Teaching Portfolio

Biochemistry Example

University of Colorado, Boulder

II. Table of Contents

III. Introduction 3

IIIb. Acronyms used 3

IV. 4

A. Philosophy of Teaching and Learning 4

B. Assessments and Evaluations 6

B1. Assessment and Evaluation of Student Learning 6

B2. Assessment and Evaluation of My Teaching 7

C. Diversity Statement 9

D. Academic Curriculum Vitae ..... **Error! Bookmark not defined.**

Appendices ..... **Error! Bookmark not defined.**

III. Introduction

My first experience as an educator came when I was in elementary school. I come from a line of educators and while I spent those younger years deciding that I wanted to be something different, as I grew, I kept going back to teaching. In high school, I volunteered in my mosque as a Sunday school teacher and taught elementary school children. I enjoyed their energy, but realized I was not patient enough to work with them for six hours a day. In college, I started the process to become a high school teacher and was a few classes away from getting the certification but I was in my observation class for a semester when I realized that I could reach some of the kids but that if I didn't follow them, they would lose their interest quickly in college. I wanted to make sure a lot of these kids that I worked with would graduate from college. So I decided to become a post-secondary educator and set my sights on getting my PhD. It was there that I became a teaching assistant in charge of mini-classes called recitations. I was in my element and very quickly realized that my bet on teaching newly minted adults was going to pay off. I have always been lucky that my path in life had a theme, that I knew I belonged in classroom. Through various trial and error experiences, I know now that teaching in a college is how I can best contribute to the world.

IIIb. Acronyms used

CAT – Classroom Assessment Technique
CIRES – Cooperative Institute for Research in Environmental Sciences
CU Boulder – University of Colorado, Boulder
GLOBE - Global Learning and Observation to Benefit the Environment program
NOAA – National Oceanic and Atmospheric Administration
PhD- Doctorate of Philosophy
SOTL -Scholarship of Teaching and Learning
TA – Teaching Assistant

IV.

A. Philosophy of Teaching and Learning

I believe that my job as a chemistry educator is to teach my students how to interact with class content the way a scientist would and to instill a sense of confidence in each of my students. I achieve these goals by employing a form of play in the classroom as a teaching method through demonstrations and activities and making my students comfortable with me and with making mistakes.

It's important to realize that scientists interact with knowledge with both curiosity and a healthy dose of skepticism. This is a difficult skill for most humans to develop, especially students who are not chemistry majors. I approach this dilemma by introducing play in the classroom to encourage creative ways of engaging with the material. For example, I have worked on 'The Batman Problem' with one of my recitation classes, a relatively difficult set of chemistry problems that probed the feasibility of a stunt done in the Batman movies. Because of its difficulty, most teaching assistants didn't have their students attempt the problem. I, however, invited 'Batwoman' to teach my class and because of this playful approach, my students were eagerly participating in the activity. Instead of lecturing, I spent most of the hour walking around the classroom directing students to ask the right questions. **Because of the playful and safe atmosphere, students felt comfortable assisting each other, leaving me more time to give extra attention to students who needed it**, making it excellent for reaching various learning styles and even large classes. It also teaches students how to approach more complex problems similar to what scientists encounter. I plan to have at least one problem like that in every unit that I teach, and I have been attending pedagogical workshops and hope to attend more in the future to best develop my curricula to include as many opportunities for play as possible.

In my experience teaching, I have found that students very quickly give up trying if a problem looks intimidating, even if they had previously demonstrated their competence in almost the exact same problem presented in a more straightforward way**. I have found that if I increase my students' confidence in themselves, regardless of whether or not I have provided them with extra practice for the material, the students are more willing to attempt the more difficult problems**. Once they are willing to truly attempt the more difficult problems, they are then most primed to learn the material. Therefore, I focus a lot of my attention on making the students comfortable with their chemistry competence and comfortable with making mistakes.

To that end, I celebrate my own mistakes and make sure to bring them up in class all the time. For example, I once got rust on wrenches I have at home, and I used my knowledge of chemical reactions to remove it. Later in class, we talked about every mistake I had made before successfully removing the rust. Importantly, at one point, we shifted the conversation as to how some mistakes my students had made in the past had improved them. Through efforts like these, by the end of the semester, my students were trying more difficult problems and didn't just immediately say "I don't even know where to start". **Being confident enough to try problems is one unconventional way I measure student success, because it allows for students to truly practice the material.**

Finally, I increase their confidence by making sure that every student knows he or she is important, that his or her questions are important, and that what happens to them matters to me.

