

## **Empowering the Youth to Choose Non-Traditional Careers in Research & Academia**

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## Abstract

The United States is facing a dramatic shortage of clinician-scientists within the domains of medicine and dentistry. In this perspective article, we stressed the problem involving the continuous shortage of specialized professionals capable of addressing complex basic sciences questions, while maintaining clinical relevance. Here we present a different perspective regarding the early engagement of young students to clinical sciences by teaming up with high schools across the US, and to energize the debate on our current shortage of clinician-scientists.

Little did we know that by the end of 2019, we were heading towards one of the most disruptive pandemics the modern world has seen, with over 6.5 million deaths globally (<https://covid19.who.int/>). However, this was the first time humans had the knowledge and tools capable of interfering with the natural evolution of a pandemic. Decades of continuous investment in training scientists and advancing new technology allowed the breakthrough delivery of a new kind of vaccine capable of curbing death rates worldwide <sup>1,2</sup>. The new RNA-based vaccine brought to light the latest technology of lipid nanoparticles capable of efficiently delivering messenger RNA (mRNA) to cells. Originally, mRNA-bound fatty droplets were developed to address the lethal Ebola virus <sup>3</sup>; however, the SARS-CoV-2 outbreak skyrocketed focal funding and efforts aiming at research and development <sup>4</sup>. None of the achievements with the RNA-based vaccine would be possible without the actual discovery of mRNA in the 60s <sup>5</sup> and the advances in nanotechnology resulting in efficient mRNA delivery systems <sup>6</sup>. These discoveries along with pre-clinical tests of the emerging technology for new flu and rabies vaccines, paved the way for RNA-based vaccines. No need to stress the importance of research in our lives, and perhaps, the urgent need to secure continuous training of future researchers.

Skilled clinicians with solid research training are represented in many clinical research domains. However, some professions, like the ones encompassing dentistry and its specialties, are facing a shortage of clinician-scientists <sup>7</sup>. Dental schools are particularly struggling to fill research-intensive faculty positions with clinician-scientists. Usually, the successful researchers that apply and are able to secure federal grants are Ph.D. trained professionals with years of postdoctoral experience but with little to no clinical experience. Meanwhile, search committees are left with a short pool of clinician-scientists presenting a broad understanding of the field of dentistry while retaining advanced knowledge in basic and translational sciences. When have we failed to engage students to take non-traditional opportunities encompassing a dental degree as a gateway to initiate an exciting and fulfilling career as clinician-scientists? Perhaps the answer resides in recent information from the American Dental Education Association (ADEA) report published in September 2022 (<https://www.adea.org/seniors2022>). Within the comprehensive data from the report is the unforeseen evidence that the Generation Z of senior dental students, in its majority, decided to pursue a dental degree before

college. In the US, there are 15 million students enrolled in high schools, with over 3 million graduating yearly.

It becomes apparent that we need to engage with young and motivated students who are eager to explore non-traditional health care careers. We commonly hear from students that their personal experiences, like going to the orthodontist or having their wisdom teeth removed, influenced their future decisions to choose dentistry as a career. The question is, from over 3 million high school graduates yearly, how many have had the opportunity to experience research, especially in dentistry? The feeling of discussing cancer biology or learning about the latest cancer research breakthroughs directly impacts the high school student's perception of dentistry and medicine. It allows the student to engage in clinically oriented research that can become a gateway to a rewarding career in research. The most exciting news is that some high schools already have programs that can foster research opportunities in collaboration with local colleges and universities. This is the case of the community resource (CR) program from Community High School in Ann Arbor, Michigan, that empowers students to develop their classes, including wet lab experiences, fostering the dissemination of knowledge of non-traditional careers.

The real impact of a CR-like program as a professional informative and decision tool for high school students is, in many ways, difficult to access. The idea of writing this perspective article came from numerous discussions around the CR topic and how we found high school students excited with the perspective of being part of a major research institution. As a result of a succession of discussions, we decided to write this perspective alongside some of these students who share their thoughts and experiences with us.

### **Listening to the youth**

The community resource program allows students to develop academic skills that are not necessarily offered within the school's walls while building up their social and networking skills. Students are asked to reach out to advisors and are, for the most part, independent from the school in their course work. The proximity of the Community High

school to the University of Michigan has allowed us to gain exposure to scientific research in a non-traditional capacity. Post-pandemic, our tenacity to take advantage of the opportunities to diversify our extracurricular profile in a manner that is cohesive with our secondary educational interests was at an all-time high. Taking advantage of the CR program at high school, we reached out to research-intensive faculty in the hope of gaining experience in the biomedical field. Our experience in a laboratory setting has been instrumental in shaping not only our post-high school plans but also in exposing us to an area of science that is typically overlooked by the media. While our path may seem like an outlier, it does not have to be. Throughout the whole process, our main advice to students is as follows, think outside the box, don't be afraid to reach out, and opportunities are out there ready to be taken advantage of. Similarly, we pose the question to professionals within various scientific fields: How will you increase accessibility to opportunities for future scientists?

### **Structuring a pipeline of knowledge**

Considering that public schools throughout the US present different demographic characteristics, the strategy to engage students in research may need to come in different flavors. While high school students living next to research-intensive institutions are more likely to be exposed to research, other students may not have the same opportunities. Fortunately, the SARS-CoV-2 pandemic brought us up to speed with the new era of video calls, videoconferences, and remote learning. More than ever, anyone with access to a computer or a smartphone can learn from anywhere in the country, which constitutes genuine democratization of knowledge. Tapping on the new era of digital inclusion, dental schools as well as higher education institutions, have the knowledge and tools to implement virtual CR-like programs with the potential to target a broader population of high school students throughout the US and abroad. Although it may seem like a daunting proposal, the University of Michigan School of Dentistry has pioneered a virtual outreach course introducing the profession to high school and college students using the well-known Coursera platform (<https://www.coursera.org/learn/dentistry101>). The success of the online course, named Dentistry 101, is based on free access to high-quality and well-

crafted content along with the flexibility of watching each course module at your own pace. A similar approach that focuses on non-traditional careers in dentistry, medicine, engineering, and other areas of knowledge does hold the promise for a more equitable and inclusive engagement of our 15 million high school students nationwide and abroad.

Above all, the main objective of this perspective article is to bring to the attention of colleagues from a diverse professional domain, including our fellow oral pathologists, surgeons, and clinician scientists, to engage in local efforts to expose high school students to research and the excitements of a non-traditional career. It is also our goal to energize the debate on our current shortage of clinician-scientists and spark the excitement of creating digital tools to democratize information about our professional and prospective careers.

#### **Conflict of Interest Statement**

None declared.

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