond their immediate context. In fact, many people don't even realize that their actions are unusual and impressive because it is simply "the way they do things." We set out to find out more about these activities by capturing the thoughts of the few who shared their stories with us.

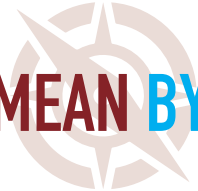
To capture the unusual and impressive actions, we integrated Appreciative Inquiry (AI) into our interview approach. Appreciative Inquiry, in its simplest form, aims to support effective change by focusing on the positive question of "What is working?" The answers to that question then allow people to draw generalized lessons that can then

be adapted for other contexts. It is our intention with this book to provide examples of best practices that could be adopted by institutions as part of their internal broadening participation process.





WHAT DO WE MEAN BY MENTORING?



Identifying the benefits of mentoring on a student's career advancement is not a challenge. Mentoring makes sense and is widely acknowledged to also have an impact on other aspects of a student's life, such as everyday situations and specific class assignments. To the reader, mentoring may appear to only benefit the student. However, in conversations with faculty who have mentored, they are quick to respond that they, too, benefit, as they find the experience to be fulfilling. Generally, mentors reflect on their own experiences from when they were mentored and find it important to repay these deeds. Generally, mentors have an altruistic nature about them.

And while mentors have many functions, their key functions do involve teaching tools and techniques in some form that can be compared to an apprenticeship. And of course, people are complex beings and may naturally encounter challenges at home, work, or school that may bother them. Here is where a mentor further functions as a counselor or a source of support; depending on the challenge, a mentor

just might be the person that could save a life as a result of an intervention involving campus experts. On a lighter note, mentors are connected and can provide a network that students might access when seeking support for an assignment, research, or job opportunities. As an associate of ours once asserted, teachers grow colleagues. And to that end, a function of mentoring does not necessarily have to stop after graduation. There is no shortage of stories of mentors describing enriching partnerships with their mentees, in which they publish books, co-deliver workshops, engage in service, and form friendships long after graduation.

Yet trends suggest that a need for mentors to support underrepresented minorities within higher education is greater than ever. Notice the trends that the National Academy of Sciences uncovered in their 2011 report *Expanding Underrepresented Minority Participation* [4]:



“MENTORS ARE CONNECTED AND CAN PROVIDE A NETWORK THAT STUDENTS MIGHT ACCESS WHEN SEEKING SUPPORT FOR AN ASSIGNMENT, RESEARCH, OR JOB OPPORTUNITIES.”

- Employers can't find enough skilled labor to fill jobs
- Employees do not have the soft skills to handle the fundamentals of office life
- Graduates are not prepared to handle the complexity and uncertainty generated by organizations that expect new hires to hit the road running
- Colleges are not providing real - and enough - support during the college experience
- The number of college-ready students is declining
- U.S. students continue to fall in global rankings on STEM subjects

In response to these trends, the National Academy of Sciences advanced a clear argument for the urgent need to broaden participation within STEM.

The report's authors took great pains to emphasize that their clarion call was by no means the first. The reactions at the national scale were echoed at state and regional levels too. The vast majority of educational institutions have produced guidelines [5] and frameworks to encourage diversity in all aspects of their work. And progress against

these objectives is usually monitored at the highest levels within the institutions.

Not surprisingly, the very slow rate of improvement has led to many wide-ranging reviews of the barriers to inclusion, and the Academy's report adds to the existing body of work by recommending a number of strategic changes that would positively impact the overall supply chain of scientific talent.

If demand for mentors continues to outweigh the supply, then this gap may have harmful consequences for the career development of students who benefit from faculty collaboration. Such experiences are central to making a lasting difference to underrepresented minority students. The gap is alarming and for that reason, funding institutes continue to grant awards to explore solutions that effectively broaden participation of these students.



WHAT DO WE MEAN BY BROADENING PARTICIPATION?

Broadening participation is a problem that can be usefully addressed at many levels, from the whole system through to individual actors. But to address the problem, a definition of broadening participation might serve as a useful guide toward solutions. Here is the definition the National Science Foundation provides:

Broadening Participation refers to increasing the diversity and number of individuals, geographic regions, types of institutions, and disciplines participating in STEM in order to close achievement gaps within the STEM fields.


NSF Education and Human Resources directorate (2015)

Other scholars² went as far as to illustrate four areas where a flow of potential broadening participation influences can occur.

- Community Outreach/Dissemination
- Potential Societal Benefit
- Building Infrastructure
- Integrating Research and Training

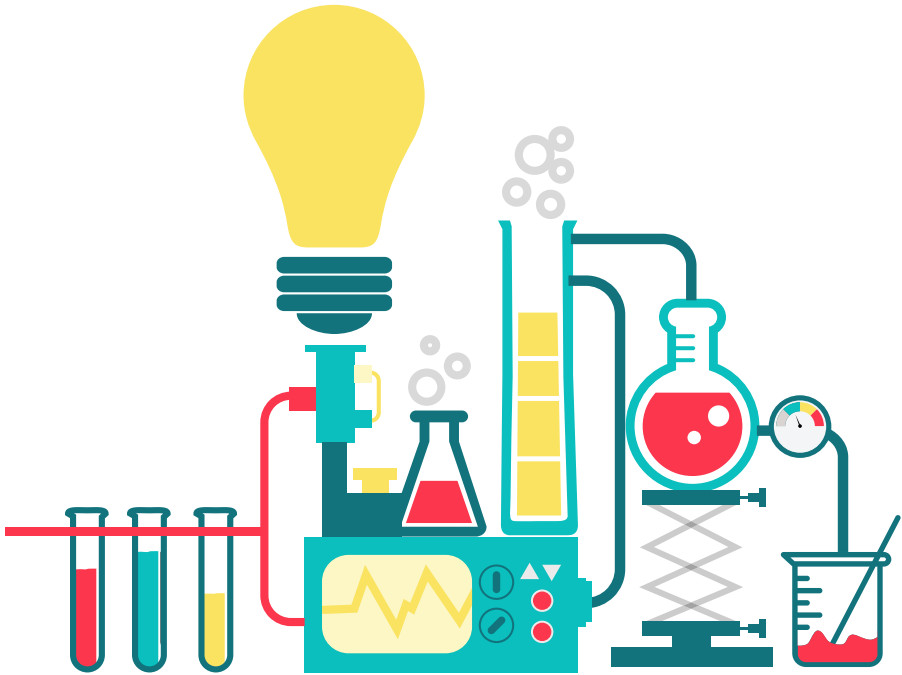
For each area of focus, broadening participation efforts might close the achievement gap at three units of analysis, namely at the individual, institutional, and geographic levels. For example, observing how nature solves problems, as a means to find more ways to involve K-12 students

² Clewell, B. & Fortenberry, N. (Eds.). (Jun 30, 2009). Framework for evaluating impacts of broadening participation projects.



“PEOPLE ARE COMPLEX BEINGS AND MAY NATURALLY ENCOUNTER CHALLENGES AT HOME, WORK, OR SCHOOL THAT MAY BOTHER THEM.”

in their science museum field trips, is a technique at the individual unit of analysis within the **Community Outreach** area. An individual-level example of **Integrating Research and Training** might be designing a classroom safe space for at-risk students that is based on effectiveness studies of a creative thinking course. An institutional-level example of **Building Structure** is a research design that examines how creative problem solving tools relate to attrition and graduation rates. A geographic-level example of **Potential Societal Benefit** is the discovery of a solution that can improve the lives of many people.







TALES FROM THE FRONT LINE

Over the last year we have had the chance to talk with many interesting, enthusiastic, and ingenious individuals. From the mouths of our interviewees, we have collected habits, environments, tools, and processes that can help other mentors broaden participation in underrepresented minorities in the scientific realm.

Before diving into those collections, we wanted to share with you the stories themselves: who the mentors are, the situations that their students were in, the challenges they faced, and the ways they overcame them. Here you will find narrative accounts of each mentor's success. We hope that you can read them and find wisdom, humor, and inspiration.





Emilio Bruna has the best job in the world: he is a faculty member at the University of Florida, but more importantly, he is a mentor.

When he was just starting off in the field of mentoring, his very first PhD student, Christine, became pregnant during her last year in the program. Understandably, she was concerned about finishing on time, if at all. But under Bruna's guidance, Christine was able to stick to a plan that worked for her, and navigate through the remaining fieldwork. She completed her PhD on time and, beyond that, won the Marianne Schmink Outstanding Dissertation Award.

Bruna has always been proud of Christine's accomplishment, but not because of his own role in it. His student faced a challenge and personally realized that she could overcome it. "And others saw her do it," he says, "and do it award-winning well. Christine has become a real role model for other students in our program."

Bruna is a firm believer in what he calls “Imposter Syndrome” – a condition where students think they won’t fit in, don’t deserve what they’ve gotten, or generally won’t make it. He admits to suffering from the syndrome himself. “To this day I’m waiting for UC Davis to send me a bill,” he laughs, “because they accidentally gave the fellowship to the wrong person. I always felt like I was the dumbest person in the room in graduate school.” And because of his personal experience with Imposter Syndrome, Bruna knows how to handle it with his students: by sharing his own insecurities.

“We all have stories like that,” Bruna says. “Self-deprecating mentorship, if it’s sincere, works really well, because it shows people that we suffer the same stress. More important messages are about the frailties that we all have.” In fact, Bruna believes that a large part of his job is to make sure that his students can get feedback – not necessarily on their scientific studies, but on mental wellness, therapy options, and how to deal with the stresses in their lives.

In general, Bruna tries to treat his students like colleagues. “I’ve been very lucky to have students that I’ve learned a lot from,” he says – and he’s not afraid to admit when he needs to learn about something. “I’m really in tune with the things I’m good at, and also the things I’m

bad at,” says Bruna, adding that asking for help is better than struggling alone.

In fact, a cooperative atmosphere is what Bruna strives to provide in his lab. “We’re here for each other as a family,” he says, citing compassion and understanding as keys to mentoring success. “It’s okay to be really proud and excited about your accomplishments, and to tell people about them. There’s a lot of reflected glory in our lab.” And it’s also important, advises Bruna, to remember that there are many paths to an end goal – some take a bit longer than others, but the destination remains the same. “Let’s not take ourselves too seriously,” he chides. “We study bugs, people.”

Bruna keeps a door-policy: when the door is open, students can come in to chat about anything; half-closed, and the appointment should be urgent; and if the door is closed, Bruna is usually battling a deadline. “So if you’re going to faint, try not to hit the door on your way down,” he laughs.

“Mentors are busy all the time,” says Bruna. “We’re stressed all the time, and we have no money for grants – but there is no place better anywhere in the world. If we can figure out a way that other people can enjoy this job as much as I do, then we should do it. This is an opportunity to tell people that this is the best job there is.”



CHECO COLON-GAUD

Checo Colon-Gaud approaches mentoring like a father, an older brother, and a fun uncle, all rolled into one. So when one of his graduating undergraduate students decided to take a semester off and visit South America before graduate school, Colon-Gaud had mixed feelings about it.

"In my mind I was thinking, that's great!" he recalls. "But as a parental figure, I told him he was on track, and to make sure he came back and stayed on track. It was a little scary." The student's parents even reached out to Colon-Gaud, asking if there was anything he could do to persuade their son not to go. But that didn't feel right to the mentor.

"I told him to go and chase his dragon," says Colon-Gaud. And that's exactly what he did. But to everyone's surprise, the young man returned early from his travels. "He missed the work," Colon-Gaud laughs. "He missed the research. It all worked out in the end." The student's parents even wrote a thank you letter, recalls Colon-Gaud, thanking him for letting their son realize that he could go and chase the

dragon. According to Colon-Gaud, “You don’t always realize the impact of what you say.” Now, as a result of Colon-Gaud’s influence, the young man is a research scientist leading the Department in Aquatic Invertebrate Studies. “He’s living the dream,” says Colon-Gaud proudly. “He’s actually doing it!”

Colon-Gaud sees a lot of himself in his mentees: coming from different backgrounds and not having the greatest grades, but having the drive. “People gave me opportunities that opened doors,” he says, “and I try to do the same. Broadening participation is important to me because I’m a product of it.” Colon-Gaud gives his students the freedom to be themselves, and treats them like people – not just numbers in the classroom or the lab. “I try to be personable with them,” he says, emphasizing the importance of acknowledging the good work that his students are doing. “I want them to feel that they’re just as integral to the lab as I want to be.”

From the beginning of the mentoring relationship, Colon-Gaud tries to get his students involved. “The journey has got to be personalized for each of them,” he says. “They can’t all get to that mountain at the same time.” And so, Colon-Gaud begins with a hands-on approach, and transitions into cruise control throughout his time with the students.

Colon-Gaud encourages a relaxed, family-oriented environment in his lab. His office is filled with color and the occasional Bob Marley poster, and he requires music to be playing in the lab when his students are performing tedious tasks. "It's high-energy," he says, "but not overly intense." To encourage the family feel, Colon-Gaud invites his students over for dinner and encourages them to really get to know one another.

Colon-Gaud hopes that mentoring will soon get the attention it deserves. "I really wish we had the opportunity to work with every student until their cup was entirely full," he says, citing the importance of support from universities and fellow faculty. According to Colon-Gaud, it is important to engage students with all faculty members, and encourage them to work hard for their opportunities – regardless of accent, nationality, or representation. And as mentors, Colon-Gaud recommends simply being excited about your field of study, and igniting that passion in your students. "I tell my students, if you can go out and put your hands in the water and your feet in the mud, there's definitely a career for you in Aquatic Science."





Damon Mullis didn't know what he was getting into when he decided to go back to undergraduate school in biology and fisheries as an adult. But his freshman year, he found a first-year professor who would change his entire life.

Damon took an environmental biology class with Checo Colon-Gaud that had over 200 people in it. He didn't expect to get noticed, he just expected to do well. Then, at an event for his daughter's ballet school he ran into his professor, whose daughter attended the same school. This chance interaction was the beginning of Damon's professional career.

Colon-Gaud was still settling in as a professor and needed help setting up his lab. After hearing the similarities between his own interests and Colon-Gaud's field of study, Damon immediately volunteered. "A lot of the time it's easy to be intimidated by professors," he says, "but he was just really open and inviting." According to Damon, the lab work started out with mostly menial tasks, and as his

interest and skills progressed, he was introduced to more advanced lab work.

“He does a really good job of explaining what we’re doing and why we’re doing it,” says Damon of Colon-Gaud. “He wants everyone to understand everything.” And so, as a volunteer with a mentor to train him along the way, Damon excelled quickly. “Checo expected a lot from me and he pushed me hard,” he says, “but it was never in a negative way. It got to the point where I just didn’t want to disappoint. He really cared about my success and was invested in it.”

Even when there were setbacks, Colon-Gaud helped Damon through. From a fear of public speaking to less-than-ideal writing communication skills, and even a failed first thesis, his mentor was there to help. “The patience was amazing,” Damon says. “If you cloned him, you’d have a lot of great mentors out there.”

