

My Teaching Philosophy
Nathan Lents
The Department of Sciences

I took my college and graduate school education in a Jesuit university, and the Jesuits frequently quote two related sayings that sum up their style of teaching and preaching: “meet them where they are,” and “speak to them in their language.” This philosophy left a lasting impression on me and definitely forms a principle component of how I think about teaching. I do my best to meet my students where they are, and then I try to bring them where they need to be. This is manifest in several ways:

Concepts First – So often in science higher education, instructors try to jam as much content and information as they can into 16 weeks. The result is that the course, which ideally should be an *enjoyable*, if daunting experience for students as they ponder the subject matter that will form their life’s work, becomes a stress-filled memorization marathon. This is not just ineffective – it is *counter-productive*. Students are so overwhelmed with “factettes” that they fail to grasp the larger concepts and the larger *context* in which those details reside. Styles of examination often follow this pattern – large multiple-choice exams that ask students to regurgitate memorized information. When these are our approaches, why are we surprised when students lack foundational depth?

I teach almost exclusively freshmen, which many university professors would bemoan. I do not. I see this as a wonderful opportunity to lay the student’s foundation for all future biology education. It is I who will lay the framework into which all further knowledge about biology shall be placed. This may sound dramatic, but I firmly believe that this comes with a serious responsibility. Thus, my philosophy is to teach CONCEPTS, and teach them thoroughly, before I teach details. And if some details are “sacrificed” because we run out of time, so be it. Study after study has taught us that even the strongest students actually retain a small percentage of the *details* that they learn in a science course, as little as six months after the course is over. Concepts, however, if learned well, can be lasting. In science education, this is what is called “permanent learning,” the understanding of a core concept so thoroughly, that students retain the understanding indefinitely. While elusive, this is *essential*, especially for freshmen coursework, so that future knowledge and learning can truly build on this foundation and help students gradually *understand*, not just memorize details about, the natural world. There is another term in science education, “vertically building” to refer to how courses build on one another in sequence. This is a serviceable term, and I do use it, but I prefer to think about the role of the introductory course as a scaffold, framework, or a skeleton. First, the big picture is established, then upper-level courses incrementally fill in the details.

This translates into my teaching in several ways. Most importantly, I employ the very generous use of examples – real-world examples and ones that students can relate to. I show them how what I am talking about in class relates to the soda they drink, the muscle they flex, and the chest cold they fight. My goal is to think of what would make them run home to their parents and say, “guess what I learned today!” But I never give only one example of anything, lest students apply this knowledge to that one example only. By showing them multiple applications of this new knowledge, they gain an appreciation for the universality of the principles I teach them. The lesson is that this is not textbook information – this is real life.

Speaking Their Language – If one walked into a classroom of Spanish-speaking students and began teaching in German, obviously very little learning would take place. This principle can be extended to modes of communication in general. When I first began here, I was astonished at how few students came to see me in office hours and ask questions, despite the large number of struggling students. I would write on their exams that they should see me, but very few did. There are many barriers to student-teacher contact here at JJC: commuter campus, students generally have jobs and little time, demographic, cultural, and economic differences between our faculty and our students all contribute to the divide. One day, I heard an “IM” noise in class (a student had received an Instant Message or a text message) and I realized something: Instant Messaging and Text Messaging form a big part of how college-age people in this country communicate with one another. Perhaps we professors can tap into this reality as a way to reach more students! So I began to use Instant Messaging and online office hours, and it was an instant success. I took careful data and the results are clear – Instant Messaging dramatically increased student-teacher contact, and not just online – in person also!

Video Lectures – The success of the Instant Messaging experiment got me thinking that the majority of my students were raised entirely in the era of “web2.0.” They are computer and internet savvy, accustomed to long hours in front of a computer screen, and socially integrated into the internet as their primary source of information about the world at large, and their local community and friends. Thus, I decided to experiment with delivering lecture content to student via the internet. This was supported by the Alfred P. Sloan Foundation as a means to foster online-enhanced modes of distance learning. I proceeded with great caution, carefully monitoring and tracking student success, and discovered that students could succeed in this model. Pre-recorded video lectures, together with online office hours, prepared students as well, and in some cases better, for exams in my course. This has further strengthened my “teaching philosophy,” that if we want to find better ways to reach our students, we must meet them where they are!

Vocabulary – One of the most daunting aspects of higher education is the mountainous amount of jargon and technical terms. Fortunately, with some creativity, this can be transformed into an opportunity for easier grasping and recalling of these terms. The key is that most life science jargon is based on latin and greek vocabulary (most being latin). Thus, every time I teach these terms, I break the word down into the prefix, suffix, and root word in latin (or greek). *Further*, with such a large percentage of Spanish speakers (and most of the class having some working knowledge of Spanish), the latin roots will ring familiar, and I always point out the connection to modern Spanish vocabulary. I think this can make a huge difference in helping unfamiliar terms seem much more manageable.

