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One by One

The Best Way to Make Scientists

By Mike Turnlund

I recently retired after teaching for many years at Clark Fork Jr/Sr High School in Clark Fork, which has a population of 536. During my time as a teacher, I learned that students have different reasons for being in school. Most just want to get through the system, graduate with a diploma, and move on—some directly into the workforce, others into the military, and still others on to some form of post-secondary education, such as college or an apprenticeship program. High school is a means to an end.

But for a few students, school is not simply a road that leads to some yet-distant destination, it is the destination. School is a place to not only learn but to explore. Potentially, it is, to use a well-worn phrase, a place to blaze one’s own trail. These students see learning as an adventure. These self-actualized young people always prove to be exceptional learners.

I taught a variety of subjects, but my favorite was US history. I was fortunate to be able to work in a school system that allowed me to offer college-level courses for the more academically-minded students: “dual-credit” classes that awarded students credits for both high school and college. I did this for many years, working primarily with the University of Idaho in Moscow.

But I often was not able to take my most inquisitive students to their next level of learning, where they could conduct their own independent research, discover new things, and perhaps uncover stories still hidden to the rest of the world. Once, I was almost there. Working with a handful of dedicated historians-to-be, I devised a curriculum in which they would research all the historically significant buildings in Sandpoint, determine their origins, discover their sense of place, and learn about the architects and builders who created them. All this would be done through hands-on research at the county museum and through personal interviews. It never happened. We weren’t able to coordinate everyone’s schedule to fit into the time slot available. Oh, what might have been.

This is why I greatly admire Darren Thompson, PhD. Darren is a chemist who specializes in the study of peptides: amino acid chains of various lengths and characteristics. He does take students to that next level, by making them partners in his own research. He serves not only as a mentor to them, but they become co-explorers in this field of science. They blaze that trail of discovery.





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Darren Thompson (left) and Tyler Siegford at a conference. Nancy Wong photo.



Tyler presents his work at a 2018 conference. Jerome Pollos photo.

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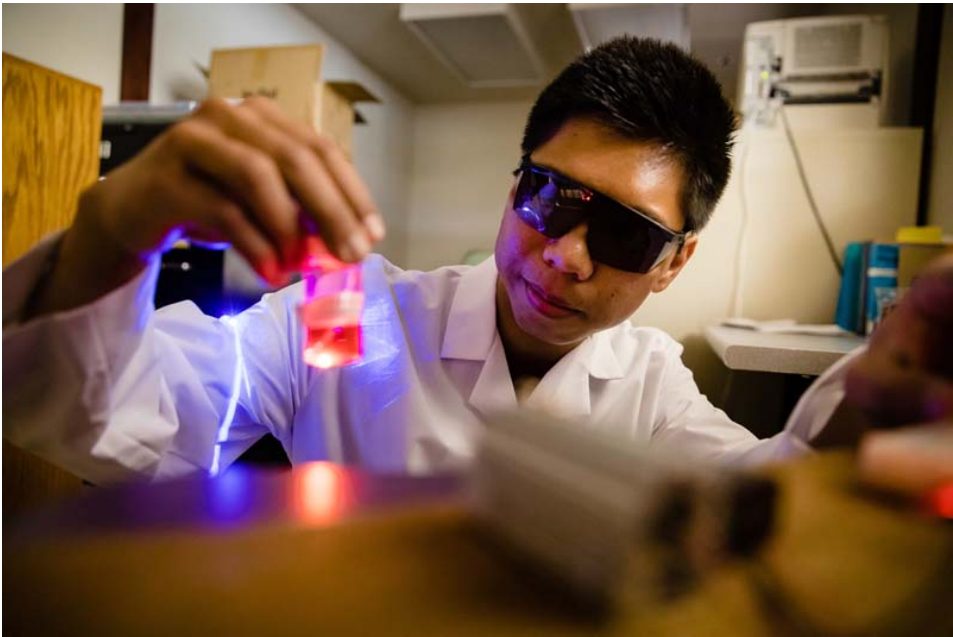
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Student John Sanchez demonstrates laser florescence. Jerome Pollos photo.



Darren in the lab with student Jonathan Webb. University of Idaho photo.



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Kristen Nethercott working with mass spectrometer. Darren Thompson photo.



Darren gives an address at the University of Chicago. Nancy Wong photo.