According to Damon, Colon-Gaud strongly believes in a family environment, with little distinction between work and play. “He has barbecues and cookouts,” says Damon, “and when we’re out in the field we might bring fishing poles and just go fishing after.” It’s that environment and high-energy (yet laid back) personality that makes him so great at what

he does. "He's only been at it a few years," reflects Damon. "In thirty years... imagine. He's going to have a big impact on the world."

"I view the world completely differently because of him," Damon affirms. "He always preaches the interconnectedness of everything, in life and nature. That's how I see things now. I feel like I am a positive contribution to the world. I'm making my little difference. He's completely changed my life for the better."

In fact, Damon wants more people like Colon-Gaud out there, and he stresses the importance of mentor-matching programs for students who are unaware of the benefits. "It started with a chance meeting that changed my life forever," he says of his mentoring relationship with Colon-Gaud. "Maybe we should make those meetings not so chance."



“ I FEEL LIKE I AM A POSITIVE CONTRIBUTION TO THE WORLD. I’M MAKING MY LITTLE DIFFERENCE. HE’S COMPLETELY CHANGED MY LIFE FOR THE BETTER.”





Angello was a one in a million student – or at least, he was one in 60,000. As a sophomore in high school, Angello, a first-generation American, had to have brain surgery. He had an aneurysm that needed to be removed. His mother and step-father didn't speak English, so when his diagnosis and options were announced, they were announced to him – a sixteen-year-old boy, who already had too many responsibilities.

Fast-forward three years, when Angello met Cyndi Freeman at a workshop. A freshman at Ohio State University, Angello went through what many students experience: disengagement, and wondering, "Why am I here?" When he was re-introduced to Freeman the following year, at a workshop that she herself was running, she decided to step in.

As a mentor in the sciences at Ohio State, Freeman recognized the potential in Angello. She challenged him to enhance his own experiences outside of the classroom,

and to take some responsibility. With Freeman's influence, Angello applied for and was accepted into the Summer Research Opportunities Program at the University of Iowa. Uncertain and afraid to leave his comfort zone, Angello was reluctant to attend. But Freeman insisted, and Angello decided to attend the summer program – and continued to live outside of his comfort zone from then on.

So how do we encourage and mentor students in Angello's situation? According to Freeman, in an institution with 60,000 students, only one undergraduate Latino male is in computer science and engineering. "He's not going to find another Latino face. He's not going to find a Latino faculty member. He's the one. So when you find that student, and you're able to connect in a way that is personal and professional, it really means something."

Angello truly benefitted from Freeman's intervention. Aside from attending the Summer Research Opportunities Program, Angello conducted research at Purdue University, was awarded the Generation Google Scholarship, and is furthering his education with the PhD program in Computer Science and Engineering at the University of Illinois.

What was it that made Angello such a success story? Says Freeman, "I think one of the big pieces was forcing

him to go to Iowa.” Angello was accepted into a research program during the summer of his sophomore year, where the average tuition is \$15-20,000 per student. He left his comfort zone and his family for three months... and returned a conquering hero. From there he took off: networking with other students and encouraging them apply for programs, becoming a mentor himself. “There’s an African proverb: ‘You cannot be a prophet in your own village,’” recites Freeman. “At Iowa, Angello saw the reflection of himself in the eyes of others, and learned he was a star.”

We all know that one in 60,000 student, who is disengaged but has enormous potential. Why not tap that potential and see how many lives we can change?



THERE'S AN AFRICAN PROVERB: 'YOU CANNOT BE A PROPHET IN YOUR OWN VILLAGE,'"





ANGELLO ASTORGA

Angello was struggling. It was his freshman year as a Computer Science major at Ohio State University, and he had already acquired that label of being a “good student.” But even as a 4.0 student in high school with an Incoming Morill Scholarship to Ohio State, Angello was behind in his curriculum. His low ACT scores forced him to begin taking classes at a lower level than was fitting for his level of experience, which started his college career a semester behind where it should have begun. And as a good student, with a full ride scholarship, Angello sought out counseling services provided by the school to help him cope with his struggles. The counseling was a step in the right direction, but Angello felt as though he needed more support. He needed someone to hold him accountable.

In his sophomore year Angello met Cyndi Freeman, the Diversity Initiatives director at Ohio State. He was attending a workshop on seeking research opportunities when Freeman, the speaker, pointed him out and brought him to the front of the room. “If you’re dressed like this,” she said of Angello, who was wearing sweatpants

and a t-shirt, “you’re probably not going to get many opportunities.”

It was then that Angello knew he needed Freeman as a mentor. A strong personality, Freeman immediately encouraged Angello to seek out research opportunities and experiences. Feeling already overwhelmed with the hard work that was required to hold a strong 3.5 GPA, Angello put it off at first. His concerns stemmed from the difficulties he had gone through to obtain that GPA: taking remedial level courses, even though he had done well in those classes in high school, made him worry about the difficulty levels of more intense courses. But as he spent more time with Freeman, and as he followed more of her advice on surviving at Ohio State, he found that she was right. Freeman “held his hand” when he needed it, even taking him out to dinner when she saw he wasn’t eating well due to stress. She made him feel as though he was not alone in his struggle, and she encouraged him to apply for research opportunities and to take chances. And over the course of the next four years, Angello kept going back to Freeman – and he kept succeeding at whatever it was that she encouraged him to do, from coursework to research.

According to Angello, the plan that he had for himself was to go to college, get a degree, and return home to help his

family. A first-generation Latino student, Angello was forced to be the translator for his parents, neither of whom spoke any English. But Freeman encouraged him to apply for the Summer Research Opportunities Program, and changed his outlook on the ultimate plan. Now, he is a PhD student in the field of Computer Science at the University of Illinois – Urbana Champaign and a Google Generation Scholar, with the ultimate goal of becoming a faculty member and mentor in the future.

So what was it that made Freeman such a productive and effective mentor? Says Angello, “Cyndi reminded me of someone, like a strict family member, that’s just there... I wasn’t a scholar to her, or someone who would succeed eventually and be in a position to give back eventually. Cyndi cared, and that was nice. I’m most thankful for her ability to call me out when I was just complaining too much.” Aside from caring, Angello describes Freeman as resourceful and hands-on, someone who pushes you to seek more, excel, and advance. She is a problem-solver with a calming effect on her mentees, and she makes you want to come back for more guidance.

According to Angello, Freeman helped him to see that he wasn’t alone in his struggle. Her office and colleagues were professional, but inviting and personal at the same time. “Cyndi is very consistent,” he says. “She surrounds

herself with people who share her vision, and that helped me to trust her.” Angello felt free to show up at her office at any time, without an appointment. It was an encouraging environment and comforting. “You could just be yourself.”

When asked about the result of Freeman’s mentoring, Angello said without hesitation, “She helped me to see that I can actually do more good than just help my family... She had no doubts that I would succeed, regardless of what I did.” Because of Freeman’s mentoring and commitment, Angello now knows, “I can be a role model, or I can be that person that I would have liked to have had as a freshman. It’s about paying it back and paying it forward, and a really good way to do that is to be a faculty person.”

Angello believes that gaining and offering research experience is a major way to broaden participation in the sciences. Research is a way to promote independent learning while still offering support and guidance.

Of the mentoring experience, Angello says, “It should be a genuine experience. Mentees should want the help to ultimately become better professionals and individuals, not just to get ahead. Mentors should have the desire to help others become better people.” But overall, it is a process. And whether it is a long or short one, there has to be an element of patience.



A little over a year into his position as a Graduate Research Associate at Ohio State University, Donald Gillis was pushed into a mentoring role: He was asked to guide three students from the University of Puerto Rico through a ten-week summer research experience.

“My advisor put me in that position because he was confident in my abilities to go through with it,” says Gillis. “He wanted me to show myself that I was perfectly capable of mentoring those students.” And he was – through the ten-week program, Gillis was not only able to help the students understand the processes of research and experimentation, he also built personal relationships and friendships that allowed him to connect with them more productively on a professional level.

New to the role of a mentor, Gillis didn’t think he’d be as good at it as he was. He attributes part of his success to his own advisor. “He’s really good at adapting his teaching style to fit the different learning styles of his students,” says Gillis,

citing the not-uncommon lab occurrence of his advisor describing what he wanted done to his auditory learners, then moving to his visual learners with a notepad and delivering his assignments in a completely different way. “He made sure everyone understood what they needed to do,” Gillis recalls.

But it wasn’t just Gillis’ ability to adapt his mentoring style to reflect his mentees’ needs. Another contributing factor to the successful experience was the age similarity between himself and his mentees: there were no more than two years between all of them. “I felt like I understood them more, and like I could relate to them more on that level.”

And relate to them he did, on that level and more. “We were all minorities in that situation, at Ohio State, in that program. It was easier for us to get together and develop those relationships.” It helped, according to Gillis, that there were not too many distractions in the town of Wooster, where the summer research program took place. Due to the isolation of the town, Gillis was able to be more involved. He took his students out to dinner, or invited them over to his house. “If you’re going to be effective as a mentor or work with anyone on a team,” he says, “you have to know them at a more personal level.”

Which is exactly what Gillis decided to do – and it paid off. While trying to explain a particularly difficult concept, Gillis recalls, he took the information and likened it to a videogame that he knew his students enjoyed playing. This common ground got the idea across in a much smoother, more applicable manner than the textbook definition he had been attempting. “I took information and presented it in a different way, that they were more familiar with and more comfortable with,” Gillis says. “I was only able to do that because I had developed that personal relationship with them.”

“I love science, and I love what I do,” says Gillis, “and I was so excited and so ready to share that passion and that love that I have for science with someone else. That determination and drive that I have in myself was the main cause of success, because I was able to instill that in my students. And one thing that I found surprising was that I actually liked to teach. Actually being in that position made me fall in love with the idea of being an educator.”





Alvin Holder is all about positivity. Whether in his personal or professional life, Holder focuses his energy on happiness and optimism. And he applies the same courtesy to his students.

Holder hails from Barbados, and he earned his B.Sc. in Special Chemistry and Ph.D. in Inorganic Chemistry at the University of the West Indies, Mona Campus in Jamaica. He then moved on to become a faculty member at the University of the West Indies, Cave Hill Campus in Barbados. But when he came to work in the United States, he had to start from the bottom and work his way back up. He was hired on as a postdoctoral fellow and had to work hard at that position before he was granted the title of “faculty member.” It is that same hard work that he encourages in his students, and it’s the same hard work that he expected from Dorothy Horton and Toyketa Horne.

Dorothy and Toyketa were minority undergraduate students under Holder’s mentorship. Along with several other researchers (including Holder himself), they contributed

significantly to the production of a top-quality publication. Holder provided minimal supervision in his lab, and only gave his instructions once. Both women have now completed their Masters degrees, and are considering PhDs.

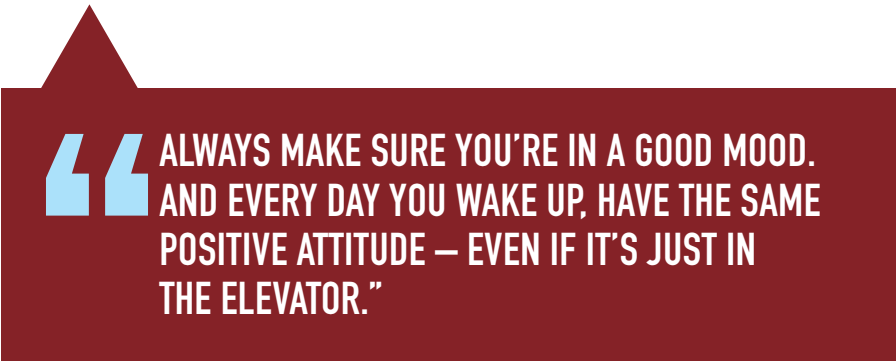
"I want it done right," he says with a smile, "but even a negative result is a result." And that, according to Holder, is something to learn from. In fact, Holder encourages his students to document all of their failures, in their professional and personal lives. This helps them to learn from their mistakes and avoid similar situations in the future.

In his laboratory, Holder pushes for clinical, precise work. "If you don't follow the recipe," he says, "the cake is going to fail." But that's not all he expects within the lab. "Safety is paramount," he adds. "You have to have common sense first."

In his students, Holder encourages respect for others – peers and superiors alike. To him, the team is the most important part of a laboratory, and the most important part of a project. "Treat everyone in the group as equals," says Holder. "Don't have favorites." From constructive criticism to shaking hands after a disagreement, collaboration is key, as is giving credit where credit is due.

But most of all, Holder wants his students – and everyone – to experience and live by the positivity that he himself exemplifies. “Don’t work when you’re hungry or tired,” he advises. “Always make sure you’re in a good mood. And every day you wake up, have the same positive attitude – even if it’s just in the elevator.”

“As long as you’re working for me, if you don’t achieve anything other than work, you haven’t done any work.” Holder’s message rings loud and clear: the mentoring process is about more than work. It is about gaining insights and bettering ourselves, and those around us.



“ ALWAYS MAKE SURE YOU’RE IN A GOOD MOOD. AND EVERY DAY YOU WAKE UP, HAVE THE SAME POSITIVE ATTITUDE – EVEN IF IT’S JUST IN THE ELEVATOR.”





So often we see students come into college knowing exactly what they will be doing with their lives – but not what that they *want to do*. DiAnna Hynds, a mentor at Texas Woman’s University, has had more than her share with these types of students. Such was the case with Jo Contreras.

“I could tell from the moment I met her that she was a researcher,” recalls Hynds. The two first met when Jo became involved in several of Hynds’ training programs. A minority student with significant financial pressures, Jo was selected to be a part of many of these programs, including the NIH Bridges to the Baccalaureate program and the NSF Scholarships for STEM program. And the transformation, says Hynds, was astounding.

When Jo first came to Texas Woman’s University after attending a community college, she wanted to be a Physician’s Assistant. Or at least, that’s what her family wanted. Jo came from an economically disadvantaged family, and they were looking to her to get a job in

medicine, so she could financially support her family after college. That strong family connection and expectation is not uncommon with underrepresented minority students. Jo was on her own at the university: she had a clunky truck with terrible gas mileage, and she had a significant commute to school every day. It's no surprise that her goals were financially-oriented.

So Hynds listened to what she had to say. Jo spoke of her goal of becoming a PA, and her reasoning behind it. And when Hynds repeated back what Jo had said, she added one important sentence: "There's a difference between where you're looking to go and what you want to do." And from there, the change began.

"I have enough life experience to tell them to look forward and have something to look towards," Hynds explains. "Empowering is a big part of that." She encouraged Jo to explore the world of research – not just in her own lab at TWU, but through opportunities found at ABRCMS and Summer Research Experiences. These research experiences opened Jo's eyes to the fact that her research could, in fact, help her give back to her community – a realization much more transparent in the field of medicine. Once Jo caught the research bug, it became a matter of convincing her family that this was the right path for her.

So Hynds decided to invite Jo's mother to one of her daughter's research presentations at a regional. Not only was the presentation outstanding, it also won an award. This led to Jo's mother supporting her shift in career goals – or, as Hynds likes to put it, “the family buy-in.” Because of her guidance, Jo is now in a PhD program in the field of neuroscience.

