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PHILOSOPHY OF TEACHING

Chemistry is a fascinating field of study that is rightly called the “central science.” Chemistry touches every other area of science and contains the cohesive principles that allow each discipline to speak to the others. Chemists can explore the limits of mathematics via quantum mechanics and various computational methods. It is chemists that can discover and explore the intricacies of recent medical discoveries along side molecular biologists and pharmacists. The field of chemistry is diverse and training in chemistry can have an untold impact upon the world.

My philosophy of teaching chemistry is an outworking of my various experiences in chemistry and with chemical curricula as a student. I have had the opportunity to observe the methods of many excellent professors, mentors, and lecturers from whom I had the privilege to learn. Teaching of any subject must consider the needs of the students. The teacher must present the material in a way that is accurate, exciting, stimulating, and applicable to the student. If students are able to grasp why chemistry is important to their chosen field of study they will be much more engaged in the learning process. The teacher’s role includes passing on the tools of the trade, as well as conveying a sense of intimacy with the material and its importance. Passion sparks interest, and interest produces a genuine desire to learn and strive for excellence. Interacting with the material with enthusiasm, clarity, vigor and confidence will help to convey the passion the teacher has for the material.

At the early undergraduate stage, the typical chemistry student is not pursuing a chemistry major, but requires the fundamental chemical knowledge as part of their chosen field of work. These students are very diverse coming from many different areas including medicine, engineering, food science, and the like. These students will likely take chemistry courses for one or two years and have no additional exposure to formal chemistry. Yet these students, who comprise the majority of students, will be exposed to chemistry in many different facets of their lives both professionally and personally. They will use their “common” chemical knowledge to make decisions regarding the use of medication, substance compatibility, environmental responsibility and safety. It is largely the chemistry instructor at the freshman and sophomore level who will instill this “common sense” chemical knowledge.

There are a number of preconceived ideas that students have regarding chemistry that can be a hindrance for chemistry instructors. Over the years, I have asked students during the first

week of class how they view chemistry in general. Unsurprisingly, the majority of students recount stories of “suffering” through chemistry at the high school level. They tell of difficulty encountered with abstract topics. They lament the mathematical aspects of chemistry curricula. Many state the opinion that chemistry is purposefully made difficult to “weed out” those who are unfit to continue on in their selected major. This negative predisposition can make instruction in chemistry an uphill battle at the very beginning. Achieving success as a teacher of chemistry requires combating these attitudes and showing that chemistry is interesting. A focus on the practicality of the topics and an engaging atmosphere where students can participate without fear of belittlement allows students the freedom to overcome these destructive ideas. The student who observes a sense of awe in their instructor with regard to the fascinating material will not be as intimidated and will shed their misconstrued sense of dread.

I have observed a number of upper level students who have unfortunately not learned some basic chemical tools. They lack proper, basic, and practical wet analytical techniques. Their courses have emphasized abstract concepts and advanced instrumentation. While those ideas are important they should not be promoted over a basic fundamental understanding of the central science. It is these fundamentals that will provide a knowledge base for students to operate scientifically. Their ability to predict the outcome of experiments, to draw relationships between similar chemical systems, and to utilize the concepts of molecular understanding to explain chemical reactions requires a strong handle on basic principles that the chemistry teacher should communicate effectively. These foundational concepts provide the student interested in chemical research a basis for interacting with chemical literature and a unique opportunity to contribute to scientific understanding.

My own experience with successful undergraduate chemical research provides me a great understanding on which to model such a program. Students involved in research will be asked to think in ways they are not accustomed to doing. They will need to use their chemical foundation to explore areas where there are no lab manuals providing step-by-step directions. This type of approach is encouraged best when the mentor guides students via a series of questions, and interacts with the literature in conjunction with the student. It will seem that the mentor is running at the same pace as the student, which will allow for open communication and intellectual stimulation on behalf of the student involved. This in turn provides a sense of excitement and enthusiasm for the research project that will allow for an environment of success and learning. Students will use material in new ways and be exposed to concepts in a syncretistic way that will incorporate and connect areas of knowledge in new ways. By portraying the multidisciplinary aspect of research and focusing on the specific role of chemistry in the overall

picture, the teacher can instill in the students a mentality of lateral thinking, which is highly important in today's rapidly progressing global society. Undergraduate research also serves to prepare the student for future endeavors in graduate school or a professional environment where thinking abstractly and working in a team are beneficial.

Additionally, the chemistry teacher should provide students with experience in communicating scientific results and ideas. Encouraging students early on to write proper lab reports can help to do this. These lab reports will develop over the course of a student's undergraduate education toward writing actual scientific publications. Students should be encouraged to present topics in class utilizing modern technology such as power point. Often many class projects lend themselves well to being presented in such a manner. Both written and oral communication of scientific advancements will prepare students for the next stage of their career where accurate, succinct, and potentially technical ideas will need to be communicated.

My past chemistry teaching experience has shown me that in order to teach effectively I need be enthusiastic, and communicate concepts with clarity. I will be open, approachable, and applicable to different areas of study. I will seek to meet student's needs by providing basic chemical tools that are of use to many areas. I will do my best to ensure that any negative preconceptions that students have about chemistry are shattered. I believe that students need to understand the concepts behind the observations that are made in the laboratory and will work to ensure that all students have the knowledge necessary to continue on in the field of chemistry if they so desire. These are characteristics that I have seen displayed by the most effective teachers and professors that I have had experience working with during my academic career and that I have personally implemented during my own teaching experiences. I believe this approach is successful partly because of the positive feedback I have received year after year of teaching general chemistry related courses.

This is my philosophy of teaching. Whether I am teaching introductory courses such as general chemistry for non-science majors and chemistry for life or advanced courses in quantum mechanics, computational chemistry, and physical chemistry, I will teach my students to the best of my ability. I will strive to improve and be as effective as possible. I will ensure that students find the time spent in my classroom to be rewarding, intellectually stimulating, and memorable.

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