Student Lucy Pavey working at a fume hood. Darren Thompson photo.



When you meet Darren, your first impression might be of his deceptively youthful appearance. Except for the gray in his beard, he hardly seems old enough to have yet earned a doctorate. But at forty-seven, he is a seasoned researcher, with thirty-nine authored and co-authored papers published in scientific journals. The man knows his stuff.

The second thing you will notice about him is his halting speech and stilted gait, the consequence of an unfortunate but intentional cyanide poisoning. This almost-fatal suicide attempt occurred after he graduated from the University of California, Santa Cruz, but before continuing on at the same institution to earn a doctoral degree in chemistry and biochemistry. And while these physical impairments from the cyanide might slow him down, they have had no impact on his keen intellect or his science. And the event changed his life.

He has come to see himself as having been spared because there was a plan for him. He decided his physical impairments would not be impediments, and he set out on a path of “paying back.” This is why mentoring students is so important to him. He feels that he has been given much and, in a fashion, is repaying those who invested in him. Second, he believes that young people need good role models, especially in science. “Individuals rise or fall in accordance with expectations and challenges placed before them,” he told me. “I do not champion mediocrity.” Darren also quoted President John F. Kennedy’s statement: “We go to the moon not because it is easy, but because it is hard.” He believes if young people are given challenging opportunities, they will rise to the occasion.

Darren earns nothing from his lab work and mentoring, both of which he supports out of pocket and through donations from individuals who share his vision. In-kind assistance from John Wieser, PhD, lab coordinator at the University of Idaho’s Harbor Center in Coeur d’Alene, (UI-CDA), also plays a crucial role.

After Darren’s post-graduate work at UCSC, he found himself settling into the community of Sandpoint. He founded an independent consultancy that helps with chemistry grants and manuscripts, and synthesizes a chemical reagent for companies that he designed as a postdoc. He also is an adjunct professor at the UI-CDA campus, where a science lab is available to him and where he began in the summer of 2017 to mentor promising future scientists: local high-school and college students drawn from the surrounding counties.

Darren takes them one at a time. This is a powerful method: a teacher and student working together, one-on-one. I had such an opportunity only once in my entire public school teaching career, and that time it was a fluke. The dual-credit courses I taught at Clark Fork Jr/Sr High School often included just a handful of students. This was a reflection of the small school itself: a rural combination junior and senior high school of six grade levels, which at the time had perhaps a hundred students. We had the minimum number of teachers allowed by law and required the minimum number of credits for students to graduate. Dual-credit courses were electives, and scheduling was always an exercise in balance, as every required course was typically taught in only one class period per year. If a student had to choose between my elective dual-credit US history class or Algebra I, which was required, the math class would win. Students who did not choose Algebra I would have to wait an entire year before it was offered again or take it online, which generally was not a popular choice.

That was how I ended up with a single student named Audrey for one term of dual-credit US history. Of all the students who had originally chosen my class as an elective for that term, every one of them had to drop it because of scheduling conflicts. Everyone except Audrey. She ended up being my sole student, and we had the best discussions! The pace of teaching and the flow of instruction were personalized around her: her questions, her hypotheses, her interests. It was probably the most satisfying teaching experience I ever had at the school. We had the time and opportunity to go down so many relevant rabbit holes—for her sake, to satisfy her curiosity—that could never have happened in a class with a larger number of students.

But this is the norm for Darren Thompson. His one current laboratory mentee is Kristen Nethercott, the Coeur d’Alene High School 2020 salutatorian. Kristen won a full-ride academic scholarship to the University of Florida, Gainesville, starting in the fall of 2021. In 2019, as a high-school student, she and two classmates entered a science fair project that earned Best in Category and the runner-up as Best in Fair at the North Idaho Science and Engineering Fair held in Coeur d’Alene. She is working with Darren throughout this summer before continuing her studies in Florida.

One former student had particular success in Darren’s ideal learning environment. Tyler Siegford spent two summers with him as an undergraduate student at the University of Idaho in Moscow, and gained valuable skills and insights into conducting research. So successful was Tyler’s work with Darren that he completed two research projects and presented the results at multiple conferences, including the Idaho Conference on Undergraduate Research and the Idaho INBRE (Idea Network for Biomedical Research Excellence) Conference. He subsequently received a summer undergraduate research fellowship and two INBRE fellowships. He accompanied Darren to the Symposium for Stephen Kent at the University of Chicago, where he met some of the world’s foremost experts in protein chemistry. Tyler also presented his work at the American Chemical

Society Conference in Orlando, Florida, in 2019.