When asked about her impact as a mentor, Hynds says, “I give them the tools to talk to their families and say, ‘This is really what I’m excited about, and I know it’s not what you envisioned for me, but this is how it’s going to help me, and this is what I’m going to do with it.’” Hynds also cites services offered by TWU to which she refers some of her struggling students, including writing services and counseling. But her main technique is to listen. “Don’t be afraid to get to know them on the personal level,” she advises. “That’s the thing that I find most helpful to me as a mentor: talking to that person and figuring out what their motivators are... what types of pressures they’re dealing with.” Hynds also encourages a non-threatening environment with a community vibe, but her advice comes with a note of caution:

“There is no one approach for everybody. So flexibility is one thing you have to work into your style.”





JOSÉ MANAUTOU

José Manautou is a special kind of mentor. Like most others in his field, he loves to help students succeed, and he goes out of his way to find the best opportunities for them. But what sets Manautou apart from the rest is this: he mentors because he was mentored.

As an undergraduate student in a pharmacy program, Manautou was a hard-working individual, trying to complete his bachelor's degree. But along the way, he met faculty members who saw a potential for him beyond that degree. They recognized his talents and nurtured him, encouraging him to put a lucrative career as a practicing pharmacist on hold and seek out more educational opportunities.

As a minority student from Puerto Rico, Manautou received scholarships that allowed him to continue his education. Because of the mentors present in his life, he went on to become the first PhD in his family, where medical and engineering professions were more common paths.

Now, as a mentor himself at the University of Connecticut, Manautou is trying to pass on what he learned from his experiences. Since his arrival at UConn, he has started a program that allows him to bring in pharmacy students from Puerto Rico to do lab research at the university in the summer. The first of those mentees has since returned to UConn to pursue a PhD, and is now a Senior Toxicologist at Proctor & Gamble. "It's interesting," says Manautou, "to see how you have such a profound influence on the personal and professional trajectory of the person you mentored."

When asked about the qualities that make him an effective mentor, Manautou cited his own background. Manautou wants his mentees to look at him, a Puerto Rican man, and think, "If he made it, I think there's hope and an opportunity for me to be like he is." It doesn't hurt, he adds, "being a former mentee and understanding what the needs of the students are."

According to Manautou, his PhD students are like family. The mentor-mentee relationship is not one that disappears after the diploma is received. He teaches them about his field of science, of course, but also how to network, how to contribute to the scientific community, and how to deal with and overcome adversities. But most importantly, says Manautou, "I give them a lot of independence and freedom."

I'm not a micromanager. They have the opportunity to explore things themselves and be creative."

Manautou admits that his mentoring process is an evolving one. What started off as a guidance of students from the start to the finish of a project has turned into a hierarchy of assistance. Newer students get one-on-one time, and lots of help. More experienced students are often present in the lab, helping those who are struggling and looking to Manautou for approval and guidance. But no matter what level the student, Manautou's door is always open.

"It will be very rare that I will say, 'Come back tomorrow, I can't deal with this right now,'" he says. "I had the luxury of doctoral and postdoctoral mentors who would stop whatever he was doing to tend my needs. And I think that gives you the level of comfort, having somebody that feels that your issue is so important that he needs to stop what he is doing at the moment. And that stays with you. You just take the best from the people that trained you, hoping that you integrate that into the way that you deal with your own students."

And so far, it seems to be working. One of Manautou's PhD trainees is now a faculty member in the School of Pharmacy at Rutgers University, and is also mentoring doctoral

candidates. This represents the third generation of this mentoring chain: what you learned from one mentor, you apply as a mentor.

So what qualities make a productive mentor? The answer, for Manautou, is simple: compassion and caring, and a safe environment. "People that receive that gift of good mentoring; they know what it is, and when they're in a position of giving back, they do it, and they do it with passion."

Looking back, it seems as though Manautou wouldn't change his experiences for anything. "I trained in science," he says, "but you have to be an expert in finances, you have to be a psychologist, you have to be an administrator, you have to be a lot of things that you have little training in... and when you're training students, there's a lot that you learn about human nature."

"It's something that we need to do," Manautou concludes, "and we need to be passionate about it. We have a responsibility to train the next generation of scientists... and we have an obligation to ensure that we have a diverse force of scientists working. So do the work with conviction, and do it with passion. Be passionate about it."

JULIA MASSIMELLI



With just one year to go before graduation, Julia Massimelli's TA came to her looking for help. She had been collecting data for her senior thesis, but her project was unsuccessful, leaving her with no project to submit before graduation. So with one year to go, Massimelli offered the student a project and gave her a preliminary defense date, where she would present her new project to the readers. But when the time came for the student to present the project, things did not go as planned.

"It was a disaster," Massimelli recalls. "It was very disorganized, and I realized it was going to be a very big challenge to have her in shape in three months." But that didn't stop her. Instead, Massimelli kicked it into high gear and went about getting to know her student. "You can't just mentor based on principles," she says. "You have to mentor based on what you know about that person."

What Massimelli discovered was that her student was not only disorganized, but she had relatively low self-

confidence. So little by little, Massimelli introduced new items to help her along. "I started to implement structure for her," she says, adding that she would create feasible deadlines that her student would be able to accomplish, "and I started focusing on positive things to bolster her self-confidence." When the student would accomplish a task or complete another section of her thesis, Massimelli was there with a congratulatory remark and verbal encouragement. "I knew she could do it," she recalls. "It was just a matter of finding a way to take out the things she was not doing right."

In the end, the hard work and support paid off. "Her thesis was phenomenal!" Massimelli says proudly. "She gave one of the best thesis presentations I've ever seen." Following the presentation, Massimelli encouraged her student to take the presentation to a conference. Once again, the young woman's self-confidence wavered, but with her mentor's support, she presented at the conference and even won an award. And now, the student is preparing for medical school.

As a mentor, Massimelli chooses to focus on her students as individuals. "Most of the mentors I had assumed that I was there because I wanted to be like them," she recalls from her own undergraduate career. "They had no idea who

I was and what sort of things worked for me. I promised myself that I would never do that.” Instead, she asks her students questions – lots and lots of questions. But more than simply asking questions, Massimelli actively observes and listens to what her students tell her. “It’s important to know where they’re coming from,” she says, referring to educational, familial, and cultural backgrounds. She then makes suggestions and highlights immediate goals, based on what her students are looking to do.

Massimelli believes in helping her students become the best that they wish to be, and she does so in an environment that is open and approachable. And when it comes to some of her colleagues’ more competitive approaches to mentoring and teaching, Massimelli disagrees. “In order to be competitive, you have to believe you can do it,” she says. “Sometimes minority students don’t have that. They’re first-generation college students. They just feel the pressure.”

Though mentoring can be difficult for everyone involved, Massimelli wouldn’t trade her role for anything. “It’s one of those jobs that you don’t get recognized for,” she says with a smile, “but it’s an amazing job that you can do for someone else.”





For Camille McKayle, mentoring relationships are the strongest when everyone involved walks away with more than they brought. Such was the case with her very first undergraduate mentee.

The student was a double major in Mathematics and Geology and was working on her senior thesis with McKayle. Her primary knowledge was in the field of geology, and McKayle, a mathematician, used her expertise to fill in any gaps along the way.

The balance, according to McKayle, was dynamic. "I felt like I was learning as much about the project as she was," the mentor says. "She got a really good project out of it, and she really understood it." The experience with that student, who went on to graduate school for Geology, taught McKayle quite a bit. "It reminded me that we can all learn from each other," she says.

The mentoring experience was successful for several reasons. "Part of it was what she brought to it," McKayle

begins, “which was enthusiasm. She was very energized and wanted to learn. She really wanted to know the material. It wasn’t just about getting the thesis done. She would’ve kept going if time wasn’t an issue.” And of course, much of the credit lies with McKayle. “I was very solid in what I needed to know from the mathematics perspective, so I felt that I had a lot to offer her in knowledge,” she says. “She gained a lot of confidence.”

McKayle tries to discover and provide what her students need from a mentor-mentee relationship, but she knows that she’s not perfect. “One of my weaknesses is that I don’t say enough that things are great,” she laughs. “I look at all of the great things and say, ‘That’s fine, now here’s what you need to work on.’ Sometimes you need to be painfully honest, but I think I can work on saying ‘Atta boy’ first.”

Whatever the case, McKayle wants her mentees to feel comfortable. That’s why she prefers to have her meetings outside of her office and, if possible, outside of the school. “I believe that people are more open outside of a work environment,” she says, adding that coffee shops are great places to connect with students on a professional level and get to know their interests. It’s in a laid-back meeting that the students reveal their true selves.

McKayle recalls the story of a business major in her mathematics course who had a passion for math. She asked him if he had considered switching his major – which he hadn't before then. "So he became a Math major and got a scholarship, and went onto graduate school in Math and got his Masters in Math," she says. "I think someone asks you what you're going to be when you grow up when you're five, and that's the track you've been on ever since. You don't even know about other possibilities. People might not see themselves in that way, and sometimes it helps for someone else to mention it to them."

"When you think about broadening participation," says McKayle, "it's really just about broadening options."



I BELIEVE THAT PEOPLE ARE MORE OPEN OUTSIDE OF A WORK ENVIRONMENT," SHE SAYS, ADDING THAT COFFEE SHOPS ARE GREAT PLACES TO CONNECT WITH STUDENTS ON A PROFESSIONAL LEVEL."





Amy McMillan is always on the lookout for “that thing.” It could be anything: taking meticulous notes, enthusiasm for the subject area, intrinsic motivation, or a general engagement. Whatever it is, “that thing” makes a student stand out from the crowd.

And that is exactly what she found in Sandra Apenteng. A very good student on track to enter the medical profession, Sandra was from Ghana and did not know who to talk to about her future. McMillan, Sandra’s professor in an introductory course, saw that she had “that thing” almost immediately. Sandra was enthusiastic and hard working, and effusive. “Just the sweetest kid,” McMillan recalls. So she asked Sandra to work with her in the lab.

“Had I not picked her out of a crowd, she would never have approached anybody,” McMillan says. Sandra was thrilled to be doing research, even though she knew nothing about it. It was the learning that motivated her, and she ended up being a great researcher. “The mentoring experience was not challenging,” recalls McMillan. “It’s just recognizing

that I'd opened up doors for her." And opening those doors proved to be just what Sandra needed: she was later accepted into the Connecticut School of Medicine.

Sandra was just one of McMillan's mentees. Some of them were great students, and some of them didn't perform so well in the classroom. But the ones that she chooses to work in her lab are those who catch her eye, regardless of grades or status. You guessed it: they all have "that thing."

"I don't see color," says McMillan. "I see the person. I don't even see that they flunked out of my class." What matters to her is who each student is, underneath the exterior. "You have to really let the student be the student," she reflects. "Let them be the person they are. And that's actually much more challenging than it sounds." McMillan also notes the importance of being flexible. "Every student is a different person," she says. "You've got to realize that your style may have to be modified."

Of her mentoring technique, McMillan notes, "I don't like to pry, but I listen. And I let them make mistakes. You can't sit there and hover and expect them to do everything right. That's not how we learned. I made every mistake in the book." Her emphasis on the importance of failure stems from her belief that, without being allowed to fail, we

will never perform at our full potential. “How can anyone perform at their optimum if they’re worried they’re going to make a mistake?”

In fact, McMillan’s belief in failure is so strong that she shares her own failures with her students. “Usually I share with them at least one major mistake I’ve made. I’ve made many,” she laughs, “so I can usually pick one that is appropriate.” McMillan tries to create an interactive and engaging environment, complete with peer-to-peer learning between students. It is also integral that the environment be non-threatening. “Humility is important,” she says. “You’re not always going to do it perfectly, and I’m okay with that.”

For her fellow mentors, the 2015 recipient of the President’s Award for Excellence as an Undergraduate Research Mentor, has a piece of advice: “Don’t let other experiences influence you, other than teaching you how to be better at it. You have to ask. You have to advocate. You have to be involved.”





Rodney Duvra was afraid of failure. And who can blame him? The idea of not achieving your goals, especially when you haven't thought of alternatives, can be incredibly daunting. That's where Amy McMillan came in.

"Our mentoring relationship didn't start out with the intention of being a mentoring relationship," he recalls. "I was her research student. But then it became one, when I needed the encouragement." Rodney initially considered himself one of McMillan's "bad" students. Then one day, she invited him to work in her lab. Confused, he asked her why.

"She told me I was doing very well, and even gave me examples of how," says Rodney. It was the encouragement that he needed, after feeling like he wasn't succeeding in the ways he had hoped. But more than just encouraging him to succeed, McMillan allowed him to fail. According to Rodney, the key to overcoming the fear of failure is "accepting that it's a possibility, but not letting it be so daunting that it gets in the way of actually doing it."

And it's not only McMillan's tolerance of failure that impacts her mentees in such a positive way. Despite his first impression that McMillan was strict, Rodney has only positive things to say about her. "I think she's an active listener," he says. "She's very genuine and sincere, and she's patient. She's really approachable." He highlights the importance of communication, especially during times of self-doubt. "Her listening and giving positive input and feedback helped out a lot, and it meant a lot to me," Rodney remembers. "I think that was the crux of making her feel like a mentor to me."

When asked about McMillan's mentoring process, Rodney has trouble pinpointing specific tools that she may have used. "The flow was very organic," he says. "The guidelines weren't set out from the beginning, but it was almost implied what they were."

Because of McMillan's mentoring, Rodney has become more confident, daring, and to the point. "She's direct in an effective way that I can't put words to," he states. With her as an example, he has found the courage and drive to challenge professors with whom he might disagree, and no longer finds it intimidating to talk with previously "unapproachable" professors. Thanks to McMillan, says Rodney, "I can be an active participant in my academic endeavors instead of just taking grades."

Having had such a positive experience with McMillan, Rodney wishes nothing but good things for other students. “I wish that mentoring in general would be more widely available in every field,” he says. “That people be less afraid to ask for a mentor, to genuinely see that, hey, I could use a mentor in this situation.”



THANKS TO MCMILLAN, SAYS RODNEY, “I CAN BE AN ACTIVE PARTICIPANT IN MY ACADEMIC ENDEAVORS INSTEAD OF JUST TAKING GRADES.”



ANDREA PORRAS-ALFARO

Andrea Porras-Alfaro comes across many international and national students who are simply looking for someone who understands them at Western Illinois University.

And so, when a young woman from Africa was struggling, Porras-Alfaro's instinct kicked in. "I supported her," she says, "and listened to everything, not just the science." The student was having a difficult time keeping up with the academic expectations of her program, but was also home sick, dealing with family issues, and fighting depression. Porras-Alfaro helped the young woman through her academic troubles and encouraged her to get in contact with the counseling services offered on campus, something she is not afraid to do with any of her students who need extra help.

Six years after the student graduated, Porras-Alfaro received a letter in the mail. "I am married," it read. "I have children. You made a difference in my life. Thank you for being there for me when I needed you."