If a student feels seen and heard, a student will be comfortable making mistakes and trying difficult problems, which is exactly what scientists do every day. To that end, before every exam, I sent my students an encouraging email that inspired my students' confidence and gave them perspective. One student in particular had been enduring a very traumatic experience and felt that I was the only person who noticed her. It was especially eye-opening, because this student throughout the class seemed disinterested and bored, and she was not a good student, and at the time I did not know why. Now she remains my most inspiring student, because she taught me that students come from different environments I may be unaware of and that they each have needs that I ought to be sensitive to. I have noticed this with the students I have mentored in my research lab as well. In my future classes, to prepare students for difficult experiments, I will run simpler experiments where there is no pressure to get good results, to increase comfort in running experiments and making mistakes. I use every opportunity I can to make sure that my students feel like they are humans learning science instead of robots getting a grade.

I have developed this belief system through the past 10+ years I have spent in a classroom either through the education system or a religious, mentoring students in various times of my life, and conducting outreach. These experiences have taught me how to best reach students of all ages, with various learning styles, and various demands on their time. This has all culminated in understanding the role of play and mistakes in creating the scientists of the future.

B. Assessments and Evaluations

B1. Assessment and Evaluation of Student Learning

As a teaching assistant, I had limited control over assessments, as the course instructor decided most of the assessment guidelines and created many of the assessments, such as tests. Therefore my experience with assessments is largely informal. From my experiences, I ascribe to the idea that assessment is both for the benefit of the educator and the student. Assessments tell me where to improving my teaching and tells students where to improve their learning. I think this is a daily activity, and I assess my students by asking probing questions of myself and the students in class, administering 2 or more reflective questionnaires throughout the semester, and through increasing the role of participation in class as opposed to accuracy. Accuracy is reserved for projects and tests, not for active learning.

As a student myself, I hated when teachers would ask 'Does anyone have any questions?' only once immediately after presenting a topic because at that point, so much information was thrown at us, and I didn't have the time to absorb the material or recognize where problems may occur. I have taken that criticism I had of teachers and used it to adjust my learning. When I present a topic, I ask at multiple instances pointed questions about the material, such as 'Does anyone have any questions, perhaps about why we are converting grams to moles in this step?' Students tend to stare apathetically at the first half of the question regardless of the topic, but many students may show confusion once I ask a more specific question, and I know that I have to stop and clarify things. That is the most basic assessment that I do every day that I teach. Whenever I do practice problems, I always stop and look around for blank faces, and if I see one, I start asking questions about each step to see where a student (who is often too shy ask a question) might be confused. For example, if we were solving a grams to moles problem, I would ask the class 'where did the number 6.022E23 come from?' Often, asking questions like these and receiving the answers from peers helps a student understand. If not, I try to help the student to form a question about the problem. If that doesn't work, I will talk to the student individually.

In the middle of the course, I also administer questionnaires for the students. These attitude surveys, as they are called in CATs, are ways for me to see how they are doing in the class as well as assess their own personal goals and how I am helping them achieve them. Then I ask for ways I can improve their learning. An example is given in Appendix C.

Towards the end of the labs, as they become proficient in each of the parts, the labs take on a more research-based approach and SOTL projects are completed. One lab in particular involves the students to analyze unknown solutions to determine which ions are present in their solutions. Literature is presented to them and based on those guidelines and their own preliminary tests, they develop their own separation scheme. This is how each individual student tries to solve his or her own specific problem and each approach is different. Some are very accurate, but most have a few flaws and when students get presented with an obstacle, they use the available literature and their own faculties to overcome the issue. In the end, they present their results in a formal lab report that has an introduction to their problem, how they went about extracting information and coming up with a separation scheme, and then a discussion of results, much like a research report.

In recitation, I grade based on attendance and participation and not on accuracy. I feel that recitation is a place for learning how to think about chemistry, not to get a bunch of problems right. In my class, we clear up any misconceptions together, and mistakes are welcomed. This helps ensure a friendly, safe atmosphere, and within a few sessions, most of my students are comfortable with me and their peers, enough to ask questions in class, and some students become friendly enough to meet up after class and do homework together. I encourage that behavior and if a group becomes really close in that way, I won't split them up. The hope is that as they move on in their classes, they will be able to take them together and always have a peer they can turn to for help.

