The teaching of a science curriculum at any level has certain advantages and disadvantages in comparison to the humanities and social sciences. Although science courses are often surrounded by an aura of difficulty and abstract nature not usually associated with less technical fields, they have the advantage of being highly logical in nature and objective. Regardless of the level of my target audience, I will approach teaching with an emphasis on these traits. In the course of any teaching process, I will establish fundamental knowledge early on and continuously stress that base as we tackle increasingly sophisticated exercises. I will adopt a comparative approach in problem solving to help students realize that “the right answer” can often be arrived at by examining several possibilities and finding the one that stands up to scrutiny the best. Because this approach requires constant skepticism, it will demand that students return to basic, simpler theories to answer questions of increasing complexity.

Undergraduate (or so-called first year) organic chemistry must necessarily be geared to a broad audience simply because of the ubiquitous nature of organic molecules across the sciences and related applied fields. Therefore, an emphasis must be placed on certain sets of basic knowledge and problem solving. Again, I will stress the basics to my students by initially teaching/reviewing theories of structure, bonding, hybridization, and electronegativity. It is extremely important to review these in the context of organic molecules because structure determines reactivity. In the course of teaching those basics and moving to reactivity, I will strongly emphasize a comparative approach in tackling problems and exercises for reasons mentioned above. In assignments and exams, I will also include short essay-like sections in order to force students to elaborate their thoughts. Such exercises have the triple advantage over “fill in the box” problems of addressing scientific communication, emphasizing fundamentals, and also serving as an indicator to the teaching staff of what concepts require further attention and clarification. In addition, I will likely assign exercises and exams on a frequent basis in preference to only a few of these as I believe learning requires doing: much like immersion is the best way to learn a language, the best way to learn the language of organic chemistry is to use it regularly. Finally, a practice I found exceedingly useful as an undergraduate was to use multiple textbooks as sources of information, even if only one was formally required for the course at hand. Although it would be unfeasible to formally require more than one text, the message to my students is this: there are numerous resources of organic chemistry knowledge: textbooks, people, internet, etc. I will encourage my students to use these, and will inform them of their availability as appropriate.

My teaching of graduate courses in areas such as physical organic chemistry, synthetic chemistry, heterocyclic chemistry, and natural products will share many stylistic traits to undergraduate courses; however, a greater proportion of reasoning will be devoted to thinking “by analogy.” In this way, I hope students begin making predictive, forward-looking connections and conclusions. In this way, they will test their own limits of understanding and reasoning as well as begin their transition to being independent thinkers. In addition, the essay questions mentioned above will allow students much more freedom in answering. For example, often graduate students of organic chemistry are often asked to propose a synthesis of a small organic molecule. I would obviously continue to include such questions in problem sets and exams, but I would go one step further and ask students to compare the strengths and weaknesses of several given syntheses. In this manner, students will not only further refine their understanding of chemical concepts of
reactivity, stereocontrol, and strategy, but also further improve their scientific communication skills.

In the laboratory, the level of interaction with my students – undergraduate, graduate, and post-doctoral – will be proportional to their needs and the difficulty of the research problem at hand. In designing a research problem, I will collaborate with my students in order to instill in them a sense of ownership of the project and intervene only when substantial improvements to design can be made. In addition, once a project is underway, I will devote time and energy to meet with them regularly to discuss progress and obstacles; I will likely adapt according to personal preferences. Also I believe it is important to keep in close and regular contact with younger graduate students to build-up their confidence in their skills before more ambitious and uncertain experiments are attempted. As a project moves forward, I will increasingly ask for student input and design in informal settings to allow students to critically evaluate their options, thereby enabling them to mature to independent scientists. This will also afford them opportunities to think creatively and take risks without fear of failure. In addition, by gradually stepping down my influence, it will force them to learn to prioritize their experiments and research in ways that are maximally productive, enabling them to become self-reliant leaders. Additionally, we will write drafts of scientific manuscripts and grant proposals together to further bolster their scientific communication skills. By the time the metamorphosis into independent scientists is complete, I expect that my students will be world experts in their subfield of research but also have the perspective and skill set to confidently attack any reasonable scientific project outside my lab.

Regular group meetings are the forum wherein I will bolster my students' knowledge of the scientific literature of organic chemistry, and it is the arm of teaching I look forward to with most enthusiasm. While I will keep these weekly sessions informal in character, I hope to review both recent and more established bodies of work with a critical eye and maximum understanding. Topics for student lectures will be selected and assigned in advance to the student for a particular week, allowing them to become an expert in that topic. However, there are two distinct modifications I will make to the standard seminar format. First, whenever a point of uncertainty is reached, I will ask a member of audience rather than the lecturer to address it. This will force the audience to truly strive to understand as much as possible, rather than making the entire exercise a benefit for essentially one person. Second, in cases where there is any doubt or desire for further information as to a question, that topic will become the subject of a future short lecture. In this manner, I hope that the group will arrive at consensus answers. Seminar topics will be diverse in nature, enabling students to sample research outside their immediate environ and to gain perspective on where they fit into to the broader scientific enterprise.