

## Narrative Reflection, Winter 2019 Benjamin V. Holt

Based upon my student and peer evaluations, I shall outline what went well and what did not go so well both overall, as well as in each individual course I taught this term: MTH 105 (*Math in Society*), MTH 241 (*Calculus for Business and Social Sciences*), and MTH 243 (*Probability and Statistics*).

### What Went Well

**Overall:** I have continued to adopt and create quality free-to-low-cost materials for my students. The materials I have developed and adapted have, for the most part, been well received.

As far as I am able to tell from my evaluations this term, I have been accessible both in and out of class, as well as online. One of my favorite components of teaching is the one-on-one interaction I get to have with my students, and I am not shy in advertising this fact to all. I believe that I was somewhat successful in getting students to seek out my help outside of class.

**MTH 105:** There was a large course component of student-to-student and student-and-instructor interaction. The students who picked up the material quickly did well in helping their peers to learn the material that we covered. Allowing students to take the driver's seat in instructing their peers (under my facilitation) was an effective model for this class. Moreover, it was a welcome compliment to the lecture component.

**MTH 241:** This course also featured a non-lecture component which emphasized being able to assimilate ideas with the help of peers and the instructor. For the lecture component, I was able to create web-based, non-static illustrations of ideas involving limiting processes such as the definition of the derivative. There were also instructor-created materials including questions tailored to student interests, namely forest ecology and forest management and economics. One of the best examples included applying the quotient rule to maximizing the mean annual increment at the stand and forest levels.

**MTH 243:** I adopted a free, downloadable textbook for MTH 243 (open-stax), and I created a wealth of materials which align with this book. These include lectures, question banks, and exam-simulation software. The lectures also contain demonstrations of dynamic ideas including those from probability (probability as a long-term proportion, expected value as a long-term average, and the central limit theorem in action) and inferential statistics (confidence intervals from repeated samples, and changing  $p$ -values in the face of new evidence). These course materials were, overall, well-received.

### What Needs to Improve

**Overall:** In general, students have mentioned that lecture slides are void of solutions in the slides themselves. The reasoning behind not including solution in the slides was two-fold: 1) I do not simply want to read a solution off to my students; I want to write the solution and guide students through it as it is being written. 2) I want students to have even more motivation to come to class

by solutions being available not online, but in class.

In talking with students and looking at what they have written in my evaluations, I can find some fault in the above reasoning. First, some students have no choice but to miss class either because they attend institutionally sanctioned, off-campus events, or because attending on a particular day might pose a domestic hardship which cannot be surmounted. Second, it is possible to include solutions by making them visible or invisible at the push of a button. This is not a difficult thing to do. I can keep solutions invisible while lecturing, but still accessible online for those who need it in some other form. Thus, I have decided that the best way to accommodate the variety of circumstances and situations of my students, I will begin including solutions to newly-created lecture slides and slowly adding to those I have already posted.

Another common complaint was that students felt some kind of formula sheet or note-card would have been exceedingly helpful on exams. Looking back at the volume of material that my **MTH 105** were responsible for as one example, I must say that I am inclined to agree. Although memorization is part of any course, it also stands to reason that making a note-card as preparation for an exam is a great study tool and helps students to synthesize their knowledge. The task of deciding the hierarchy of importance of facts and ideas is a very basic but marvelous way to actively engage with the material as a whole. Therefore, I have decided that I will allow a 3 inch by 5 inch sized note-card for exams. The space constraint is a challenge which will require the student to make choices about what they believe the most important ideas are in the course.

Another consistent thread I found in my evaluations concerns the online homework: 1) progress on a particular attempt cannot be saved, and 2) the website provides only a correct answer, as opposed to more detailed feedback. These are valid points which I shall address in more course-specific detail below.

**MTH 105:** For this course, there were simply too many graded items. In addition to the usual battery of online homework, written homework, and exams, I also included a paper whose topic could be chosen (with some constraints) by the student with my approval. I reasoned that writing about some mathematical topic would be a non-threatening way to gain knowledge while utilizing the strengths of many students who take this as a terminal course. It was amply clear in my evaluations that a paper was not a welcome addition; it was perceived as a time sink rather than an opportunity to use their strengths. As a result, I will not include a substantial writing component in this course in the immediate future. I will consider how I might include such an item by adjusting other graded items.