B2. Assessment and Evaluation of My Teaching

When I taught in my first semester of graduate school, we had Faculty Course Questionnaires (FCQ) that students would take at the end of the semester. It was optional, and it had a three month turn-around time. I got my first FCQs halfway into my second semester of teaching, and only eleven students out of eighty submitted one. Due to this low response rate and the vagueness of the questions, I learned very little. The next semester, I created my own questionnaire that fit the course I was teaching and specific aspects of my teaching that I was unsure of. I administered these in class on the last day and ensured student anonymity, including reading them only after grades were submitted. The focused questions really ensured that I was getting information out that I could really use in my teaching. Furthermore, because they were in class and not online, I ensured a 100% response rate. I have included a few responses from this FCQ in Appendix E. From these, I have learned a lot about many of my strengths (accessibility, versatile methods of instruction) and my weaknesses (losing focus and going on tangents, being unprepared at times).

Additionally, I took measures in my classroom on a daily basis to ensure that I was explain my lesson in an easy to understand and engaging way. One such method I used is the very simple ‘eye overlook’ method. At the end of every problem I completed on the board or in the middle of a given lesson, I stop and look out into the class for a few seconds. This is for students to have a chance to process the work, if less than roughly three quarters of my students are looking at me with glazed, confused, or distracted expressions, I will stop and go back to the problem and ask probing questions to the most confused or distracted students at each step to find out where the confusion started. This helped the confused students and it often also helped the really distracted students. I found that if my students could not follow my work on the board, they were very easily distracted because they couldn’t figure out what I was doing anyway and listening harder didn’t seem to be helping. By going back and asking them questions, I not only snapped them out of their trance, but they could respond and even ask questions about what was really confusing them. In the beginning of the semester, it was really difficult for my students to admit their confusion in front of their peers, but I did it so often and every student was chosen at least once that eventually they reluctantly would provide me with some feedback on where I could improve my explanations. If it looked like a student was far too embarrassed to say anything out loud (it only took a few weeks for me to identify those students), I would make sure to individually come to them during one of our problem sets and work on them one on one.

I realize this method is only possible with small classrooms, but it can be scaled up to larger ones. Some are obvious, such as using ‘iclickers’ in classes. I have been in and seen classrooms

use ‘iclickers’, and while I will utilize that approach, I don’t think it can be used in isolation for daily assessments. In classes I was in that used clickers, many students who didn’t know would just ask one of their neighbors for the right answer, and if that was unavailable, would look over to see what answer others were choosing, or would randomly pick an answer without even trying. Lots of students still got the questions wrong, but it inflated how many students really understood the lesson. It also didn’t identify where the misunderstanding had happened. Some answers can be manipulated to identify common mistakes students make (such as including an answer someone would reach if they multiplied instead of divided), but it’s really difficult to anticipate all of those. Then the professor would have to guess where the confusion lay and it is easy to just reexplain the problem and move on, even if it didn’t reach most of the students. One professor I know had a wonderful workaround for this. He would assign problems at some point in class (usually multiple at a time, and not every class), and would walk around the 100+ person class, would randomly pick students that looked like they were not working, or ‘fake working’, or obviously confused. The professor would either have a peer student that they trusted work on the problem with the student or would personally himself work with the student. It was inefficient, yes, but it encouraged students to be comfortable asking him questions, and allowed students who were struggling to catch up at least a little on the lesson of the day. If it looked like the student could not understand the concept after a brief intervention, the student was personally requested at office hours or another time mutually decided upon to further the discussion. Most importantly, he would mentally take down the student’s name and remember if the student was not present for the meeting. He was able to reach many students and clear up many confusions this way. I especially liked this method and plan to use it in my teaching, as a more pedantic kind of ‘eye overlook’

One final measure I have taken to ensure my success in the classroom was to keep myself very approachable and open to constructive criticism. I frequently asked my students if there was any way I could improve over the course of the semester, at least once every two weeks or so. This was not as helpful as the FCQs I received, but it did help with minor improvements over the course of the semester, which do add up. It was useful for specific recitations I administered, when maybe I spend too much time on one section of the recitation that was unhelpful to the students and not enough on a harder section.

I have been evaluated by seasoned educators in the past, through video consultations or also written evaluations. An example evaluation by a lecturer at my University is provided in Appendix E. This lecturer attended one of my classes and assessed my teaching. I also had two video consultations in two different semesters, in which I was video taped during one of my lectures and then watched myself teach with an experienced educator to identify certain areas of improvement. This approach was especially helpful, and I watched these videos on my own a few times, and each time was illuminating in a different way.

