



Editorial

An interview with Dr. Eleftherios P. Diamandis on mentorship and success



1. Introduction

This brief interview centers on Dr. Eleftherios P. Diamandis's extensive experience in educating and mentoring graduate students and postdoctoral fellows as well as his long career as a Clinical Biochemist. He is Head of the Division of Clinical Biochemistry at the University of Toronto, Head of the Clinical Biochemistry Section, Pathology & Laboratory Medicine Department at Sinai Health System and Biochemist-in-Chief at the University Health Network. He holds the Hold'em for Life Chair in Prostate Cancer Biomarkers. Dr. Diamandis won many awards from the American Association for Clinical Chemistry, The Canadian Society of Clinical Chemists, The International Federation of Clinical Chemistry and Laboratory Medicine and he is an elected member of the Royal Society of Canada and a Fellow of the American Association for the Advancement of Science. He is an expert on proteomics and biomarkers and published over 800 refereed papers. He has an h-index of 115 and collected over 55,000 lifetime citations. He writes frequently on mentorship and some of his mentorship essays appeared in the journals *Nature* and *Science*.

2. Can you give us an overview of your career?

I received both my Ph.D. in 1979 and MD in 1986 from the University of Athens, Greece. After receiving a Clinical Biochemistry Diploma in 1984 at the University of Toronto, I was offered the position of Director of Research and Development at a small biotechnology start-up company and moved permanently to Toronto in 1986. In 1988, I became professor of clinical biochemistry at the University of Toronto where I started a research laboratory. Since then, the lab has grown from three to 20–30 people in 2000–2018, composed mostly of students and postdoctoral fellows. Over the years I have trained 60 graduate students - mostly at the PhD level - as well as about 100 post-doctoral fellows. I work very closely with these students and I observe their approaches to science and life. The diversity of people that I was exposed to allows me to say that I have probably seen all I could, and I am glad to share some actionable advice, with the hope it will be useful for other mentors and mentees.

3. Could you share some lessons from your extensive experience mentoring young scientists?

First and foremost, I respect all of my trainees regardless of their strengths and weaknesses. I believe it is crucial for mentors to approach all lab members as human beings, not as cheap labour or working pairs of hands. I genuinely care about their well-being, on their scientific and other problems and if they approach me with concerns, I always listen and try to help. My mentorship experience can be better understood in

a video clip [1] and is summarized in Fig. 1.

Creativity, hard work, perseverance, focus, communication skills, collaboration and problem-solving abilities are important attributes for young scientists. These attributes can be found in any list of “success rules” by simply searching Google. I encourage all mentors to look for, and praise, all these traits in their students. However, what is crucial and not usually mentioned in these success lists is how many of these traits are necessary to succeed. Most of my students have some of these attributes and lack others. To provide an analogy: a great basketball player is usually very tall, athletic, flexible, creative, a team player and an accurate shooter. With exceptions, the lack of a single attribute can degrade a great player to a mediocre one.

Regardless of natural strengths, I recommend that mentors cultivate a genuine passion for discovery in their trainees by modelling it themselves and being enthusiastic even about their small steps towards discoveries. I also encourage my students to be excited about other areas of science beyond our speciality; all my lab members alternate through giving short News & Views presentations at our weekly lab topics. Recent presentations include diverse areas such as driverless cars, black holes, extinction of white rhinoceros and the ethics of engineering humans.

Staying passionate is a particularly important marker for success and fulfillment in this competitive field. However, many people see their degrees as a means to an end, such as getting into medical school or other professional endeavors. Most students understandably prefer professional security over risk. And the discovery process is an exciting but risky business.

While I believe hard work is important, I do not want my students to become slaves of science. Skillful time management and work life balance are very important as burn out is a pervasive problem in this field. Too much pushing may create other problems such as anxiety and depression; I recently wrote about this serious issue [2]. I try to encourage my students to have a healthy relationship with work by maintaining my own work life balance.

Consequently, I advise all my students not to become or behave like robots or lose sight of the big picture. I encourage them to read outside their specific research focus and stress the importance of learning about other scientific disciplines and specialities as well as literature, politics, sports, music and other interests [3]. Some of our lab's musical explorations can be seen on YouTube [4]. I think it is important for mentors to take time to do hobbies and activities completely unrelated to science from filming a music video to a lab lunch to playing a volleyball game because regardless of the path they choose to pursue, multidimensional individuals with wide knowledge and excellent communication skills are generally more successful professionally.

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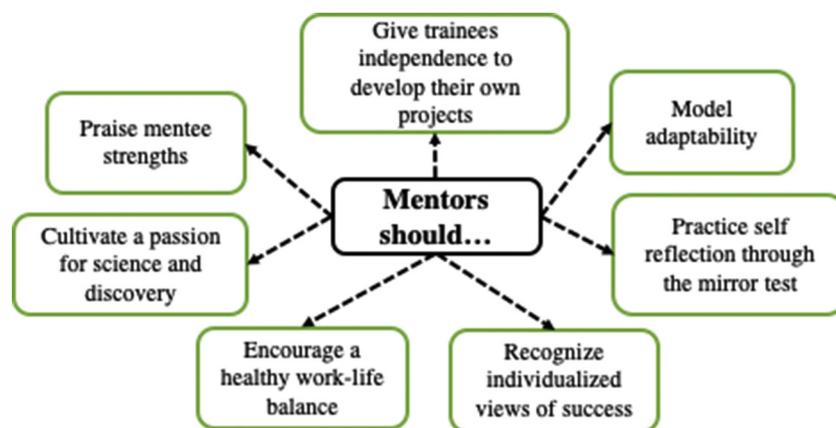


Fig. 1. Summary of mentorship advice from Dr. Diamandis.

