III. Effective Teaching

The quality of teaching is a primary consideration in the…promotion of faculty members. Effective teaching includes superior classroom performance, organization, development, and articulate presentation of subject matter. Involvement of the student in the learning process with due concern for motivation, and an appropriate respect for the intellectual needs of students. The conduct of seminars, colloquia, or other forms of planned faculty-student interaction, and the supervision of papers, student projects, and independent study, when these are appropriate to the faculty member's duties, shall be considered an important part of effective teaching.

Providing a stimulating atmosphere within which students can learn and grow intellectually is also a major professional contribution the faculty member can make to the development of students. This includes frequent and active presence on campus, student counseling and advising, and participation in activities that promote interaction between student life and the academic environment.

Student evaluations of teaching effectiveness shall be important tools in ascertaining teaching effectiveness… (Faculty Policy Manual).

A. Assess your effectiveness as a teacher, and describe the evaluative techniques used to determine effectiveness in teaching:

I have been teaching physics and math courses for about twenty years. While half that time has been at Thomas More, only about a third of the courses have been. This is because in my third year here, I took on some administrative duties that reduced my course load. Much of my development happened in the first third of my career and as I innovated and found techniques that worked I gradually relied more and more heavily on those techniques. I continue to reflect on my teaching and I have both sat in others' classes as well as asked others to sit in on my classes[1]. By far I get more out of sitting in somebody's class for an entire semester and have done that four and about a half[2] times.

I am now in a place in my career where I am refining innovations and ideas from previous courses more than I am creating new ideas that are unrelated to the successes I have had in the past. Nonetheless, I took the Director of the QEP role in part because I saw it as a mechanism for being exposed to entirely new ideas that could potentially revolutionize my teaching. It did not revolutionize my teaching, but it provided a new language that continues to help me reflect on important aspects of my teaching with a new mechanism for framing the reflection.

In the first part of my career, my attention was swallowed up by how I could present the content in a new and better way that would make sense to the students. I have come to realize that there is no best way (although there are many bad ways, which should be avoided!). The "best" way depends on who you are talking to and what their background is, which not only changes from year to year, but isn't even uniform in a single classroom. I now focus, instead, on how to build communication and I try to work with the students to together find a way to fit the information into their ear. While I think it might be useful to describe my approach to the classroom in a little more detail, it also seems

[1] See, for example, the recommendation by Dr. Haverkos.

[2] The last time I tried this, I asked to sit in on a course in the biology department because I am teaching the biology majors. I was only able to keep up with the information for the about half the term because I was not doing the homework or studying sufficiently to develop a reliable understanding.

distracting from the three sections asked for in the application. So I created a section, Classroom Approach, in Appendix D to explain it. It is not necessary to read that to understand the rest of this document.

Ultimately, the message I am trying to convey to them is that it is less about what I say and more about what they hear. If they aren't hearing me, then it doesn't do me any good to keep talking. The dialog that I try to achieve in the classroom is about how we can work together to get the information to fit in their ear.

The anecdotal evidence of classroom interactions indicates to me that if I can convince them that my primary goal is their understanding and their success, then I find that they are much more willing to open up and risk revealing their confusion so that we can work together to fix it. That these anecdotes indicate that I am an effective teacher is reinforced by the thank-you notes in Appendix B.3 and by the patterns in my student evaluations in Appendix B.2. In the next section I will describe my development as a faculty member through the various innovations I have tried in a variety of courses. Most of these a direct applications of the approach I attempt to implement as expressed above. I also provide syllabi of the courses to show the pattern of development and the form of the implementation.

Despite the small number of courses that I have taught over the past seven years since applying for tenure, I believe I can show a history of effective teaching. Regarding my classroom performance, I have been rated highly fairly consistently in my student evaluations. On the 4-point scale, my average tends to be between 2.8 (70%) and 3.4 (85%). On the 5-point scale (implemented in Fall 2013), all of my scores tend to be above a 4.0 (80%). The comments (summarized in a Table in Appendix A) are fairly consistent and positive. The most common comments are about my passion and knowledge-base. The overall trend that I would like to draw to your attention is that there is a thread throughout about my interest and willingness to explain in a variety of ways and to make sure people are understanding the material at some reasonable level. Frankly, I believe (granted without evidence) that this is the point that leads to the smattering of comments indicating that some (small) fraction of my students claim that I am either their favorite teacher or the best teacher they have had either this term or even through their entire time at Thomas More.