C. Diversity Statement

I am a Muslim, Arab-American daughter of immigrants whose first language is Arabic who didn't learn English until first grade. Starting school was incredibly painful and isolating, because I couldn't speak English. My attempts at starting conversation ultimately highlighted my weaknesses and result in ridicule. As a result, I spent recesses and lunches underneath a tree, reading. Unfortunately, solitary reading is how I had to learn English. In sixth grade, I moved to a new school and one of my now dear friends well-intentionally tried to protect me in this new environment by taking complete charge of me. This was better than elementary school, but I hated being so controlled. In tenth grade, a refugee family from Iraq transferred to my school. It was my turn to be on the other side, and I had a few ideas. I made sure that they felt comfortable approaching me whenever they wanted with questions or company but also emphasized that they did not need to follow me or be my friend if they did not want to. **It is amazing how independent people can be in a new environment if they feel secure but free to grow.** This is how I approach diversity in my classrooms. I am accessible and open, but I want to make sure I am not in my students' way. **I do not assume to know what they need, but I want them to know that I am there to help them succeed however I can.** I make sure I teach my students in an accessible way, provide them access to me when I can, and accommodate their needs when I find out about them.

One important aspect to teaching a jargon heavy subject like Chemistry is developing methods to present information accurately yet accessibly. Some jargon is required and it's a goal of mine to make students comfortable with the jargon, but I also don't want to use too much jargon too soon. To develop this skillset, I was involved with Science Buffs, a Science, Technology, Engineering, and Math (STEM) blog at our University. The goal of Science Buffs is to disseminate scientific information to non-scientists in a way that retains the interesting aspects while still accurately describing active scientific research. One article I wrote for Science Buffs was for the "Ten Hundred word challenge", which instructed scientists to describe their research using only the 1,000 most commonly used words in the English language. When I published the article, **I had a new understanding of how much jargon I used when describing my research to others, some of which was unnecessary and merely decreased accessibility**. I kept writing articles for the blog, and I now have a better understanding of how to make my teaching easier to understand.

Presenting the information is one aspect of the puzzle, **but I also have to make sure to assess knowledge gained by the students, which means I am constantly in contact with them**. I provide my students many ways to earn participation points, from talking in the class to helping their peers on assignments to asking students for feedback. I tell my students if they are at risk of failing many weeks before their grade is unfixable. I determine office hours based on when my students are most free, and because there are inevitably students who cannot make those office hours, I contact them personally to determine when they could meet. I can proudly say that I have never had a student who did not have a time when we were both free. In the first semester I taught, I had a student had personal and professional commitments until about 8 pm every night, and so for two nights a week, I was on my email at 8 pm - 9 pm and the student would send me screenshots of their questions and we would work it out over email. Even when it was difficult, I was there to make sure my students knew that I was there to help them succeed.

I also make sure I keep in touch with my students for when I know they cannot be in class. I celebrate Eid and I had to miss school for Eid when I was a student. Participation in this religious holiday required intentional preparation ahead of time and a plethora of make-up work, all of which I had to personally arrange as early as middle-school. When I was a TA, I had little control of the schedule, but I asked students to tell me at the beginning of the semester days they expected to miss, not just for religious holidays, but also for important sports events and personal commitments like weddings or court dates. Once I had this information, I worked with the students to make sure they don't fall behind.

I want to make sure to address that, even with all of the experiences I have had, **there is always more to learn about how to be more inclusive and equitable, especially for underserved populations that I don't have much experience with**. Oftentimes, that involves asking students what they need, and it's important to know what to ask and how to ask. To get some training on this front, I was on a diversity panel that asked employees about equitable practices the employers had administered. Were these practices working, how could they be improved, and what struggles remained? I helped in question formation and language to make sure it was inclusive. This experience is teaching me how much I have to learn.

Once I am an educator, I plan to use all of my experiences to help make learning a less logistically arduous task for my students. For example, I have always wanted students to ask me questions, but most of my efforts have failed and even I as a student always felt really stupid asking questions. During the COVID-19 pandemic, I attended a few remote seminars and discovered the private comment option. In my classes, I will take 2 breaks or so during the class where I will ask students to privately send me questions or comments on their phone via a certain platform or with paper and pencil. In my future classes, textbook materials will be as free as possible. When I was a student, I myself could not afford all of my textbooks, which obviously caused problems and needless stress. The solution to this came in the form of my 2009 mathematics professor who assigned a free "textbook". It was a compilation of free online resources for whatever topic he had assigned, with practice problems he found or created. The same class with a different professor assigned a $250 textbook.