I asked him about the role Darren played in his early science education. He wrote this reply:

Dr. Thompson has been an enormously impactful mentor to me. I met him during spring break during my freshman year at the University of Idaho. I was so excited about my major and was searching for a summer internship in a research lab. I was so surprised that someone with Dr. Thompson's research accolades would want to mentor me in his lab (at that point I still didn't know very much). I learned so much that summer. As a freshman, I was doing real science. I was using expensive instruments and dangerous chemicals to complete a project that had the potential to impact the world. Dr. Thompson was a great teacher and always put so much effort into answering all my many questions. I had such a great summer that I was dying to come back again the next year.

The next summer Dr. Thompson trusted me with an even more advanced project and spent even more time with me in the lab. I consider completing this project with him as one of my greatest accomplishments. I am so grateful for all the time [and] energy...that Dr. Thompson has given to me and all the other students he has mentored.

Tyler was recently accepted into the Idaho Dental Education Program and will spend the next four years earning his DDS at Creighton University in Omaha, Nebraska.

An additional boon for Darren's students is his recent acquisition of a mass spectrometer. These instruments are used to measure the mass of molecules, an essential function in verifying the results of chemistry experiments. Darren was able to secure his own mass spectrometer through a series of events that have convinced him were providential in origin—all part of that ordained plan. First, through an old contact at the Scripps Institute, he discovered a "gently used" spectrometer available for sale. Second, this particular machine was identical with the one he had become familiar with at Gonzaga University. Equally important, Thompson had become well acquainted with Scott Economu, whom Thompson calls Gonzaga University's "chemistry equipment guru...and [who] is really knowledgeable."

This contact was important, because Scott could provide technical support from only forty miles away. Otherwise, the cost of maintenance and support of an on-site mass spectrometer would be prohibitive. To simply bring in a technician to repair the machine might cost three thousand dollars, not counting the price of parts. The presence of Scott Economu, who graduated from the University of Idaho in 2002, was invaluable.

After the unit arrived and was installed on May 5, 2021, Darren tested the machine by checking the spectrum of horse myoglobin. "The charge envelope was as expected," he said. That means the reading was accurate.

Previously, Darren had access to a mass spectrometer at the University of Idaho in Moscow or at Gonzaga University in Spokane, but it was crucial for his work to obtain one that he could use on-site with students. "A lot of reactions are transient and must be monitored in real time," he explained to me. "If you have to store samples in microcentrifuge tubes and analyze them a month or two later, what you would expect to find may have degraded."

In other words, the data might not be reliable. Of course, with the machine on-site, his students can develop the skills necessary to verify their work using a mass spectrometer. "This is the only electrospray ionization mass spectrometer in northern Idaho," Darren said. "Without this essential, modern instrument, North Idaho College and local high school students' work with me would remain largely conjectural."

To me, a science laboratory is like a sophisticated wood shop, except the tools are a bit more delicate. No table saws, planers, or CNC machines are to be found, yet the specialized machines in Darren's lab are required for a student to accomplish whatever needs to be done in the research. In my field of US history, my "lab" is museums, archives, and dusty old books. In chemistry, the laboratory includes equipment likely to be found in a hospital.

While the mass spectrometer might be the centerpiece instrument of Thompson's work with his students, other lab tools also have to be mastered. These include a high-pressure liquid

chromatograph that is used to separate, identify, and quantify each component in a chemical mixture. Also, there are multiple centrifuges, a rotary evaporator for removing solvents from chemical samples, and a lyophilizer or lab-quality freeze dryer. Without access to these tools, the student would have to fall back on the hypothetical: books and lectures. There is no substitute for hands-on learning, which is the only way that practical and essential laboratory skills can be mastered.

As a former teacher, I envy Darren Thompson. He not only helps students to learn the tools of the trade of a scientist or medical specialist but has the opportunity to guide them in making their own contributions to science and the greater good, which is a rare gift. In my career, I experienced this once. For Darren, it happens every day. With the help of a few other key individuals who share his vision, he's making the world a better place—one young person at a time.



About Mike Turnlund

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