Reflection on my teaching philosophy and approach

Education, Teaching

Throughout my career as an educator I have been involved in teaching in various environments and on several levels. I have a strong passion for science and relish sharing this tremendous excitement with students. Realizing that some intricate scientific topics such as genetically modified organisms, stem cells and climate change are progressively finding their way into discussions and influencing decision-making in our daily lives, promoting scientific literacy among students has been one of my main goals as an educator. Throughout my career as an academic, I have always sought to promote science literacy through several teaching opportunities as an instructor of a course that I developed as a lecturer, as a graduate teaching assistant, and more recently, as a research mentor in the laboratory, and a science education volunteer in high schools the Japan science dialogue outreach. In each of these occasions, my approach has been to foster interest and enthusiasm in doing science and develop students critical thinking skills that will facilitate their understanding and appreciation of science in the world around them.

I believe that cultivating an enthusiasm for learning science is critical for instituting scientifically literate students having a robust lifelong interest in science. Whether my students are undergraduates or the Wakasa high school students I am volunteering with through the Science Dialogue Outreach, which is a science education outreach program, my approach to accomplishing my aim is the same -I provide opportunities for students to discover new ways of engaging scientific topics by employing an assortment of teaching approaches in order to make the subject material as comprehensible as possible. As a science teacher, I have always encouraged students to increase their literacy in science through analysis and critical reflection of science in the world around them, because in today's world, the public is wide-open to science that is both more complex and more predominant than in years past, which makes it essential to understanding how science is generated, comprehended, communicated, and applied. For instance, Science and Society is an undergraduate non – majors course that I designed and taught, in a writing assessment, I asked students to identify an emerging biological news story in any of the popular print media, tracing the story back to a primary literature article, write a paper recounting the biological process that is being effected, including the original findings of the published article, and how these findings were eventually reported by the media story. This exercise not only reinvigorated the students to further appreciate science in the world around them via news reports e. g. some protests over genetically modified crops or about developments in renewable energy sources, but it also enabled them to reflect critically on what they read. Perhaps one of the most important ways in which this class surpassed my expectancies was in learning how modern ideas or issues are synthesized and how to critically analyze them to enhance effective communication of my ideas.

During an undergraduate-level Nutrition class, my interest was piqued by a protein called perodidase and catalase which cause browning reaction in fruits, but whose kinetics was mostly unknown. Although my professor had little knowledge of the presence of these enzymes in Mango (Mangifera indica) kernel, he supported my proposal to investigate whether or not these enzymes are responsible for browning reaction in Mango kernel, and (if at all) what their kinetics would be. His encouragement proved fruitful as the research showed that mango kernel was a reach source of a novel peroxidase with potentials for clinical and industrial applications. I had one of my first research papers from the research, and this curiosity, research and publication has since been sustained. This experience nurtured my desire to promote the scientific curiosities of students in any area they so wish to pursue.

One of the approaches that I used to promote enthusiasm and interest in students (especially those with diverse interests) was to carefully and professionally craft a module with diverse components based on students' interest but meets the set learning objective, this means that students are given full ownership of the material that they are studying. For instance, when supervising research students in the laboratory as a lecturer, I apportion them personalized projects that enables them to have the same degree of freedom and ownership over their work and satisfaction when their effort yields a result. This individualized project makes them feel like they are the " lab expert" in their field. I have also applied a similar strategy to the classroom setting. For example, in a writing assessment for the module biochemical methods, I gave the students the option of choosing from topics such as (i) methods for analyzing the nutritional contents of maize (Nutrition interest) or (ii) Molecular method for diagnosing malaria using urine sample (Molecular biology or clinical biochemistry interests) or (iii) Review Metabolomic methods for assessing the metabolism of a named drug

(Pharmacology interest). The learning objective here is the same, which is biochemical analysis and review methods. So that everyone has the option of doing something different based on their interests without compromising the generally set objective and learning standard.

Similarly, in an introductory biology lab course for first year undergraduates I assigned students mini-topics, including the steps in the use of light microscope or cell cycle stages of an onion cell, to present to the rest of the class the research findings as background knowledge of the subject we were to covering the next class. Further instruction and discussion were initiated by these reports, the student giving the report became ‘ the authority’ on the topic. Overall, the students became more enthusiastic, active and invested participants in their own education by simply taking ownership of their learning material.

On my previous role as a lecturer for an undergraduate cell biology course, while teaching on how an action potential traveling along a neuron is been facilitated by ion channels and pumps, I noticed the spectrum of learning styles among students. For some of the students the concepts and examples given in class were very clear, while a subset of students needed to see a diagram to fully understand. So, for the next class I prepared cardboard cutouts of Na+ channels, K+ channels, Na+/K+ ions, and Na+/K+ pumps, and requested that students act out the ion flux that enables the action potential to move through the nerve cell. The students had all mastered the mechanism of action potentials by enthusiastically participating in the demonstration. I was so inspired and fulfilled by the accomplishment of this hands-on exercise that I devised similar activities for other more challenging concepts like G- protein cycling and signal transduction pathways. I received an encouraging feedback after the course, and it underscored the significance of making science exciting and understandable through an assortment of teaching strategies.

Additionally, as a Graduate teaching assistant in an undergraduate Pharmacology course, I strove to create an academic ambiance that promoted students' critical thinking skills by staging in-class ' debates' on characteristic examples of competing models of Pharmacological processes. Under this debate format, each group gave a synopsis of their model, reviewed supporting literature evidence, and proposed a new experiment they thought would ultimately show that their model is the correct one. Interestingly, most of these typical competing models that were being debated had long been solved, nevertheless, the students often developed novel, remarkable, and creative methodologies when faced with these problem- based tasks. The analytical and critical thinking skills that the students acquire through activities such as these underpin their future as important members of the scientific community.

My teaching philosophy and approach is based on experience gained over 17 years and it is an on-going process that requires constant modification, adaptation, and refinement in order to incorporate new skills, information, and pedagogical approaches. While on my previous role as a lecturer, I have worked very hard to develop my abilities by attending several teaching training and development workshops, science education journal clubs, and presently the Japan Society for the Promotion of Science sponsored Science Dialogue outreach- aimed at developing innovative strategies to make science exciting and attractive to students. I look forward to the possibility of putting these experiences and concepts into practice as a Lecturer and mentor to students.