This letter had a strong impression on Porras-Alfaro. "Sometimes you don't even realize that you're doing something that impacted anyone," she says, adding that it's not just the academic achievements that mentors should brag about. "She has a business and a family, and she's so proud of where she is, because she pulled through. It's more than having a PhD. It's so much more than that."

Porras-Alfaro is very humble about her mentoring skills. "Most of the time it's just listening," she admits. "From my perspective, I don't do much. I just take a little time to get to know them." And she's learned a lot about her students by doing just that. Porras-Alfaro has many first-generation college students, and they often lack self-confidence and preparation.

"Students don't always know what to expect," says Porras-Alfaro, adding that many students come from rural areas or farming towns, and some don't even have the support of their families. With students in these situations, it's important to be approachable. "Learning how to be a college student is hard," she says, adding that it is especially difficult when working multiple jobs just to pay for school. "Being able to talk to a faculty member without being scared helps a lot."

Porras-Alfaro tries her best to help those who are struggling, either by lending them books, helping them get campus-based jobs, or inviting them to record her lectures and review their notes during her office hours. But sometimes that's not enough – and that's where the lab comes in. "When I find students who are struggling," Porras-Alfaro says, "I reach out to my lab students to reach out and help them fit in."


This camaraderie, along with the peer-mentoring system that Porras-Alfaro uses in her lab, creates an environment where students can learn with and through one another. "It helps the environment when they work by themselves or with other students, and they don't feel as intimidated by coming to me," she says. "It gives them ownership."

Porras-Alfaro insists on making herself available to her students. "I am here to facilitate," she says. "I open doors as much as you want me to." In fact, she encourages her students to feel comfortable in approaching her. "I'm not God," she laughs. "I have my old notebooks where experiments failed, and I pull them out." Using her past failures as examples, Porras-Alfaro helps alleviate her students' feelings of isolation.

As much as she loves mentoring in higher education, Porras-Alfaro is confident that even earlier stages of

academic support are essential, along with programs such as Research Inspiring Student Excellence (RISE@WIU). “Research makes a difference,” she says confidently. “When you see students learning from other students in the lab, they just get a support group.”

But in the end, it’s all about giving them wings. “I love to promote my students’ work,” says Porras-Alfaro with pride. “Because when you give ownership to your students, they fly.”



“ IN THE END, IT’S ALL ABOUT GIVING THEM WINGS. “I LOVE TO PROMOTE MY STUDENTS’ WORK,” SAYS PORRAS-ALFARO WITH PRIDE. “BECAUSE WHEN YOU GIVE OWNERSHIP TO YOUR STUDENTS, THEY FLY.”



Terri Tobias looks at her mentor and sees her own potential. Terri was first introduced Andrea Porras-Alfaro as a graduate student with a project that wasn't quite working out. Although she was working with a different professor at the time, Terri was guided through the difficult time by Porras-Alfaro. "She sat me down and explained that we didn't have the funding for the project I was working on," says Terri, recalling how Porras-Alfaro pointed out the difficulties of working on a project without the resources needed. Then, Porras-Alfaro went a step further. "She took the time to help me through it," notes Terri of the difficult news, "then ask me about my favorite part of biology and offered me a project I might be interested in. That's what drew me to her lab."

As soon as she agreed, Terri knew she had made the right decisions. "She allows you to be independent *and* gives guidance," she explains. Before signing on, Porras-Alfaro required Terri to do a week's worth of research on the project. "She takes the time to really help you learn how to

do good, quality science, and she teaches the skills needed to be a successful collaborator.”

Because of her graduate experiences with her mentor, Terri has opted to stay on as Porrás-Alfaro’s PhD student. “Andrea has taught me the importance of mentoring,” she says, noting that it’s not just about doing the experiments anymore; it’s also about communicating and sharing the science behind them. “I’ve learned how to be a good mentor through her.” In fact, Terri and several other of Porrás-Alfaro’s lab students have already begun to follow in her footsteps by taking part in outreach science programs for 3rd graders and high school students. “It’s something that she was doing on her own time, so it’s something that we decided to do, too,” says Terri. “It’s not hard to get children excited about science.”

It’s as straightforward as that, according to Terri. “She’s very passionate about what she does with both science and teaching, and that’s just contagious. She’s like fungi,” Terri laughs. “Her enthusiasm just spreads in the lab.” Porrás-Alfaro has also fostered a supportive environment, much like that of a family. Once a week, the lab partakes in what Terri calls “Science Friday:” students and professors take turns cooking, and everyone gets together to eat and discuss a paper. These meetings allow student to interact

and learn about the latest molecular technologies. “We’re all friends,” says Terri. “She’s fostered an environment where we help each other.”

When asked about Porras-Alfaro’s impact on her, Terri says, “I have become a much better scientist, a much better person, and a much better teacher. She has not just taught me how to be a good biologist, but she has also taught me about patience in teaching.”

“Everybody needs a little guidance,” she says, before diving into a story about her manuscript writing experiences. “It’s really tough. I turn in a draft and it comes back with more red than black.” But as disheartening as that is, Porras-Alfaro has a way of turning it around and reminding her students about the underlying pleasure of science. “She asks, ‘What do you think the story of this data is going to be?’” Terri recalls. “She takes the pressure off of compiling data and writing it out.”

“I wish everyone realized how important mentoring was in any professional field,” says Terri in closing. “Mentoring leads to success.” It’s as simple as that.



PEDRO QUINTANA-ASCENCIO



Pedro Quintana-Ascencio is a mentor on a mission. His goal? Empowering students to step outside of the academic norm.

“It is very important to convince students that they can have their own ideas, and that they can recognize the problems that are relevant,” Quintana-Ascencio says, adding that too many teachers, leaders, and mentors try to impose their own ideas on their students. And according to him, that is not the best way to positively influence others. “I understand that my role as a mentor is to help them to develop their own ideas.” Without that, argues Quintana, students’ levels of creativity are strongly limited, and they are less likely to create new content in their fields, which is essential to global competition.

Such was the case with Betsey, a mentee of Quintana-Ascencio’s. Betsey had a difficult time choosing a research project. According to Quintana-Ascencio, Betsey shifted through several projects before finally choosing the one she did. But when she did finally choose, it was the best decision she could have made.

“She owned that project,” Quintana-Ascencio says proudly, noting that he had not pushed her one way or another when it came to deciding on a research topic. “It was her project.” Indeed, Betsey’s passion for her research project led her to go above and beyond what was required. “She did experiments with thousands of plants,” says Quintana-Ascencio, “and she did this working extra hours, involving lots of people, and being creative.” And her dedication paid off: Betsey is now the Resource Director of MacArthur Agro-ecology Research Center (MAERC) at Archbold Biological Station, where she conducted her research. She went up against post-docs for the position, and according to Quintana-Ascencio, she earned that position based on the research she did and the passion she showed for it.

Quintana-Ascencio is convinced that a productive, successful mentor is one who guides, but doesn’t meddle. “We only train people to do things,” he says of the current system, “not to think. That’s not creativity.” Instead, Quintana-Ascencio recommends allowing students to explore their interests as fully as possible.

“Keep an eye on not imposing your ideas on the students,” he advises, “and respect the ideas of your students, and motivate creativity.” While this may be easier said than done, Quintana-Ascencio knows from first-hand experience

that it is possible. With an environment of independence, collaboration, communication, and trust, mentors can empower students to pursue their own interests and ideas with passion and dedication. And that, according to Quintana-Ascencio, will produce more innovative science than mentor-imposed ideas could ever create.

Quintana-Ascencio understands the difficulties of letting students fly solo, in the lab and in the field of research, but an environment that encourages independence and individualism is key. “Give enough advice for the students to avoid the major problems,” he allows, “but give them enough leverage for them to try their own ideas, even if they look risky to us.”

“To me,” says Quintana-Ascencio, “the most exciting thing is to find a relevant question that will have some impact on our lives.” And if he can guide his students to finding that question, whatever it may be, then he has done his job well.





BETSEY BOUGHTON

Betsey Boughton was an intern in a lab when she was introduced to her future mentor. “When I first met him, he was a post-doc and I was an intern,” she says of Pedro Quintana-Ascencio. “But even as a post-doc, he thought he could learn a lot from me. That fostered a very deep feeling of respect.” And that respect has been the foundation of a strong and lasting mentor-mentee relationship. “He truly values people from all levels.”

Betsey, now a research scientist at a nonprofit, stuck with Quintana-Ascencio for the remainder of her academic career, and it was good that she did. During her PhD, Betsey had a child, and began to worry about spreading herself too thin with the amount of work she had been used to. “I remember him telling me that it’s important to balance work with family,” she says, noting that most professors require their PhD students to work eight-hour lab shifts. “Without his support, I probably would’ve had to drop out. That was really key to my success, how supportive he was of me and my family, and of me being a mother.”

And Betsey has learned more than just empathy from her mentor. When the unexpected occurred, whether in the lab or in the field, Quintana-Ascencio would approach it with a smile on his face and excitement in his heart. “That passion for experiencing the moment was something I learned from him,” she says. “He loves to have fun. He loves to problem-solve and work things out.”

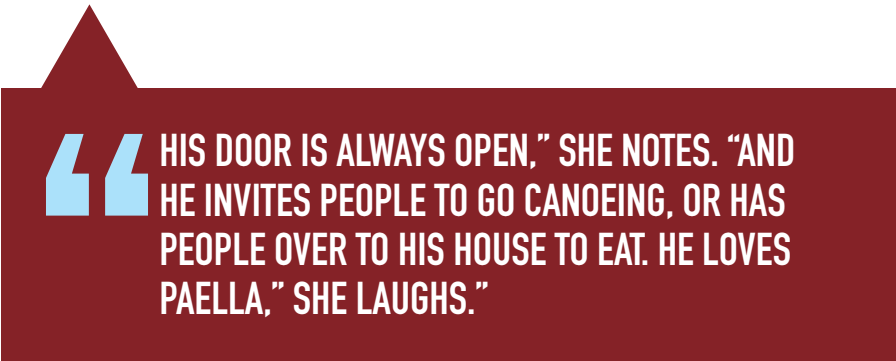
But nothing compares to Quintana-Ascencio’s love of teamwork. “He’s highly collaborative,” recalls Betsey. “He would always encourage us to get feedback from lots of people so we weren’t working in a bubble. He wants to be there with you, doing the grunt work.” In fact, Quintana-Ascencio’s collaborative spirit is one of the things that stuck with Betsey. “He didn’t place himself above you. He didn’t believe in the student-teacher dichotomy,” she says of their mentor-mentee relationship. “He felt like he was the student the whole time.”

When asked about the qualities that made Quintana-Ascencio such an effective mentor, Betsey first cites his bilingualism as a big positive. “He started out with a language barrier,” she says. “He had to work with someone to learn English. Now, he’s kind of like a bridge for Spanish-speaking students.” According to Betsey, Quintana-Ascencio integrates many Hispanic minority students into the biology

department simply by reaching out and talking to them, and from there, the other professors dive in.

But more than that, Betsey appreciates Quintana-Ascencio's openness, emphasis on communication, and easygoing nature. "His door is always open," she notes. "And he invites people to go canoeing, or has people over to his house to eat. He loves paella," she laughs.

"I want to emulate Pedro," concludes Betsey. "Love what you're doing, and really live in the moment."



“HIS DOOR IS ALWAYS OPEN,” SHE NOTES. “AND HE INVITES PEOPLE TO GO CANOEING, OR HAS PEOPLE OVER TO HIS HOUSE TO EAT. HE LOVES PAELLA,” SHE LAUGHS.”



JULIAN RESASCO



Julian Resasco learned from the best. Throughout his college career, he had multiple mentors to help him with the different aspects of his life and field of study. But one mentor in particular made an impression on him, and because of that man, Resasco has been able to make the transition from being a mentee to becoming a mentor.

As a PhD student, Resasco was working with a freshman undergraduate student who knew that she wanted to be an entomologist. “She was so dedicated,” Resasco recalls. With his guidance, the student was able to follow her dream, and even received an NSF graduate research fellowship. “It says more about her than me as a mentor,” says Resasco. “She went far and followed her dreams, and I was able to help her.”

When pressed, Resasco cites the characteristics of his former mentor as his reasons for mentoring success. “I tried to emulate some of the things that I saw and that were effective in my mentor, which were having an open-door policy, being very giving of one’s time, helping with writing, and recognizing that drive and interest in students and

helping them run with it," he says. "These aren't necessarily things that come naturally to me, but they're things that are effective. I don't think there was anything inherent in my mentoring ability other than wanting to be good, and seeking out ways to do that."

It's also important, Resasco believes, to be introspective, and to communicate excitement about projects and accomplishments. "What makes mentoring successful is if you make the mentee want to work hard and achieve success on their own," says Resasco. "It's important to let them be challenged, but know when to step in and help out. At the edge of the mentee's comfort zone is where the learning and the growing happens."

But according to Resasco, he wouldn't be half the mentor he is today without the influence of what he calls his "mentor for life." When applying for an NSF graduate research fellowship, Resasco was seeking help in writing the essays. When they got down to the wire, his mentor reached out and invited him to his home, where they worked late into the night. "It really stood out to me," recalls Resasco. "I feel like most mentors would clock out, but he went above and beyond."

His mentor also encouraged him, as an underrepresented student, to work with underrepresented minorities,

including middle school students. “Working with middle school students was one of the hardest things I did in graduate school, but it was very rewarding,” Resasco says. “Because of him, I’m a lot more thoughtful about being a good mentor, and about thinking about his good characteristics.”

Which is exactly what Resasco recommends to his fellow mentors. “Think about what it takes to be a good mentor,” he advises. “Do research. Then see where you can make improvements.”



“WHAT MAKES MENTORING SUCCESSFUL IS IF YOU MAKE THE MENTEE WANT TO WORK HARD AND ACHIEVE SUCCESS ON THEIR OWN,”





For Carla Restrepo at the University of Puerto Rico, successful mentoring is all about observation. It may be something that she picked up from her own mentor. When she was working toward her Masters degree, Restrepo went through a very difficult and sad time in her life. Her mentor was keen enough to notice her acting differently and advised that she seek counseling. “She was still there for me,” Restrepo says, and that had an impact on her.

So when she noticed that a PhD student of hers was struggling with her writing – including drawing checkmarks backwards – as well as emotionally insecure, Restrepo suggested that the young woman work with her on a Masters degree instead of a PhD. Although this was a step backward, the student was ultimately grateful. “She completed her Masters successfully under my mentorship,” says Restrepo, adding that patience and support played key roles in the success of the mentoring relationship. “Just facing the problems that were there, and for her to accept them, really helped us through.”

Restrepo describes herself as direct, consistent, and straightforward. She holds weekly lab meetings with her students where she goes over basic tools and communication skills, such as how to put together a curriculum vita. These meetings are integral, she says, to keeping the students in her lab on the right path.

As much as she connects to her mentees as a group, her relationship with each student is different. "It becomes very personalized," Restrepo says. "I set deadlines and goals with each student, and tell them there are many ways to reach those goals." But if there is something that has to be done in order to achieve a milestone, Restrepo is sure to tell them. "I'm extremely direct and honest with my students," she says, "and I want them to be the same with me."