Also, according to some informal, anonymous feedback, I was told that many students saw little value in studying set theory. As much as I adore the theory of sets, and as much as I had hopes that my excitement for the topic would be infectious, the theory of sets turned out to be a hard sell. This feedback mentioned that is both too abstract and too impractical. While I beg to differ with both of these assessments, their point is quite valid: the only connections we make to sets is applying or relating them to other topics in the course: logic and probability theory, and these topics were also largely received poorly in terms of immediate applicability.

Given that the course title of **MTH 105** is *Math in Society*, I do feel inclined to agree with the above in some part. I would like to give students something they feel is either immediately applicable, or helps to reveal and understand the workings of society. For example, voting theory and/or apportionment would be a welcome addition to the topics traditionally covered in this course. It is my intention to work these topics into the next section of **MTH 105** that I teach.

Finally, although peer-to-peer and student-instructor interaction was built into the course, I would have liked to have included more activities, particularly in the area of statistics which help to solidify concepts around data collection and analysis.

**MTH 241:** The biggest complaint from my MTH 241 students is that they are not able to save progress on `holt.blue` website. I have mixed feelings either way. On one hand, having to start an assignment with a whole new set of questions means having to focus for some period of time as opposed to being distracted. On the other hand, flexibility is a key component of the materials I would like to develop for students. Developing a way for students to save their progress on assignments poses a development challenge for me which would require a substantial investment of time.

Along these lines, students in both my **MTH 241** and **MTH 105** mentioned that they would like some sort of feedback other than a correct answer. From my informal **MTH 105** feedback mentioned above, a student wrote: “I learn nothing from seeing that I have gotten the question wrong.” Again, I have mixed feelings about this. When I was a student, we had answers to certain problems (typically odd-numbered problems in a textbook), and figuring out how to work toward an answer in the back of the book was a very instructive exercise. It seems that this age of information is also one of immediate gratification; answers are now at our fingertips and require minimal effort to obtain. On the other hand, striking while the iron is hot and providing an answer or a hint while the student is motivated to seek out an answer also seems like it could be beneficial. Moreover, when comparing my platform with those that students must pay for, others do include hints and solutions to certain problems. As instructive as it may be to fill in the details of a solution, I can also see the benefit of an immediate hint or solution. For the future I will consider working these into the code which generates the problem sets students complete online.

Along these lines, another source of frustration for my students was that some topics are considerably more challenging than others. For example, applied optimization proved to be a difficult topic for my students. These problems really do require more of a student than say using a set of rules to find derivatives; solving 20 optimization problems is a much different expectation than finding 20 derivatives. My reasoning in doing things that way I did was that some topics simply do take more time than others, but I think most of my students in this course were disheartened to the point of giving up on the assignment. Although the sample size was small, and I believe some of my students to be inexperienced in what is expected at this level and beyond, I will likely consider varying the number of problems for each assignment to make the investment of time required to complete and assignment more consistent.

**MTH 243:** Some of the issues encountered in my **MTH 243** course concerned the length of assignments, which I addressed above.

## What Lies Ahead

Students have voiced a need for more support materials along the way. These include hints and solutions to problems and not simply whether or not an answer is correct or incorrect. These also include solutions embedded in lecture slides and other expository course materials. It is my intent to begin amending my existing course materials to address this shortcoming, as well as using this as a starting point when creating new materials.

**MTH 105:** Based on student feedback, both formal and informal, I would like to introduce topics that will make this course better live up to its title: *Math in Society*. Moreover, I would like to cover topics which students perceive as more useful and/or meaningful. I intend to start by developing course materials for topics not typically included here at Southwestern: voting theory, apportionment, and power in weighted voting systems. I would like to focus on the mathematics of collective decision making since I cannot think of a topic more relevant to the theme of “Mathematics in Society” than this. To include these topics might also mean rallying departmental support for making some minor changes to the course outline for **MTH 105**.

**MTH 241 & MTH 243:** I would like to develop a way for students to either be able to save their progress when working online with `holt.blue`. This is a larger goal that I have for this not only this course, but more generally speaking. For now, the best I can do is to begin researching ways to create a way for students to be able to save their work. A compromise which I can make to address some of the issues of assignments of a consistent level of difficulty is to change the lengths of assignments based upon the difficulty of their respective topics.

## In Conclusion

With some honest-to-goodness student feedback in hand, I have decided to make some fundamental changes to my courses as outlined above. I am grateful to both my students and colleagues here at Southwestern for their time in expressing their opinions and suggestions, and I extend a hearty “thank you” for their contribution to the success of future students.