4. How do you define success?

Success is highly personal, and my students understand it in different ways as their definition of success often evolves over time. Success is not necessarily becoming a big shot in academia, the hospital or industry or amassing money and eminence, but the fulfillment of one's personal goals, which include professional and personal (family) aspirations. Mentors should remind themselves that success looks different for each of their trainees and be open minded to supporting their mentees individually towards their unique career and personal goals.

Regardless of ambitions, I encourage my students to employ a technique I call “the mirror test” which I use frequently on my own to check “my success”. I look at myself in the mirror and ask myself: do I like what I see? Have I done everything to the best of my ability? This test is not about narcissism but determining if you are proud of who you are and what you have accomplished that day or earlier. If the answer is yes, I believe that constitutes success and I try to convey this to my mentees. I was surprised to see this mirror test portrayed in a prominent psychiatric book as an anxiety-relieving technique, which went beyond what I mentioned previously [5]. The book's author also suggested giving hugs and kisses to you as a means of boosting self-esteem. I guess this discussion comes down to the question “who I would like to be if I were not me?” I suggest that my answer would be “nobody else” although that may also sound egotistical.

5. Mentoring is evidently very important to you. Could you share your philosophy?

I often use sports as an analogy for my views on mentorship. Sports embody many lessons I try to convey to my mentees including the fighting spirit, courage, willingness to accept loss, respect for others, perseverance, finding a way out of tough times and creativity. In one of my essays I used boxing as an example and mention that the legendary Rocky Marciano, who retired undefeated, was knocked down 3 times in his career but had the courage to stand-up, fight and win the contest in all 3 occasions [6].

I particularly enjoy tennis and have played and followed the sport for decades. Just like in science, where you are ultimately responsible for your individual success, in tennis you are in the court with no one else to help you, and you win or lose on your own. For those interested, I also wrote some science fiction around tennis! [7–9].

I believe it is very important for mentors to guide students to identify their personal talents and encourage them to develop their own projects which means they are more passionate and invested in their work. It is also very rewarding to guide graduate students to their own scientific niches! Everyone is different and some students need more support than others. I am fortunate to have a large and well-resourced laboratory with an excellent Manager who is very good at helping new

students find their way.

In general, finding the natural talents of the students is a great way to get them to reach their potential. Over the years, I had some students who were very talented writers and I wrote great reviews with them. Others were great experimentalists, some were computer wizards, and a few were very artistic. No wonder some of my PowerPoint presentations have won acclaim for creativity! More recently, one of my students was proven to be a very talented entrepreneur and I encouraged him to bring in investors and start new companies. In short, there is no human being on earth who is born without many intrinsic talents. But identifying and promoting these talents is not easy or obvious.

Recently, I published an opinion piece in *Nature* outlining the importance of graduate students closely interacting with their supervisors [10]. I try to meet with all my students as frequently as possible and share primary data with them as they become available. My students know this, and they are allowed to interrupt me from any meeting, just to show me their latest result.

6. You have also adapted significantly throughout your long career. Could you talk more about this?

Yes, I believe adaptability is crucial to stay relevant and I have pursued a variety of research interests throughout my career. Initially, I focused on analytical technology but around 1990 I began focusing on molecular epidemiology. In 1995 my research shifted again to genomics. Since 2005, I have been pursuing proteomics, diagnostics and pathobiology. As my laboratory has expanded, I have also done some work with collaborators on cancer therapeutics, cancer microenvironment and metastasis as well as skin therapeutics. Interestingly, all of these changes coincided with the arrival of one or more students in the lab, who, as I found, had a specific interest or talent, as mentioned earlier.

Good education and diverse experiences are essential to avoid obsolescence. It is crucial for mentors to encourage students to stay at the forefront of innovations in their field and embrace new knowledge through wide reading, attending conferences and openness to learning from others.

Quick adaptability to current realities will help students win more grants and publish in good journals. This is no different from Darwin's theories about adaptation, survival and well-being. Unfortunately, if students cannot adapt, they can lose competitiveness and eventually pushed out of the way. Metaphorically, scientists must have a high mutational rate to be successful in the long run.

In a changing world, however, some things should never change. Mentors should always model integrity, honesty, and humility and most importantly being proud of who you are. Recently, I was asked to give a single piece of advice that could lead to success. I chose two words “distinguish yourself”. But when I am asked how this can be done, I tell

my mentees that they must find their way to distinction. The reality is that for every opportunity there are many candidates and few positions. Consequently, the chosen one is the one who raises above the crowd. In this demanding society, distinguishing yourself many require many years of hard work and careful preparation. It used to be that success was a 100 meter race but now it is a marathon.

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