To keep her students motivated, Restrepo keeps an open lab with art on the walls and natural lighting. At the door is posted an inspirational poem about the journey and the destination. The lab is organized, with small cubicles available for students who want to work more closely or privately. This environment allows for a greater spirit of collaboration between students.

Restrepo believes that students need to see themselves as a part of a broader community outside of their cultures.

“When I went to Stanford for my Postdoc it was a shock,” she recalls. “For the first time in my life, I was aware of how I looked.”

Growing up in Colombia, that had never before been an issue: she was surrounded by individuals who had similar skin tones, hair colors, and body types. But once she was back in the states, she felt as though she stuck out from the crowd, and truly identified as a minority student. “There needs to be more exchange between Puerto Rican students and mainland students,” she affirms. “Students better informed about cultural differences may have greater chances to achieve their potentials. My students want to make that difference.”



“ I SET DEADLINES AND GOALS WITH EACH STUDENT, AND TELL THEM THERE ARE MANY WAYS TO REACH THOSE GOALS.”





Mel Sabella is a navigator. He makes his decisions based on the wave that's coming in. Sabella is a Physics professor and advisor specializing in Physics Education Research at Chicago State University. Though he's worked at several other institutions, for him, there's no comparison: CSU has a student-centered community feel that he didn't find anywhere else.

It was there that he met Geraldine Cochran, a student in the Physics program who wasn't sure if she fit in. Sabella was one of her research advisors – but advice isn't something that he likes to offer up right away.

"I try not to give advice," Sabella says. "I don't know their specific situations. Instead, I encourage problem-solving as a team." Sabella noted that, while he may guide students on projects or struggles, he guides by instruction based on his students' individual situations: where they are, and what strengths, resources, and challenges they're carrying with them.

Though Sabella and Geraldine didn't always agree on the decisions that she made, there was a constant respect between the two. "I recognize there are pieces I might be missing," Sabella admits, which is why he's always willing to hear out a student's argument and respect the thought that went into each decision. "I listen to each specific situation. I know everyone is different." Which is why, according to Sabella, it's so important to withhold judgment – regardless of whether or not you disagree with a student's decisions.

In fact, that is what Sabella cited as his key to mentoring success: listening well, to each individual student about each individual situation. "There's no cookie-cutter approach," he says. "But I want to build on the resources that these students already have."

Indeed, Sabella admits the difficulty of resisting the urge to rush in and help students who are struggling. But over the years, he has learned to respect that most of his students have the resources to do what needs to be done; what they need is the time. He understands the importance of figuring out the goals of his mentees without pushing them one way or another.

From his mentees, Sabella has learned to get to know each individual as a whole person. "You never know what's going

to happen with someone,” he says. “The situations are so different, and so complicated. But there’s this relationship that you develop where you learn about the whole student. You really get invested.” With Geraldine, he both taught and learned a great deal. “Geraldine provides a unique voice in the field of Physics Education Research,” Sabella says proudly. “She makes me think about diversity issues a little more, and gives me different perspectives.”

Sabella has learned to respect the CSU environment for its emphasis on community. “At other schools, students want the answers,” Sabella says, citing his past employment experiences. “But at Chicago State, they didn’t want it that way. They wanted me to ask questions. They’re getting from Point A to Point B with just a little bit of questioning.” Sabella can tell that his students see learning as a community as the best way to learn, and the best way to build confidence within themselves.

Sabella has a tip for other mentors: “Words are really important. You can say the wrong thing about someone’s future. We need to listen to where our students want to go.”





GERALDINE COCHRAN

Geraldine Cochran is a mentor in the field of Physics at the Rochester Institute of Technology. But if you told her fifteen years ago that this would be her role, she never would have believed you.

When Geraldine was in high school, she had no plans to continue her education. But she graduated early and made a promise to her former middle school teacher: that she would go on to college. At just sixteen years old, Geraldine began her undergraduate education at Chicago State University. And at seventeen, she met Mel Sabella, a research advisor who eventually became her strongest mentor and her greatest supporter.

Sabella was different from anyone that Geraldine had met. He was very personable and kind, but he went beyond the roles of an advisor and made sure he connected with his students. According to Geraldine, Sabella was known for attending his students' extra-curricular activities, meeting their families, and generally taking the time to get to know his mentees. "He took a real interest in our lives," Geraldine says.

For the first few years of her academic career, Geraldine was unsure about her ultimate goal of becoming a physicist. In high school, her physics teacher had told her, “Physics is for guys who are going to be engineers.” It was Sabella, however, who convinced her otherwise. He would respond to her concerns by telling her that she was a “typical physicist” – and he would support this statement by referencing her research style, her perseverance, her approaches to problems, and even her study habits and quirks. “I didn’t see myself as a physicist,” says Geraldine. “I didn’t know if I fit, if I belonged. And he constantly affirmed for me that I did.”

As a mentor herself now, Geraldine does her best to emulate Sabella with her own students. “He had such high expectations for us,” she recalls. “He always kept my confidence. I know that seems like a no-brainer, and like everyone should do that, but... they don’t.” Sabella was the kind of mentor that pushed his students to plan for the future, and introduced possibilities and potentials that they hadn’t even considered. “He put me on the trajectory that I needed to be on,” Geraldine says, even though she admits having strayed from the path more than once.

Geraldine decided to leave the graduate program and become a high school science teacher. Apprehensively, she

told Sabella about her plan – and was shocked when he told her to go for it. “You would impact so many more students,” he had said. And so, she did just that. But Sabella wasn’t one to lose contact with a student, current or former. He invited Geraldine to work on research projects, kept her in contact with the department, and even asked her to write a paper with him.


In the end, Geraldine simply missed her research too much. “What will people think?” she recalls asking Sabella. “I already left the program. Will anyone want to take me on?” But Sabella, as always, had an answer for her. He told her that with experience as a high school physics teacher (and with writing a paper), she was an even better candidate than she had been before. He’d known all along that she would come back – and his unending support and confidence in her made the transition that much easier.

Geraldine has been able to apply much of Sabella’s mentoring style to her own students, though she’s not quite as active in their personal lives. “I’m afraid,” she admits. “I don’t know how far I should go, or how comfortable they will be.” But she is a mentor, and she loves what she does.

“It’s worth it to figure out what’s needed for each individual student,” she says, noting that mentors need to “realize

that they're working with humans – there's no cookie-cutter approach to mentoring." Geraldine hopes that more people will want to become mentors in the future, scientists especially.

"He was there when we came in the mornings, and we knew he would be there in the evenings," Geraldine says of Sabella. "We saw his dedication – he really invested a lot of time in us and in his profession." What better qualities of a mentor could there be?



“MENTORS NEED TO “REALIZE THAT THEY’RE WORKING WITH HUMANS – THERE’S NO COOKIE-CUTTER APPROACH TO MENTORING.”

JERAMIE STRICKLAND

Jeremie Strickland believes in early intervention mentoring. That's exactly why he is involved with so many mentoring programs in the broad field of environmental biology, including Strategies for Ecology Education, Diversity and Sustainability (SEEDS), Minorities Striving and Pursuing Higher Degrees of Success (MS PHD'S) in Earth System Sciences, Turtle Camp Research and Education in Ecology (TREE), and countless others. Strickland loves wildlife, and he loves involving the youth of his community.

"If you wait until students are in college to mentor them, I feel like it's too late," Strickland says. "It's so critical. We can't wait until they get to college." As a mentor, he has been involved in programs that reach out to high school students and college students alike. The goal, according to Strickland, is to get them involved and keep them interested.

That was the case with Nigel Golden, an intern at the US Fish and Wildlife Service (USFWS). Nigel, an African American high school graduate from Milwaukee, was

attending the University of Wisconsin at Stevens Point, a primarily white college. Overwhelmed and feeling very alone, Nigel wanted to move back home where he would better fit in. But Strickland, Nigel's mentor during his USFWS internship, had something else in mind.

"All he needed was some networking opportunities, exposure, and guidance," Strickland says of his brief yet meaningful role as Nigel's mentor. Having discussed his options and his potentials in the field, Nigel went on to work as a research assistant at UW, qualify as a forestry project specialist, perform work in Siberia studying climate change, and study environmental science and natural resource management in Germany, Poland, and Iceland. "He graduated with dual majors in wildlife ecology and biology," says Strickland, adding that Nigel is now going on to get his PhD at the University of Massachusetts in environmental conservation. "He's living his dream, and he's having fun. He's not just a statistic."

Strickland cites his ability to relate to his mentees as a root cause to his mentoring success. "Just like Nigel, I was a first generation college student," he says. "He trusted me knowing that I wasn't encouraging him to do something that I hadn't done, or considered, or experienced previously." And it's that trust that provides a strong foundation for

a positive mentorship. "Gaining that trust from the start makes them feel comfortable that they approach you and speak to you when need be," Strickland declares. "Any information that my mentee discloses with me is confidential. I wouldn't judge them. I keep an open mind, and I keep an open heart."

But what about those students that Strickland can't relate to right off the bat? "I try to learn as much as I can about my mentees," he says. "Some of their concerns, short-term goals, long-term goals, and what they think might hinder their goals." Strickland also stresses the importance of making sure the students are comfortable, noting that at times, text messaging proved to be more productive for Nigel than actually sitting down and discussing things face-to-face. "He was better at texting than at actually speaking," Strickland admits. "It helped him gain his confidence." He also notes that such flexibility makes him seem more down-to-earth and approachable. "That goes a long way," he stresses, as does patience, resilience, and above all, a passion for the position.

"If I hit the lottery today, I'd be doing the same thing tomorrow that I'm doing now," Strickland says. "I'm doing it because I know they need it. I know what it's like to have that struggle. And I know what can come of it if you make the right decisions."





Andy Suarez runs a Lab of Misfit Toys. That's why, when no other labs were bringing in Newton, an undergraduate Anthropology student from Jamaica with a less than desirable GPA, Suarez reached out.

"When I graduated from undergraduate school, I did not have a 3.0 GPA," says Suarez, who knows what it's like to struggle with graduate school rejections. "Grades and GRE scores almost never predict success." Newton hadn't applied himself early on in his undergraduate career, and he needed research opportunities to set him up for graduate school. So Suarez brought him on board.

"After 2 years, he went from having no research experience to completing a research project," says Suarez. "He gave a fantastic presentation at our university undergraduate symposium – it was as good as or better than some of my graduate students at the time." And if that's not impressive enough, Suarez notes the turn-around in Newton's application to his studies. "He would work longer hours than some of my graduate

students towards the end,” recalls Suarez. “And despite the fact that he did have some trouble getting into graduate school, including a number of rejections, he did get accepted into the Evolutionary Anthropology program at Cal State Fullerton.”

Suarez considers his lab to be generally successful. He keeps it populated with a range of undergraduate, graduate, and post-doc students, many of which come from diverse academic and cultural backgrounds. And with diversity, knows Suarez, comes different approaches. “A student’s background, regardless of that background, is going to influence the way they come into a lab,” he says. And according to him, that may be the best part.

“No two students are alike,” says Suarez. “My grad school advisor had a very cookie-cutter approach. I think many of his students were successful is because we were afraid of disappointing him.” But, he adds, that mentoring through fear is not his style. “There’s no way I could do it,” he laughs. Instead, Suarez relies on communication to discover which students are more independent, and which students require a bit of hand holding. “Students respond differently to pressure,” says Suarez, recalling what his first few graduate students taught him about mentoring. “What worked evolved over time.”

But for all of his students, Suarez encourages consistent meetings. “I’m busy,” he admits, “and I’m going to do everything in my power to avoid those meetings. I don’t mean to. But it’s up to the students to make sure we do meet every other week.” This is how Suarez discovers his students’ styles – some will push for regularly scheduled meetings, where others will take a more relaxed approach and only schedule appointments when they’re stuck.

Regardless of style, Suarez has certain expectations of his students. They are required to present their research at least once per semester, and he encourages them to set small, realistic goals to help them see progress along the way. They are also expected to celebrate each other’s successes, therefore keeping jealousy at a minimum and collaboration at peak height. “A successful environment is one where students both work hard and play hard,” Suarez advises.

In regards to his success with Newton, Suarez knows what he did right. “Instead of letting him give up, I hired him as a part-time lab assistant for the summer. Now he’s co-author on a paper we’re in the process of submitting and he’s been accepted into graduate school. It’s about creating an environment where he felt that he was successful, and that he was encouraged to never give up.”

“I provided an opportunity,” says Suarez, “and that was the single most important thing.”



A SUCCESSFUL ENVIRONMENT IS ONE WHERE STUDENTS BOTH WORK HARD AND PLAY HARD,” SUAREZ ADVISES.”



Newton Hood always knew he wanted to be a scientist. But as a junior undergraduate student at the University of Illinois, he didn't know the steps to take in order to get there. So Newton decided to attend a meeting for juniors and seniors, which focused on research experience, the GREs, and the next steps in achieving their goals. It was there that he officially met Andy Suarez.

Newton was actually in Suarez' animal behavior course, a class of over 100 students. He always sat in the back. So when Suarez recognized Newton as one of his students, it had an impact. They went back to his office that day to discuss research experience and opportunities, and from there, Newton was hooked.

"I started by helping graduate students with their projects," says Newton, adding that as he gained more experience, he began to work on his own projects. "I had never conducted a scientific experiment before, until I started working with him. Now we're working on a publication."

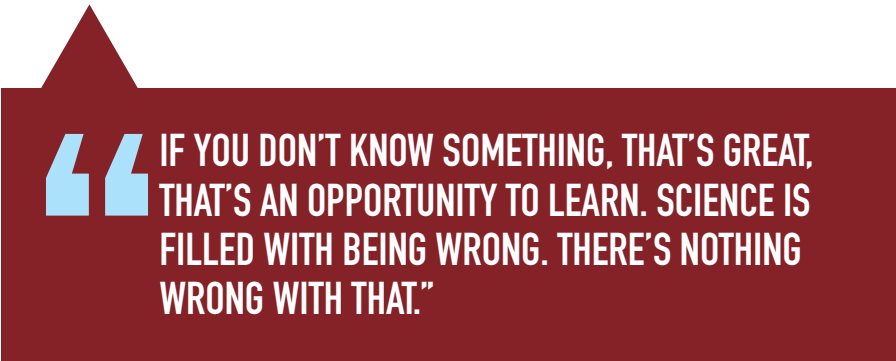
Newton attributes many of his accomplishments to Suarez himself, noting that his mentor empowers his students. "His ability to direct people in the right directions without giving them the answer is great," says Newton, adding that Suarez words his corrections in a way that doesn't exactly point out what's wrong, but invites the student to improve the work overall. "He doesn't make you feel wrong if you get something incorrect. He's very supportive, and just a generally great person to be around."

The environment that Suarez has established in his lab is friendly and open, with Suarez constantly telling stories or cracking jokes. "I don't know if he's purposely doing it to make the environment better," says Newton, "but he might just be an awesome person." The lab also has students from all levels working together, which encourages fast friendships. "I'm happy to say we'll be friends for years to come," Newton adds.