Another trend that I think emerges from the student evaluations is that while the positive comments tend to be about my ability to connect and inspire the students to put in the time and effort it takes to learn what can often be an esoteric or daunting topic (math and physics), the negative comments tend to be about classroom management. While these comments exist throughout, they do not appear as frequently as the positive comments and on balance, based on the overall scores the student rank me, the good outweighs the bad by a significant amount. To some extent, I think these time-management issues are due to the amount of time I have spent doing administrative work (See Service for details). Once I step back to being full-time faculty, I do not expect these comments to continue. As evidence that students recognize the value added by my classes, I have compiled (in Appendix B) images of several thank you cards that students have sent me. These are not usually delivered at the end of the class, but rather at the end of a subsequent year when the student is graduating. This tells me that I have made a lasting impression in their lives.

To address my classroom organization, Appendix A catalogs a selection of syllabi for the courses I have taught at Thomas More College. These are fairly representative. In addition to providing the relative

weight of coursework in the grade, expectations, and policies, you will note that they include a schedule of topics. I am typically able to stay within about a week of the schedule, although I prefer to maintain a level of understanding at the expense of the schedule if I feel that the class does not generally understand it sufficiently. In the courses where the students complain about the organization, it is because I have fallen behind the schedule listed in the syllabus and have to adjust the due dates. Nonetheless, the topics are still in the right order so that I can start my classes by asking the students what we did last time and what we are supposed to do today. Some of them will have their syllabus out already. Some of them will have checked their notes to be ready with a quick review.

It happens that I do not have many Chair Evaluations (See Appendix B), but Drs. Haverkos and Ryle both have comments about my teaching. Dr. Haverkos is in the Education Department and has sat in on some of my classes. I also sat in on her Science Education course for one semester to better understand how pedagogy is applied. It was during that course that I offered to them the use of the video I took of my class. The video was created because there were a significant number of student who needed to miss class for an event and I had scheduled an example that I have found very helpful for students to work through. The education students gave me some good feedback that helped me reflect on my teaching style. Dr. Ryle, on the other hand, is in the Physics Department and was Chair for several years. He has sat in my courses in his role as Chair and was kind enough to address both reference to our conversations about the classroom and reference to my classroom performance. Some of his knowledge is from his direct observations and some is from the math and physics majors. Dr. Ryle is one of the more popular faculty in the department and the students tend to gravitate towards him. Some of our conversations have been about student comments about everybody in the department and that has also provided me with fodder for reflection on my own courses.

Finally, regarding effectiveness, I will add that being the Director of the QEP (see Service) has also opened my eyes to the research on critical thinking. The more I learn about the difficulty of information transfer between courses, the more I realize how important it is to be explicit about how students can connect the current information to future-unknown information by discussing the surrounding context from each course that uses that information. Furthermore, I have been able to pick up some few techniques that allow me to help the students develop a thought process around the material that enables them to “think like a [physicist]...” (You may feel free to substitute your own discipline in the square brackets.) I will address some of these ideas in the next section.

B. Discuss innovations tried in teaching:

While I do not innovate in every course, mainly because I am generally satisfied with how most of my courses are going, I do try to reflect on my courses as they progress. When I do try to innovate, it does not always go well, but even then it is possible to learn and grow. Sometimes innovations fail for complex reasons and revisiting them in a different context can provide new and different insight. For example, I tried small-group work in a class about twelve years ago. The students came away frustrated with each other and confused about the material. The learning curve for my implementation at that time was too steep for my and my students' patience. On the other hand, I tried a think-pair-share a month ago and students seemed encouraged. Apparently it is time to revisit the idea. I mention these struggles to indicate that while I am highlighting some examples below, our entire department regularly discusses classroom development and how to connect with our majors as they step from one class to another. *Hot-bed of innovation may overstate it, but I would like to take one sentence to note that with three people from our department up for promotion this year, you should have a good sense of the types of conversations that everybody in our department participates in throughout every year*.

I would like to share the details of some approaches I have tried over the past several years. As I do so, I will reference the syllabi in Appendix A and some other assorted documents in Appendix B.4. In the appendix, I have sorted the syllabi so that the first five address innovations and the last two address course design (see Section III.C); within each of these categories, the syllabi are chronological because (embarrassingly) the early ones do not have student learning outcomes and I wanted to as acknowledge my development as I worked my way through the QEP (see Service-QEP) and paid more attention to education research.

You may notice that some of the syllabi contain the result of developing the concepts that were discovered in the QEP. I will start with Quantum Mechanics, where I attempted to implement both the Central Question and the Fundamental and Powerful Concepts.

Central Question (CQ). In principle the CQ should be a question that a person might ask about the subject before they have taken the course, but which also allows one to repeatedly ask throughout the course in a way that illuminates the content by connecting it to a touchstone. Unfortunately, for Quantum Mechanics, I chose a bad CQ. In many subsequent courses I have through this through, but I have yet to be satisfied with my choices for a good and enlightening CQ. I have since stopped trying to incorporate it.