Energy – In the end, I believe that what separates a strong teacher from a weak one is one basic principle – *the ability to get students excited about the material*. This is accomplished any number of ways. Personally, I do my very best to excite students through my personal enthusiasm and energy in the classroom. No matter how overworked or tired I feel, I never let that carryover into the classroom. The moment I walk into the room, I am “switched on,” and I make it my solemn duty to show the students just how amazing and awe-inspiring our living world is, and let them see how much it excites ME. Hopefully, they, in turn, are excited as well. When I see the faces light up as they learn about the Genetic Code for the first time, I know that I am doing my job. And when I see closed eyes and bored stares, I know that I am not. Each semester, I learn as much as my students, but my subject matter is THEM, and I hope that the lessons I take with me make me a better teacher each year of my career.

Reflections On Achievements And Further Intended Improvements

Lecture handouts – As I consider the various efforts I have made to try to enhance teaching (and thus increase learning) in the biology courses I teach and coordinate, I believe the component that has had the most impact on student learning is also probably the simplest: the construction of lecture handouts for students. Previously, students simply listened passively to lectures, writing at a furious pace to try to capture as much as possible in their notes. It was immediately apparent to me how ineffective of a model this is for learning. Student were spending 75 minutes writing as fast as they could, thinking little and learning even less. To ameliorate this condition, I constructed lecture handouts for students (see attached example). These handouts serve as a guide/outline of the day's lecture, but also provide much, but not all, of the content covered. Thus, students are still engaged and must listen and take notes, but they need not worry about writing *everything*, and can instead spend time listening, pondering, and thinking through the periodic examples and comprehension questions. *This has made all the difference in the world.* The class period is less stressful and frantic; we can discuss far more practical and tangible examples of everything; and best of all, students have plenty of time to ask questions, which helps me identify weakness of clarity in my lectures. I cannot say enough about what a difference this has made.

Clickers – through a student technology fee grant, I was able to purchase a supply of clickers for the four freshman Biology courses. These have been utilized primarily in Bio101 and Bio102, in which there is more time for their use, and they have been a smashing success. It is invaluable to be able to assess student comprehensive of core principles in real-time. When students are unclear about something, the material can be re-covered or additional examples given; when students have a good grasp of a concept, the course can move on. Also – the stimulation and, well, *fun* of the student response system keeps students engaged and makes them active participants in their own instruction (see attached tech fee grant).

Blackboard, Videos, Instant Messaging and Web2.0 – By no means do I consider myself an expert on using the internet in higher education. There is much more that we could be doing in science education. I got the biology courses onto Blackboard, introduced instant messaging and online office hours, and have begun progress in distance learning and web-delivery of course content, but the endless possibilities of the internet await further exploration. At the Sloan Consortium Conference this summer, I intend to learn more about ways to use the internet to deliver content and to enrich our courses with rich media, audio and video. Further, in the tradition of web2.0, I think it is time that we turn the tables and empower our students to become more active in teaching each other and to become the researchers and the presenters of course material, not just the recipients. I have some ideas of how to begin, but I hope to hone that vision further and learn how to make it a reality.

Teaching the Process of Science – One of the most exciting recent innovations in science education is the enhanced focus on teaching science from the perspective of experiments and data, in other words, teaching *how* we know what we know, not just rattling off the facts. This data-driven approach is very difficult to construct, but enormously successful when it is implemented properly. Our own Anthony Carpi (Science Department) is a national leader in this cutting edge field of science education and he is guiding me as I attempt to introduce this teaching methodology into our biology courses. The problem is that we are blazing new trails – there is little published material to work with – we have to *write* our own course content and laboratory exercises to incorporate this new approach. To that end, I have written two educational modules on DNA that

appear on the visionlearning website. This has been a long and painstaking process, developing the content, the artwork, responding to peer review, etc., but the effort has been worth it, as I now have a growing library of process-driven content to use for my biology courses. More to come!

A second phase of our “teaching the process of science in biology” project is to re-structure our laboratory exercise in a “guided inquiry” model in which students are empowered to ponder puzzling observations and design experimental approaches, rather than simply following “cookbook-style” procedures and protocols. Again, this is uncharted territory and I am working without a solid guide. But these efforts have met with measureable success thus far. A grant from the U.S. Department of Education to BMCC is supporting us for part of the laboratory restructuring and the culmination of this project will be an in-house published laboratory manual. (This will save each student >\$100 in textbook costs!)

In addition, one of our new laboratory exercises is a student-driven experimental exploration of the phylogenetic relationships among *Homo sapiens* and our closest living relatives (basically a molecular examination of evolution). This novel and innovative exercise challenges students to examine raw DNA sequences, protein sequences, chromosome structure, and skull measurements in order to re-trace human ancestry with other primates, past and present. I recently presented this at the annual conference of the National Association of Paleontology, which is devoting an entire day of the conference to education and community outreach.

Much has been done; even more remains!!