When asked about the impact that Suarez had, Newton doesn't hesitate. "I have become a research scientist," he says. "Because of him, I'm a more complete research scientist. I'm better at networking and communication." All of this can be attributed to Suarez, who refers his students to other researchers with their questions, even if he knows the answers. "I wouldn't be where I am without his help,"

affirms Newton. “He’s a phenomenal researcher and a better person. He makes you want to do research, and he makes research fun.”

Newton hopes that others can learn from Suarez’ example, by “reaching out to underrepresented minorities, and letting them know that they’re welcome in the environment and there are people there to help them out.” He wants mentors to prove to their students that you don’t have to be a genius to be a scientist. “If you don’t know something, that’s great,” he says. “That’s an opportunity to learn. Science is filled with being wrong. There’s nothing wrong with that.”



“ IF YOU DON’T KNOW SOMETHING, THAT’S GREAT, THAT’S AN OPPORTUNITY TO LEARN. SCIENCE IS FILLED WITH BEING WRONG. THERE’S NOTHING WRONG WITH THAT.”





ROBERT WARREN

At one point or another, we have all been thrown into a situation for which we were not prepared. We floundered, and reached out for guidance and support. And if we were lucky, we found someone to help keep us afloat.

When Charlene Gray began graduate school, she had not quite begun to think like a scientist. In accordance with her projected graduate career, she reached out to Robert Warren, an Ecologist at SUNY Buffalo State, and requested an interview for the Teaching Assistant position in his lab. From there, he became Charlene's mentor.

When Warren takes on a student as a mentee, it's not all sunshine and butterflies. "I like to see them fail," he admits. Warren allows his students to struggle in a sink-or-swim environment. Many students are able to fight their way back to the surface, and are stronger for it. Those who don't quite make it there get thrown a life raft by Warren, and are then taken under his wing to learn from their past failures and discomforts.

Charlene stood out from others in Warren's lab. She was able to construct Agar plates, a skill that impressed Warren and caused him to involve her in more advanced projects. According to Warren, this recognition of skills is integral to the mentoring process. He tells his students, "You are special for what you accomplish, and not for what others tell you." But that does not stop him from giving constructive criticism.

"I give honest feedback," Warren says, "and tell them not to take it personally." Because while he is there to support his students, he is also there to help them improve. "You don't want me to write you a letter of support if you're not doing well," Warren laughs. He is an honest individual, and does not tend to sugarcoat his feedback.

Regardless of his blunt honesty, students continue to come to Warren for anything and everything. "I created a hub within my laboratory," he says. "Students see the hub as a place to hang out, socialize, do homework, and engage in peer-to-peer learning." And for Warren, nothing could be better. He has created a community where students feel at home, and experience a connection to institution.

As a mentor, Warren attributes several characteristics to his success. He respects his students, and is not afraid to

create expectations and show his belief in their abilities. He discusses possible mentoring strategies with his colleagues, and finds role models for his mentees. But most importantly, Warren follows his intuition to ensure that his mentees receive the guidance and experience they require.

“You are the mentee’s friend,” he advises his fellow mentors. “You are there to get them through college and build confidence.” And according to Warren, they can really flourish after that.



AS A MENTOR, WARREN ATTRIBUTES SEVERAL CHARACTERISTICS TO HIS SUCCESS. HE RESPECTS HIS STUDENTS, AND IS NOT AFRAID TO CREATE EXPECTATIONS AND SHOW HIS BELIEF IN THEIR ABILITIES.”





Charlene Gray was ready to move forward with her Master's project. She had chosen a topic focusing on ants and their interactions with weather and climate with her mentor, Robert Warren, and was ready to move forward when the news broke: a PhD student had just completed similar research, in much greater depth than her project could hope to achieve.

Warren didn't hesitate. Having noticed Charlene's impressive work with agar plates as a TA in his lab, he introduced a potential new project for her to consider – on the micro level. "It was a bit of a shock," says Charlene. "He gave me the choice. He wasn't forcing me to do anything, but this was such a great opportunity." So she took a chance, and it opened up her entire future.

In studying ants at the micro level, Charlene gained experience in a variety of areas, from fieldwork to technology. And that experience has made all the difference. "If you have that experience, it makes you an excellent candidate in a variety of labs," Charlene says,

noting that if it weren't for Dr. Warren, she may not have had the opportunity to progress as far as she has.

According to Charlene, Warren is a team player, through and through. "He's very big on collaboration," she says, citing his humility and his eagerness to work cohesively with his colleagues. "He's very much about gaining more insight, and if you spread the work out, you're much more likely to do that. And he talks to you like you're an equal. It's helpful when you have that kind of respect coming from your mentor."

In fact, over the past two years, Warren has made Charlene's graduate experience one of empowerment and success. "I truly think like a scientist," she says proudly. "I wasn't like that before I came to grad school. I now have the ability to look at a problem as an issue that I want to understand more." She emphasizes the importance of Warren's policy of admitting when you are unsure. "You're expected to work and to research and to gain further knowledge," she says, referring to Warren as "a guide on the side, not a sage on the stage."

"That was the best thing for me," she recalls. "Just having that independence and being able to focus in and go." Warren, according to Charlene, is a hands-off mentor; he

gives his expectations, makes sure you're up for it, and then sends you on your way. "Other people might have difficulty with it," she says of Warren's mentoring style, "but I think it's been an excellent teaching tool in many ways."

As a mentor, Charlene couldn't have asked for a better fit than Warren. "I have such an affection for the man," she says, "for what he's done and for the person he is and how he treats us." Charlene goes on to cite his curiosity – "There's no end to it!" she laughs – and his academic integrity as key characteristics that make him such a wonderful mentor. "He and his wife also invited the whole lab over for dinner, more than once," she recalls. "It was lovely!"

And other mentors can learn from him. "Be human," says Charlene. "Be friendly, and be approachable!" From her own experiences with undergraduate students, Charlene has further advice for mentors and professors alike: "You have to adapt to your student population," she says, clearly passionate about the topic. "We're getting a lot of people from different cultures, a lot of people who haven't had great experience with authority figures or educators, but they've gotten this far. They've worked hard. They're not lazy. Teach them!"

Now that you've had the chance to meet and understand our mentors, we would like to invite you to take a closer look at their situations, tricks of the trade, and advice on a more general level. Throughout the rest of this book, you will find a collection of habits, environments, tools, and processes that can help other mentors broaden participation in underrepresented minorities in the scientific realm.

These collections are not attributed to specific mentors or their unique situations. We have done this with the hope that any mentor can read through the rest of this book and see the opportunity to apply individual ideas to his or her own experiences and mentees. So with that in mind, go forth and conquer your role as a mentor!





CHALLENGES

RAISING AWARENESS INVOLVING THE CHALLENGES STUDENTS FACE

What sorts of challenges do mentors face when working with mentees that are considered underrepresented? Students face all kinds of pressures, some personal, others financial. Yet these pressures oftentimes go unnoticed, and can find a way to impact academic performance. It is up to the mentors to bear these challenges in mind.

We as teachers get caught up in our day-to-day work responsibilities, which get in the way of our innate curiosity to find out more about our students. Yet curiosity is precisely the quality that withdrawn, shy students most appreciate from their teachers. When faculty take the time to get to know their students, to invite them to talk about almost anything, an impression is set in the minds of students that the teacher cares.

So how might we as mentors look for ways to open up our students to talk about their challenges? Consider the list of challenges that, once detected, has allowed for mentors to better support their students in the past.

LEARNING MORE ABOUT STUDENT CHALLENGES

FEARS

- 1.** Fear of failing an assignment, project, or research study, or even an academic program.
- 2.** Fear of asking a question due to a perceived intimidating classroom or academic environment; fear of feeling stupid.
- 3.** Not knowing how to behave in a new academic setting.
- 4.** Fear of putting forward ideas.
- 5.** Fear of stepping on the toes of the mentor or senior students.
- 6.** Fear of group work due to potential segregation.
- 7.** Fear of being teased or considered “weak” for working hard, aspiring for greatness, and/or reaching out for help.

LACK OF RESEARCH EXPERIENCE

- 8.** Extremely competitive environments for students that are accustomed to working in groups.
- 9.** Less opportunity to find undergraduate research experience with a faculty member who will mentor, due to a lack of federal funding.

- 10.** Not enough opportunities for graduate students to develop their own ideas; school environment not conducive to creativity.
- 11.** Realization that another researcher has already pursued the same research question.

LACK OF MASTERY OF PURPOSE AND VISION

- 12.** Not recognizing how one's research gives back to one's community beyond "direct" community service (as seen in physician work).
- 13.** No cultural informant available to help students understand the academic structure and how to navigate the landscape in a way that will increase political and social success.
- 14.** Seeing rejection from medical school as a complete failure; no Plan B.
- 15.** Being disengaged with no "purpose" or real reason for attending college.
- 16.** Not understanding the larger picture of individual classes (i.e. not being able to apply prerequisite courses to vision of future career).

FAMILY PRESSURE

- 17.** Feeling alone – there is only so much that a first-generation U.S. college student can share with family.
- 18.** Ultimate goal of returning home to support family.

- 19.** Parents favoring success and high income over personal investment (i.e. a career as a physician over a researcher).
- 20.** Managing academic demands during and after an unplanned or unexpected personal situation (e.g. pregnancy).
- 21.** Explaining financial impact of furthering education after obtaining a professional degree to family.
- 22.** Feeling pressured to quit college because family needs help at home.
- 23.** Being pushed to inappropriate levels by professors who don't fully appreciate student's home situation.
- 24.** Family unfamiliarity with the level of education needed for certain careers; expectations for student to only pursue a bachelor's degree.

FINANCIAL PRESSURE

- 25.** Inability to earn family buy-in to support aspirations.
- 26.** Receiving no emotional or monetary support from home regarding education and college.
- 27.** Lacking the time, money, or energy to be successful in college (working many jobs, having children, etc.).
- 28.** Being under significant financial pressure.

PERSONAL CHALLENGES

- 29.** Needing counseling due to personal struggles.

- 30.** Being away from home while other issues are going on with family.
- 31.** Lack of faculty that help shift focus away from personal problems, while still offering support.
- 32.** Lack of options for requesting and receiving feedback on personal challenges.
- 33.** Needing to talk about struggles that are difficult to overcome and/or induce fear.

TASK PRESSURE

- 34.** Becoming overwhelmed from handling too many things at once.
- 35.** Imposter syndrome.
- 36.** Fear of public speaking.
- 37.** Lacking self-confidence. ("Do I belong?" "Do I know enough?")
- 38.** Worrying about getting rejected from schools, what others will think about career path, etc.; self-consciousness.
- 39.** Having disorganized thoughts.
- 40.** Difficulty transitioning from high school to higher education; high expectations to be very independent, to think on one's own, to reason abstractly, etc.
- 41.** Being unfamiliar with new teaching styles.
- 42.** Not speaking English as a first language.
- 43.** Burning out and consequently disliking role as a graduate student.

- 44.** Having difficulties working through failure.
- 45.** Balancing social and academic life.
- 46.** Being a first-time, first generation college student without the family background to be in college.
- 47.** Inadequate college preparation from high school.
- 48.** Feelings of incompetency or inferiority.
- 49.** Lacking experience and/or opportunities.

SELF IMPOSED CONSTRAINTS

- 50.** Not fitting in; feeling pressured to leave the field and attend a smaller college with similar-looking individuals.
- 51.** Receiving extensive feedback (can be mistaken for criticism).
- 52.** Feeling alone, lacking a confidante or someone to give honest feedback.
- 53.** Losing momentum after encountering an obstacle; regaining of confidence not being encouraged by mentor.
- 54.** Being intimidated by professors, meetings, or class topics.
- 55.** Professors that get frustrated, give up on “lazy” or “dumb” students.
- 56.** Being limited in creativity by protocols, measurements, data collection, etc.

MENTOR CHALLENGES

- 57.** Having poor experiences as mentees, trying to break the negative cycle.

- 58.** Being stuck in “Sage on the Stage” mode.
- 59.** Refusing to change/adapt mentoring style.
- 60.** Inability to consider the possibility that mentees might not have the same learning style.
- 61.** Balancing freedom and structure.
- 62.** Underestimating minorities; attributing achievements to “minority status” and “handouts.”
- 63.** Avoiding students when things are going downhill.
- 64.** Feeling pressured by tenure status (difficult to meet tenure requirements if students are given more leverage, time, resources, etc.).
- 65.** Not relating to a mentor due to a lack of shared cultural background.
- 66.** Mentor does not make student aware of campus resources and services.





MENTORING APPROACHES

IT'S NOT A COOKIE CUTTER

What sorts of approaches do mentors cite as the most effective? College professors engage in a variety of activities on a day-to-day basis. Throughout the course of an academic year, professors will design, conduct, and publish research studies, and develop and teach courses – and many of these activities involve the support of students. Yet the approach a mentor applies to one student cannot cut across the board for every other student.

Ask faculty to think of steps that made them most proud, when their mentoring process most impacted a student, they will describe a process that was iterative, interactive, and complex enough to meet the nuanced needs of their students. That is to say, a process that is not prescriptive, where steps are not followed in a linear manner. Students credit mentors who did not take a cookie cutter approach. In our discussions with mentees, they glowed with warm appreciation of a process that was flexible, experiential,

facilitative, had a balance of creative and critical thinking, and was descriptive rather than prescriptive.

We asked mentors to identify their process steps, and in this section is a list of their responses. As you review this list, think about how you might take stock of how you have impacted underrepresented students through your process. Furthermore, how might you explore ways to do more of what contributed to your success? Consider how integral you are in making a difference in students' lives through the process you have in place now. How might you borrow from the successes of others? When you think of the mentoring process of others, what can you adapt, substitute, modify, put to other uses, rearrange, or eliminate to better your process?



“AS YOU REVIEW THIS LIST, THINK ABOUT HOW YOU MIGHT TAKE STOCK OF HOW YOU HAVE IMPACTED UNDERREPRESENTED STUDENTS THROUGH YOUR PROCESS.”



MENTORING MARKERS

THE SQUIGGLY LINE

How do we gauge when a mentoring effort is successful? Is it when our student gets the highest grades in his class? When our mentee makes new connections to scholars in the field? And how do we reach those markers of success?

Many instructors begin their careers with the idea that mentoring involves getting students directly from Point A to Point B. But as experienced mentors know, the progression is rarely linear. Oftentimes the mentoring process is more like a squiggly line: to reach the end goal of a successful student, one must make a lot of twists and turns.