Fundamental and Powerful Concepts (F&PC). The F&PC are 3-5 ideas in a course which are fundamental in that they capture the essence of the field and powerful in that they enable one to understand previously-unrecognized relationships. You may notice that in Quantum Mechanics, I also chose a bad set of F&PC. Unlike with the CQ, I will point out that in Electricity & Magnetism (E&M) and Elements of Physics, I was able to recognize some F&PC in each of these courses. For Elements of Physics, introducing the idea did not change the course except that I now say it explicitly. The course was already (though only implicitly) organized in a manner consistent with this idea. This is essentially also true for E&M. For Quantum Mechanics, this would take a significant reorganization of the material.

This implementation and organization of the course fit so well that it allowed me to create NSC220 "Anything Physics", which will be discussed in the next section.

I will address additional work in applying the QEP in the Scholarship section. It turns out that through these minor implementations, it was revealed to me that those experiences also fed into the QEP and provided the insights needed to present clearer workshops and connect with everybody who had an interested in exploring these ideas.

MAT 115: Pre-Calculus. This course is taken by anybody who is not prepared for calculus, both MAT 143 and MAT 151. The majority of these students are business majors or biology majors. Some of these are academically mature but interested elsewhere, but many approach this class with trepidation. These students are not as extreme as the developmental math course, but are still somewhat uncomfortable with the material, self-conscious about their math skills, and expecting to have difficulty. I had tried a similar approach in the GEC course I taught in 2007 to mixed results[3]. Some loved it and visited me through the next semester to let me know how they were doing in their next class. Others were not so enthusiastic.

It is my understanding, based on discussions with a friend in Texas who is trained in the field of Cognitive Learning, that students do best when given only enough homework to gain proficiency. Unfortunately, this varies from student to student, especially in a beginning math course. Often the online homework can test for proficiency, vary the assignment length by student, and save me the trouble of grading, but in that case, it is difficult for me to see the details of the student thinking. What I am trying this semester (See the Pre-Calculus syllabus) is:

1. tell the students ahead of time which section we will be covering,
2. ask them to look it over and try as many problems as they can do, and
3. start class by asking "Are there any questions from the section that will cover today's section that you would like to ask about?" [Answer whatever questions they have, generalizing their questions to relevant issues.]
4. When they feel they understand it (as expressed by not having more questions), then I give them a quiz over the material.
    a. The catch (their incentive) is that if they ask enough questions to fill the lecture time, then there is no quiz.
5. Then[4] I collect the work they have attempted and grade it based on number of problems tried and not on accuracy.
    a. Since the odd answers are in the back, they get 1 pt per odd problem attempted and 2 pts for every even problem attempted. Both of these are independent of getting the right answer.
    b. To get a "perfect" score, they need to do all odd problems or half of the even problems or some combination that reaches that number.

[3] This was discussed in my tenure application.
[4] This is the innovation beyond the previous attempts.

    c. It is possible to score well over 100% on every one of these. This is like having extra credit readily available and gives them a cushion against a failing exam.
6. For the first few chapters, I ended the chapter by giving them an assignment that would be graded for accuracy before the exam. On the most recent chapters, I decided that I had to change this to a small accuracy-assignment for every section, but (unlike the attempt-assignment) this is due after we discuss the material.
7. At the end of each chapter, there is a test that covers all of the topics, even if they haven't been quizzed.

The point is that they need to see that they can figure it out; I am only guiding their attention. My saying it does not count as them understanding it. In this way, they all work as many problems as they need to in order to understand it. If they can't understand the problems, they can ask until they do; but they have to ask questions if they want to hold off the quiz. This idea is also related to the "flipped classroom" idea of making the class time be about asking the questions they need to know. It is different in that before class, they are reading the book rather than watching a video.

The result is that I had more people than I expected drop the class or just stop attending. The people who are willing to try the experiment seem to like it and are rather interactive in class. So, far the grades still have a pretty big spread, so I am not yet sure if I can rate it a success.

Just in Time Teaching. One idea that I tried for a couple of years (and can be seen on some syllabi in the "Grading" section) is the JITT[5] questions. For this, I created a quiz sheet (PDF included with the syllabi); students had their own sheet that they always used. On the day when I wanted to ask a question, I handed their sheets out to them while they came into the room. I asked them a question and could review the results with them to figure out which details I needed to discuss and emphasize. I included this technique in E&M and Elements of Physics.