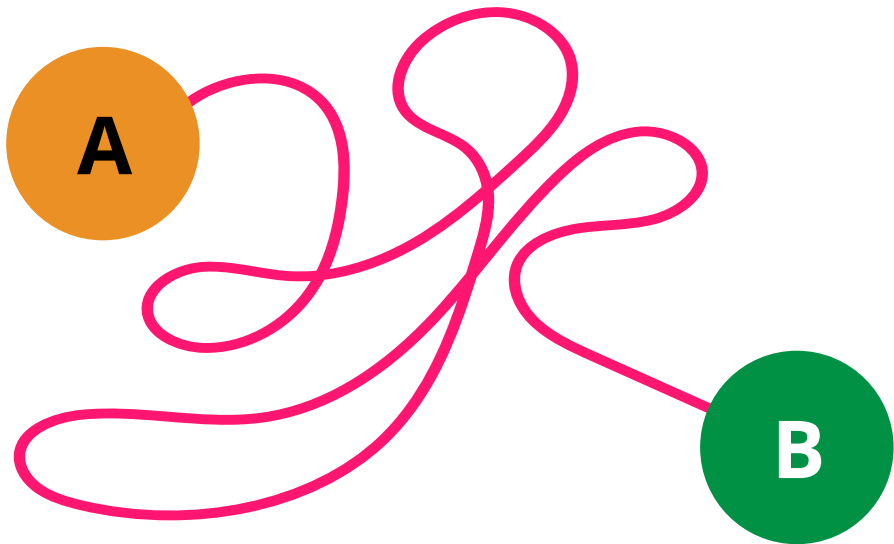
We asked our interviewees about memorable markers, or high points, in their mentoring careers, including the impacts that they as mentors had on their students. Below is a paraphrased collection of responses.

HIGHLIGHTS

- 1.** I probably saved a life.
- 2.** I felt that I could learn a lot from my student. Showing him that helped me to increase his confidence.
- 3.** Because of me, this student is much more confident.
- 4.** Before, it was hard for this particular student to communicate with other people.
- 5.** He overcame his reluctance to talk to other professors.
- 6.** She was more confident in the scientific process, more confident in her abilities as a biologist.
- 7.** My student felt like he could make a positive contribution to the world.
- 8.** She became a biologist at a non-profit research station and is now researching, which she attributes to the confidence that I helped her develop.
- 9.** My student is now a scientist.
- 10.** My student now has experience conducting multiple research experiments, and is confident conducting them himself.
- 11.** She is now an Aquatic Ecologist, a job title that comprises Research Scientist qualities.
- 12.** She was not my best student ever, grade-wise, but she was a good worker in the lab. She's now working at Boston Scientific in an amazing job.
- 13.** He's proud that we co-authored a paper together.
- 14.** She had an unexpected pregnancy during her time as

my mentee. And not only did she complete her degree and her research, but she did it well.

- 15.** A big part of the reason why she's going to graduate school is because of the help I've provided.
- 16.** Three of my students are getting their PhDs!
- 17.** Some of the students that have gone to med school have stayed in touch. They've written letters to thank me.
- 18.** She received her acceptance letter to graduate school.
- 19.** He just finished his PhD and is now working in Peru.
- 20.** She ended up getting into that program she wanted to get into and, she ended up getting the fellowship.
- 21.** When I arrived in 2007, the average GPA for students in that program was a 3.0. It's now a 3.69.





MENTORING MINDSET



INSIDE THE MIND OF MENTORS

We all have traits and characteristics that make us unique. But what are the traits and characteristics that make us positive and productive mentors? What is it that contributes to our mentoring successes?

In our interviews, we asked mentors to describe the traits that they believed added to their mentoring styles. Although the interview was for research purposes, many of the mentors took the humble approach, attributing much of their successes to their mentees. So we asked their mentees the same question: What was it about your mentor that made the mentoring experience so successful? Not surprisingly, the mentees that were interviewed gave us further insight into the powerful traits that ultimately led to a productive experience.

In this section, you will find a compilation of mentors' personalities, intellects, temperaments, traits, habits, attitudes, self-concepts, value systems, defense

mechanisms, and behaviors that were conducive to their mentoring successes.

CHARACTER

- 1.** Being passionate about academic integrity.
- 2.** Caring about students as individuals, not just scholars, researchers, or people who will one day give back to the university.
- 3.** Taking a real interest in students' lives.
- 4.** Being supportive; listening to anything students need to talk about - not just the science.
- 5.** Being readily available - allowing students to text and stop by the house.
- 6.** Providing resources, such as textbooks for studying purposes and devices for recording lectures.
- 7.** Being compassionate about the different struggles in students' lives, and conscious of how those struggles can affect academic performance.
- 8.** Showing empathy when a student is out of his element.
- 9.** Being genuine.
- 10.** Being open about mistakes and knowledge limitations.
- 11.** Remembering what it is to not be good at something.
- 12.** Not judging how students express themselves and what they say in meetings.
- 13.** Trusting students - even though some students abuse that trust.

- 14.** Being excited and passionate about the work, the science, etc. - and showing it.
- 15.** Instilling in students a passion for science and a determination to succeed.
- 16.** Being predictable.
- 17.** Valuing everyone, no matter their age or level of experience.
- 18.** De-emphasizing the student-teacher dichotomy.
- 19.** Aiming for a reciprocal learning relationship with mentees.
- 20.** Working as a team to access a greater spectrum of research.
- 21.** Treating mentees as people, not just grunt workers.
- 22.** Encouraging a friendly and respectful environment.
- 23.** Not talking down to students; treating students with respect.

COMMUNICATION

- 24.** Being honest and not holding back.
- 25.** Helping to navigate the differences between high school and college.
- 26.** Taking the time to listen and communicate.
- 27.** Understanding the needs of the students.
- 28.** Not being afraid to ask more personal questions of struggling students.
- 29.** Getting to know mentees: discussing concerns, short-term goals, long-term goals, obstacles, etc.

- 30.** Not judging lab potential by classroom grades.
- 31.** Keeping an open mind and an open heart.
- 32.** Not letting past experiences carry over to other students.

CREATIVITY

- 33.** Encouraging collaboration.
- 34.** Being curious.
- 35.** Guiding students through problem-solving without giving them the solutions.
- 36.** Using intuition to gauge what students need: affirmation, guidance, firmness, etc.
- 37.** Being open to ambiguity and new experiences.
- 38.** Being willing to take chances.
- 39.** Letting students make mistakes and being patient with them.

FLEXIBILITY

- 40.** Letting students be themselves.
- 41.** Reinforcing students' confidence levels.
- 42.** Being open to the differences between students.
- 43.** Not expecting mentees to turn out as carbon copies of their mentors.
- 44.** Not taking a cookie-cutter approach.
- 45.** Considering what might work for the mentee, instead of only applying what has worked for the mentor.
- 46.** Understanding the cultural backgrounds that students come from.

- 47.** Encouraging different career paths: research, teaching, etc.
- 48.** Allowing students to have their own ideas.
- 49.** Being vulnerable.

FRIENDSHIP

- 50.** Allowing students to express their thoughts and emotions in a safe environment.
- 51.** Being a mentor for life - not just until graduation.

COMMITMENT

- 52.** Being committed to getting mentees from Point A to Point B.
- 53.** Being approachable and accessible.
- 54.** Going above and beyond to provide support and assistance, even past the 9-5 hours.
- 55.** Being very involved without micro-managing.
- 56.** Connecting with mentees on a personal level.

INDEPENDENCE

- 57.** Allowing students to be creative.
- 58.** Encouraging students to be independent.



MENTORING ENVIRONMENT



PHYSICAL AND PSYCHOLOGICAL SPACES

Many would argue that a successful mentoring relationship is all about the people involved: the personalities of the mentor and mentee, the way they work together, and the feats they accomplish. But as mentors, we know that there's more to it than that.

The environment provided by a mentor, be it physical or psychological, has an enormous impact on his or her mentees. If students don't feel physically comfortable in a space, they are less likely to want to work and discover there. And without a safe and open psychological environment, students are less likely to take risks and make connections

This section is about the relationship between human beings and their environments: what works, physically and psychologically, to encourage successful and positive mentoring relationships.

FREEDOM

1. Allowing students to disagree and being respectful of and receptive to what they have to say.
2. Having a dynamic lab environment that allows students to study or hang out between classes or in their free time
3. Not looking over students' shoulders at all times.
4. Allowing independence and intervening only when necessary.
5. Not micro-managing.
6. Allowing students access to faculty office resources: printer, computer, etc.

CELEBRATING

7. Having fun with students.
8. Creating an environment that includes play as well as work.
9. Not taking rejection (i.e. of a paper) too seriously.
10. Requiring students to read one another's research and support each other.

FAMILIAL

11. Treating mentees as family: sons and daughters, nephews and nieces, etc.
12. Welcoming new students into the "family."
13. Encouraging friendliness between all levels in the lab: undergraduate, graduate, and PhD students.

- 14.**Running engaging workshops (i.e. using Dr. Seuss' Oh, The Places You'll Go! as a metaphor for the journey from an undergraduate to a graduate student).

FUN AND LAUGHTER

- 15.**Keeping a relaxed atmosphere where it's okay to make and share mistakes
- 16.**Inviting entire lab to eat together, go canoeing, etc.
- 17.**Encouraging students to bring in dishes from their respective countries ("Food Fridays").
- 18.**Having cook-outs.
- 19.**Going out socially to celebrate: birthdays, publications, grants, etc.
- 20.**Encouraging students to set daily goals and achieve them before going out together for the evening.
- 21.**Using Facebook as a means to stay connected and post student progress.
- 22.**Reaching out to students: inviting them to go for a walk, get coffee, etc.

LAB MEETINGS

- 23.**Having meetings as a lab once weekly to provide support for students wanting help with their research, presentations, etc.
- 24.**Alternating research meetings with guidance meetings: how to write a CV, make a presentation, etc.

- 25.** Encouraging student-to-student learning: less advanced students working with and learning from more advanced students.

OFFICE DESIGN

- 26.** Playing music.
- 27.** Hanging art on the walls.
- 28.** Posting poetry.
- 29.** Including colors and posters that reflect who the mentor is.
- 30.** Including comfortable chairs, and blankets if it gets cold.
- 31.** Having up-to-date, cutting-edge equipment.
- 32.** Being eclectic with decorations and design.
- 33.** Including different spaces for different levels of academic interaction: isolated cubicles, one-on-one collaborative rooms, open spaces for many people, etc.
- 34.** Keeping an open door.
- 35.** Having a simple office with open space.
- 36.** Not having a barrier (i.e. a desk) between the mentor and mentee.
- 37.** Having extra equipment that students can share so they don't have to bring their own.
- 38.** Including a dry-erase or chalkboard where students can write things.

SUPPORT

- 39.** Being a cheerleader for mentees and helping them get to where they want to be.

- 40.** Encouraging students to advocate for themselves and be involved.
- 41.** Working in collaboration with other faculty to help students.
- 42.** Providing an environment where students can rely on one another for support and discourse.
- 43.** Keeping students involved in the university environment by pointing out scholarships and helping them find campus resources and employment.
- 44.** Creating a safe space where students can talk about anything.
- 45.** Reminding students that everyone is equal and working toward the same goals.
- 46.** Encouraging a friendly, family-like environment: students help each other with chores and research, get into debates, etc.
- 47.** Creating a hub for socialization, research, peer-to-peer learning, etc.
- 48.** Encouraging teamwork, collaboration, and coordination.
- 49.** Introducing students to other faculty members and researchers in the field.





Throughout our interviewing experiences, we came across many inspiring quotes that reflected just how passionate mentors can be about their students and their jobs. Below, you will find some of our favorite takeaways from asking mentors and their mentees: What works?

1. "What works? [My mentor's] love of knowledge and people."
2. "[My mentor] truly values people from all levels or ages of life, so even as a young intern coming in and working with him, he felt that he could learn a lot from me."
3. "The fact that [my mentor] valued my knowledge as much as I was valuing his, it fostered a very deep feeling of respect and a relationship where I didn't want to let him down."
4. "Even when [we] would run into things that we didn't expect, [my mentor] would always have a joyfulness about life."
5. "[My mentor] will drop everything else and focus on the problem at the time."

6. "If you don't keep in contact with [my mentor] about what's going on, then he's going to be worried."
7. "Either [my mentor] is a great actor, or he really cared about my success and was invested in it."
8. "[My mentor] ended up spending like five hours with me practicing [my presentation] until late in the night when obviously he'd rather be home with his family."
9. "What works? Mentors that really care."
10. "[My mentor] is really involved, he still wants to see me succeed. And he doesn't have any vested interest in it anymore, it's just, you know, we're friends now."
11. "The class was like a hundred or so people and I always sit in the back and [my mentor] knew who I was and recognized me."
12. "When you're new and you're looking at data, you kind of feel a bit overwhelmed. And [my mentor] frames it, you know, like a storybook."
13. "The most important relationship I can have with [a student] is kind of like a mother-child relationship, you know? Where I can see you blossom and grow. I can help you gain your wings."
14. "[My mentee] has a business and she has a family and she is so proud of where she is right now. You know, because she pulled through. She has a PhD and she has a Doctorate."

15. "It's embarrassing how often students will avoid their faculty, and faculty will avoid their students, particularly when things aren't going well."
16. "The best relationships were when we had a very outgoing student mentor one of the new students. It had nothing to do with what their research interest was, what their background was, it's just that they were the ones that would continuously email the new student about social events, about seminars they should go to, because they were just outgoing."
17. "The single most important thing was allowing [my mentee] the opportunity to get started, and then once I provided the opportunity, it allowed him the ability to show me that he could be successful."
18. "We would never look down on a student because they happen to be doing more teaching or didn't get their fellowship this year, but we will work with that student to identify fellowship opportunities the following year."
19. "Getting a degree is not the last thing in one's life. It's just a step."
20. "I observe. I listen. I start to combine signs that I see in someone. I ask a little bit about their lifestyle situation."
21. "I say, 'Look, I know what you're going through and it was no different for me. I see where you're at and trust me, all these people are no different than you and me, and you work as hard as you're working right now, I'll give you the opportunity and something will happen.'"

- 22.** "Just allow [students] to be part of the process from the beginning."
- 23.** "I think there are lots of ways for [students] to get feedback on the science, but there's very little ways for people to get feedback on, 'You know, it's okay to go over to the Wellness Center and do therapy sessions.'"
- 24.** "I'm hands on, you know, I'm in your business all the time."
- 25.** "Quitting is fine. You know, you should quit at a certain point and go get help or move on to something else. Otherwise, you'll spend all day angry at yourself because you haven't succeeded at something that you're not going to succeed at anyway."
- 26.** "The best thing for me to do as an advisor is let them figure it out."
- 27.** "If my door is open, it means anything is up for grabs. Come tell me about your weekend, whatever. If the door is halfway shut, it should probably be important, you know, they need a signature, they're quitting grad school. If the door is closed, it means I'm probably battling a deadline."
- 28.** "Hey, it's your life. If you don't know what you want to do with your life yet, that's cool too. Most people don't."
- 29.** "You'd be surprised at what a simple plaque can mean."
- 30.** "You have to mentor based on what you know about [each] person."

- 31.** “[My former mentors] were talking to me from the perspective of what worked for them, and they had no idea who I was and what sort of things worked for me. I try not to do that to my mentees.”