You might notice that the true JITT is not intended to be a quiz summatively assessing their outgoing knowledge or skill, which is what is described on the Elements syllabus. Firstly, the JITT question is an opportunity to understand what baggage (or lack thereof) the students bring to the table. Unfortunately, I discovered that if there were no grade and no right answer, then rather than trying to help me understand what they brought to the classroom, the students lost their shame at not doing the pre-class work and only took it seriously when it because a quick-quiz (as described on the Elements syllabus). So, this became a tiny version of Pre-Calculus: We reviewed the previous question, I asked if they had any questions (although it was limited to 5 minutes unless it was an exceptionally good question), and then they answered the quiz.

Multiple Homeworks. The Math Methods class used to be taught for junior physics majors in preparation for the senior level courses.[6] For the upper-level physics majors, the motivation is generally already present and the innovations here have been primarily in terms of developing techniques that enable the students to develop insight and deepen their skill set. To this end, I have

[5] JITT = Just in time teaching in which you do a quick assessment before discussing an idea specifically so that you can modify your discussion based on the responses of the students.

[6] The 301-302 series has since been replaced by MAT 220 and MAT 310. It has been about four years and we are re-assessing the idea.

altered the usual[7] homework assignment technique (c.f. NSC220homework.pdf) of assigning the problems at the end of the chapter to be due at the time we finish discussing material for the chapter, usually about a two-week period. In fact, the technique mentioned above for Pre-Calculus is an extreme version of my approach with the upper-level majors. Before I cover any material in a new chapter, I assign a set of sample problems that I think the students can figure out entirely on their own. These are called "homework a" and are due the day I start the chapter. Then the students are given a second assignment in that same chapter that involves difficult problems that require an awareness of some subtlety, which is due by the time we finish discussing the chapter. This can be seen in MP301_homework.pdf for Chapters 2, 3, and 7.

[7] The "Due", "Assigned", and "Extra" categories were discussed in my tenure portfolio. "Due" means that these are the problem you have to turn in; solutions are not posted until after the due date. "Assigned" problems are ones for which I will post the solutions early so that you can used the solutions to clarify how to do the Due problems. "Extra" problems are ones I thought were useful, but I will not collect and I will not post a solution.

C. List new courses designed and old courses revised:

There are two courses I would like to showcase as my creations. The first was created before I heard of the Fundamental and Powerful Concepts introduced to me through the QEP study, nonetheless, it happens to have exactly the structure advocated by that technique. The second came from a departmental discussion about our student research projects. For both of these courses, I have provided a section in Appendix B with samples of the homework.

NSC 220: Anything Physics. My first example is an NSC course for the non-science majors that I successfully taught at my previous institution and did not have a chance to teach at Thomas More until this past spring. It requires minimal algebra and touches on student interest. We spend half of the term covering basic physics concepts such as motion, force, and energy – these would be called the Fundamental and Powerful Concepts in the language of Nosich's critical thinking teaching techniques – and then, having established a common language and a specific skill set in problem solving, we cover whatever the students in the class decide is of interest. I tell them that it is open to their every whim, so long as they can ask it with physics-language. Examples of topics that course has explored are: "How do traffic police figure out who is at fault in a traffic accident?"[8], black holes, relativity, nuclear bombs versus TNT, the motion of the stars and planets, the phases of the moon, the function of various household appliances, and weather and climate models. Last spring, the class got caught up in the physics of Star Wars and Star Trek. Fictional science got a bit distracting and made it difficult to revert back to actual science. In any case, these are all student-selected topics. It usually takes the students a week or two to realize that they have this measure of control over the course and in one instance the course turned into "stump the professor" in a good-natured competition that included the reciprocal game of "bluff the student", requiring research on their part as well.

PHY 490: Research Proposal. My second example is a course for the junior physics majors. We were having some trouble with students who would take the Senior Research course without any idea of what their project would be. We would spend some time exploring and eventually assign (or agree to) a project. The students would get part-way into it and then realize that it was either too simple or too difficult (or they just didn't want to do that particular project). So, I created a 1-hr course where they could spend an entire semester testing the feasibility of several ideas. The result of the course would be essentially a grant proposal for departmental funds for a specific project. I have taught the course three times and it seems to be consistently not doing what it needs to do. I thought at first that it was the students, but last year we had a good student and it still failed to fix the trouble it was created to solve. I am evaluating ideas for how to change it for the coming spring, but I have not yet decided.

*Please attach in APPENDIX A syllabi of old courses and syllabi of courses revised as well as syllabi of new courses designed (include a minimum of 5 and no more than 8 syllabi).

*Please attach in APPENDIX B documentation of effective teaching (student evaluations, chairperson's evaluation, peer evaluations, etc.).

*Please attach in APPENDIX C a letter of support and recommendation from the department chairperson as well as letters of support and recommendation from colleagues.

[8] In Texas, I brought in an Accident Reconstructionist and he independently explained the technique using the same methods we had already learned.