WHAT MENTORS WISH THEY HAD



We asked our interviewees what it would take to extend the efforts of broadening participation even further. What would it take for the mentoring process to really shine with success in colleges across the U.S. and around the world? The responses were many, and we were able to compile a list of “should-haves” for all mentors, present and future.

1. The role of a mentor to be included in the job description.
2. The role of a mentor to be included in the tenure decision.
3. Students to realize the importance of mentors and to seek out mentors.
4. Students with critical thinking experiences.
5. Culturally relevant teaching.
6. Students with early research experiences.
7. An academic infrastructure that supports the participation of students in experiential learning.
8. Genuine experiences between mentor and mentee.
9. Finding common ground between mentor and mentee personalities.

- 10.** A process by which faculty members are effectively paired with their mentees.
- 11.** More extended relationships between the mentor and mentee - not just for the semester or year.
- 12.** A social hour every day for people interested in becoming a mentor/mentee.
- 13.** Mentors to pass on the love and knowledge of mentoring to their mentees.
- 14.** Better communication skills.
- 15.** Higher levels of student interaction within a department.
- 16.** Students who are less afraid to ask for a mentor.
- 17.** A more robust program that brings in a higher number of students, who can be shown how important and life-changing it could be to get an advanced degree and become a scientist.
- 18.** Better student preparation for college.
- 19.** For mentees to have a better grasp of what mentoring really means and what their responsibilities are in the experience.
- 20.** Provide incentive for faculty members to become mentors.
- 21.** Institutions that understand what mentoring is and that acknowledge and recognize good mentoring.
- 22.** Teaching credit that is earned by mentoring number of students. Accumulated credits get applied towards a course reduction so that faculty can dedicate more time to mentoring.

- 23.** Faculty members getting more experience in mentoring.
- 24.** Short mentoring workshops that introduce the “flavor” in a short and engaging way.
- 25.** Increasing training for mentors across institutions
- 26.** A how-to manual to provide everyone that engages in mentoring with some sort of training.
- 27.** Professors who invite their students to talk with them.
- 28.** Professors and scientists with better interpersonal skills.
- 29.** Online mentoring tools.
- 30.** Webinars.
- 31.** More resources for mentors and mentees.
- 32.** More funding and financial resources for students and their projects.
- 33.** More people who want to be mentors.
- 34.** Great students who want to learn - the right clay to mold.
- 35.** Smaller class sizes.
- 36.** Resources to make mentoring more realistic for faculty members.
- 37.** More energy to be an active mentor on top of faculty responsibilities.
- 38.** Mentors who take more time to get to know those they are mentoring.
- 39.** More time to spend with mentees.



TIPS AND TECHNIQUES



There are keys to every mentor's successes: tips and tricks to make sure that students do well in their endeavors and reach their potentials. We all have them, and we all use them.

This section is about exploring the tools that have worked for other mentors. Perhaps you've never thought of them, or perhaps you assumed they could never work. No matter your situation, the following techniques have been proven to work at least once in the past. And if then, why not again?

1. Be flexible.
2. Tell personal stories, not just science stories.
3. Be open.
4. Be a little more open to the different types of goals that students have - not everyone wants to go into academics or research.
5. Be willing to have difficult conversations about student performance.

- 6.** Don't be afraid to admit what you don't know, and don't be afraid to seek out other resources on campus to find the answers.
- 7.** Explain your role: if you are not comfortable counseling students, point them in the direction of someone who can help.
- 8.** Assess individual student situations and proceed accordingly.
- 9.** Get to know each student.
- 10.** Stay up-to-date on statistics concerning minorities in colleges.
- 11.** Be aware of students' family obligations and pressures.
- 12.** Talk about publication very early on.
- 13.** Communicate expectations with mentees to ensure you are on the same page.
- 14.** And they need to explain to that incoming student how they like to work.
- 15.** Set boundaries that will help mentees succeed in college and build confidence.
- 16.** Have a stored knowledge of the many resources available to students: health, financial, academic, etc.
- 17.** Introduce controlled failure.
- 18.** Make sure mentees have a vision of where to go.
- 19.** Have regular meetings to understand where students are and what they're doing.
- 20.** Be willing to change your mentoring style depending on each student.

- 21.** Don't let previous student experiences influence you other than teaching you how to be a better mentor.
- 22.** Encourage group get-togethers outside of the lab.
- 23.** Invite students to dinner at home.
- 24.** Read mentoring books: Nature's Guide for Mentors.
- 25.** View mentoring presentations: Richard Tapia.
- 26.** Read mentoring articles: Dave Jenkins, Joan Fraud.
- 27.** Take stock of how you impact your students.
- 28.** Get to know your mentee. Don't assume that person is going to want to be just like you.
- 29.** Reach out to students - past and present - to see how and what they are doing.
- 30.** Encourage students to involve their families, to show them that what the students are doing is important.
- 31.** Have students write down grants they've applied for and classes they've taught and the respective evaluations. At the end of each academic year, review these with students in comparison with their expectations, and make a list of next year's goals.
- 32.** Include time for students to interact with guest speakers and scholars in their fields.
- 33.** Have each student dual-mentored by a faculty member and a reference librarian in their discipline.
- 34.** Help students talk to their parents about their academic and professional goals - especially if these goals do not line up with what the parents had in mind.

- 35.** For paid students, ask them to spend half of their paid time working with you, and the other half on their own projects.
- 36.** Keep a notebook for each student and his projects/progress. During meetings, consult the notebook and add to it.
- 37.** Help students to understand the dynamics and roles each person plays in the college setting, from undergrads to deans.
- 38.** Encourage students to examine and understand their own learning and studying processes.
- 39.** Ask lots of questions.
- 40.** Admit when you're wrong, and encourage students to find the answer through other means.
- 41.** Highlight the strengths that come from students' minority statuses (i.e. being bilingual) instead of pitching them as minority students.
- 42.** Involve others in your mentoring process: graduate assistants, program coordinators, etc.
- 43.** Gauge the level of engagement and checking-in that each student requires or desires.
- 44.** Set weekly goals and to-do lists for students, and check in/offer assistance.
- 45.** Use common interests (i.e. video games, sports) to explain complicated concepts.
- 46.** Recommend students based on lab experience and accomplishments, not grades.

BROADEN PARTICIPATION



Throughout this book, we've seen it all: highlights and environments, personal habits and techniques. These are all important pieces of information to consider, because together, they contribute to successful mentoring relationships and experiences.

To wrap up our interviews, we asked mentors why they believe their mentees followed the STEM path, and what it takes to make that happen? We didn't ask for more specific actions that contributed to the outcome, nor did we request further details from past experience. We simply asked: What Works?

What works to broaden participation? What works to encourage underrepresented minorities to pursue their goals? What works in creating a success story? The following list is a general collection of what worked for them - and what may soon work for you.

- 1.** Students need to see results right away to get motivated.
- 2.** Let students know that no matter what their level of knowledge is, they can always work hard and learn more.
- 3.** Allow students to really express themselves in their learning.
- 4.** Acknowledge students' research and presentations publicly.
- 5.** Put out news releases for the lab.
- 6.** Create a series of scholarships and awards to recognize the students that are doing well; peer pressure is fundamental.
- 7.** Make sure that students get praised when they accomplish something.
- 8.** Help students with networking by introducing them to scholars and faculty members in the field.
- 9.** Encourage peer-to-peer learning within the lab.
- 10.** Set up groups from similar ethnic backgrounds to lessen the difficulties of adapting to a college environment as a minority.
- 11.** Be flexible in your teaching and mentoring styles.
- 12.** Encourage active engagement in the classroom, and inquiry-based approaches.
- 13.** Have introductory courses in the field available to students so they can gauge whether or not the field interests them.
- 14.** Hold a boot camp for understanding the PhD process where former PhD students come in and share their experiences.

- 15.** Let underrepresented students see other minorities succeed.
- 16.** Try to connect on a cultural level.
- 17.** Connect students with one another.
- 18.** Build personal relationships on top of those based on science.
- 19.** Expose students to conferences, more research work, faculty.
- 20.** Research "Inspiring Student Excellence."
- 21.** Be inclusive - make sure that everyone feels they have something to contribute.
- 22.** Allow everyone to participate.
- 23.** Treat all students equally, regardless of minority status.
- 24.** Minority status doesn't matter. What matters is who the students are.
- 25.** Invite students over for a game night - just play, with no academic pressures.
- 26.** Help students to identify as scientists, and as part of a group.
- 27.** Adapt to your student population.
- 28.** Ask, What are we missing that is not supporting you as a minority? Then implement corrections.
- 29.** Give undergraduates research experience and potentially funding.
- 30.** Incorporate programs such as RISE (Research Inspiring Student Excellence), Instars (by the Society

for Freshwater Science), Research Experiences for Undergraduates (by the NSF), SEEDS (by the Ecological Society of America), SPICE (Science Partners in Inquiry-based Collaborative Education), CDIP (Career Discovery Internship Program), etc.

- 31.** If the funding is there, take students to conferences.
- 32.** Allow students to interact with speakers and scholars in the field.
- 33.** Provide internship opportunities.
- 34.** Teach professional development skills.
- 35.** Create an Eco-Log list that's designed to provide information for mentors or advisors.
- 36.** Create a Mentornet.
- 37.** Join the Institute for Broadening Participation.
- 38.** Create a high school outreach program to get students interested in environmental sciences and conservation.
- 39.** Provide opportunities for faculty to grow as mentors.
- 40.** Instill mentor training courses through the National Conservation Training Center.
- 41.** Help students figure out what to expect in a new school.
- 42.** Don't lie about the diversity of the school.
- 43.** Show students that what they're doing impacts the environment and the field, and how.
- 44.** Start mentoring students in high school and before.

HOW WE GATHERED THE DATA



By now, you have read through hundreds of ideas on how to make mentoring work, and you may be wondering how we got all of these ideas collected and categorized. Our team crafted and then piloted interview questions to help interviewees stay focused on their peak experiences, their times of great success—both **in research** and on other broadening participation efforts. Maintaining this positive bias is not always easy since most of us have been trained to learn from our mistakes. Yet we may actually learn more from our triumphs.

We were convinced that having participants immerse themselves in memories of their achievements stirs up pride and boosts energy. They become more open, eager to build on their most effective ways of working. As we explored these questions, we nudged participants to stay on track with what worked and discover how they made their best a more constant reality. Below are the questions we asked in our interviews:

- Describe a time that made you most proud--a high point, when you mentored someone successfully to do something challenging.
- What were the most memorable parts of the mentoring experience, including challenges?
- Reflect on: "root causes of success" What were they?
- What were your best qualities, or the mentoring mindset/qualities that helped you succeed? (PERSON)
- What did you actually do? (PROCESS)
- What environment did you foster that led to the high points? (PRESS)
- Why was it important/significant/surprising? (PRODUCT)
- What did you learn from it (PRODUCT)

- Mentoring is one approach to broadening participation. Over and above mentoring, what else have you found that worked to broaden participation?
- Imagine you had a magic wand and could have three wishes granted to improve mentoring. What would they be?
- What tips would you give to advisers, mentors, or any other person who serve in a similar role so that they can more effectively approach mentoring?

The specific aims of these questions were to bring together (a) the leadership that contributed to past successful participation (Creative Leadership); (b) the behaviors the individuals and groups demonstrated that led to success (People); (c) the organizational factors that promoted an environment of participation through organizational practices (Environment and Broadening Participation); (d) the operational and social processes that contributed to participation (Process); (e) the results that were obtained through implementing the tactics (Products). In short, these questions were designed to

embrace a holistic approach to broadening participation through mentoring.

As we stated, the individuals who were selected for these interviews were faculty members, administrators, students, or other key stakeholders. But, irrespective of their role, they had tried something, and were willing to talk about it. Our main focus was recruiting Division of Environmental Biology (DEB) related participants who wished to actively engage in the program. In total, 28 subjects were interviewed.

For students from underrepresented minorities, simply sharing how they came to succeed in their studies is an interesting story. It becomes even more interesting if they were influenced by teachers, faculty or administrators along the way. In the case of the other actors: faculty, administrators, society reps etc., we looked for people who had actively engaged with the problem, and tried experiments. The experiments might have appeared to be obvious, but the results were informative. Although we had a clear idea of our ideal participants, we understood that there was, and still is, great interest in this topic, and we therefore anticipated attracting two broad groups of participants. The primary group comprised DEB focused faculty from Research and Primarily Undergraduate Institutes and community

colleges, underrepresented minority students at all stages, and DEB focused society representatives.

Our secondary group comprised faculty from outside DEB, NSF program officers, high school teachers, and other interested stakeholders. Our intention was to focus our recruitment on the primary group, and welcome participants from the secondary group, if they materialized. Computer Aided Analysis. QSR NVivo for Mac software was used to code and cluster responses of participants. Specifically, this program handles text with ability to edit, visually code, and link computer documents as they are created and filtered. It also stores, locates, and sorts files. The program can sort and display data in much the same way numerical data is handled. We want to be clear that the coding was intended to organize information for the purpose of peer-to-peer learning and not for a qualitative study grounded by theory.

Regardless of how the data was gathered, the fact remains: data on what works in mentoring is out there. Hundreds of educators, researchers, and service people are influencing today's young and early-career scientists in positive and productive ways. And perhaps even more importantly, hundreds more are hoping to become mentors themselves, and create "What Works" experiences of their own.

This book builds on ideas and concepts discussed in the following works:

Cooperrider, D., & Whitney, D. D. (2005). *Appreciative inquiry: A positive revolution in change*. San Francisco, CA: Berrett-Koehler Publishers.

Hebert, T. P., Cramond, B., Spiers Neumeister, K. L., Millar, G., & Silvian, A. F. (2002). *E. Paul Torrance: His Life, Accomplishments, and Legacy*. National Research Center on the Gifted and Talented.

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Disadvantaged, at risk, and/or underrepresented minorities, according to Social learning theory, emulate the behaviors of those whom they deeply admire and respect. It is for this precise reason why the examples that mentors set are crucial for inspiring students to stick with STEM programs.

Therefore, the importance of mentors cannot be underscored enough, as they play an important role in reducing fears and anxieties that come from navigating through uncharted and sometimes turbulent waters. Mentors help develop the academic and life skills that students need to succeed in their schools and careers. It is the mentors that are often credited with helping students to formulate a healthier sense of self, or view that the gap between a current reality and a desired state is not inconceivable. As a result, students are more likely to put forth greater effort and persistence to meet academic goals.

As the father of creativity, E. P. Torrance, once postulated, they are more likely to associate their perceived futures with academic performances; they tend to associate their abilities to cope with the vicissitudes of life; and they recognize their competences in tolerating an exponentially changing world that is filled with volatility, uncertainty, complexity, and ambiguity.

In an academic world where students are devoid of mentors, they are likely not to pursue science, technology, engineering, or mathematics tracks. Worse, they may drop out of school entirely. If you already have internalized the importance of your role, then that is fantastic. If not, then we hope that these stories help to make it more abundantly clear how much you are needed. Your actions have a real, and long lasting impact on the lives of your students. The face of the biological community will be changed by you.

For updates on our quest to find what works in mentoring, visit whatworks.hub.ki!

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