MALCOLM RUPERT

Teaching Statement

Teaching experience

- Courses taught: Calculus I-III, Linear Algebra, Finite Math, Number Theory
- Eight years of tutoring math, one year in leadership role of a math tutoring center.
- Recitation and grading for science and engineering calculus and for business calculus for seven semesters.

Teaching Philosophy Statement

I want every student I teach to be involved in discovering mathematics. This takes different forms fitting for the variety of students taught at university, but each of my courses utilizes active learning methods and includes challenges, which reach beyond the basics and require student led innovation. For particularly motivated classes, inquiry based learning (IBL) is an effective teaching strategy. For typical classes I give interactive lectures and provide a framework for student's self-learning. There are two main reasons why expect student self-learning to be a large component of each of my courses. First, it supports skills essential for any academic pursuit, such as critical thinking and perseverance through failure. Second, there is a growing body of research that suggests that courses that use IBL significantly narrow the gender achievement gap. Employing active learning strategies has its challenges, but despite this, I believe that it is a learning strategy that is unwise to ignore.

I know that I have led a successful course when my students have accomplished the following: they are better problem solvers, they have mastered the material, their ability to communicate math has improved, and they have a higher level of excitement and appreciation of math at large. Focusing on student self-learning supports all of these goals. For remedial math classes this may look like weaning students off of the procedural methods, which they may be used to, in favor of more general problem-solving skills. For example, I will expect students to make some progress on problems that they have not seen before, and I will wait until students understand the problem completely before discussing an algorithm that could be used to solve a class of similar problems. For courses intended for math majors, throwing students in the deep end with a collection of theorems to prove and enough assistance, so that they do not flounder, will give them independence, perseverance, and mastery of the material.

Engaging students during class with small group discussions, on for example how to spot when a function is not differentiable or brainstorming applications to constrained optimization, brings the material to life and ensures that students have a better understanding of the material and can communicate it to their peers. Students should work on a variety of problems, in class and at home, as this is an indispensable part of learning. Simple problems focus on solidifying students understanding of main concepts and gives them practice communicating their solutions when the math is not difficult. Students improve their problem-solving skills, become fluent with the fundamentals, and build a repertoire of examples and counterexamples by struggling through problems which do not have clear solutions.

For instance, asking students to explain, with illustration, why a line through the origin is a subspace of the real plane but two distinct lines through the origin are not accomplishes these goals.

Because of the added requirements for independence and ingenuity, students often find self-learning to be more challenging and more rewarding than being spoon fed the answers. This is an added difficulty for the instructor, but a difficulty that is predictable and which can be prepared for. To ensure the success of every student, I prepare completely and thoughtfully for the course and for each class period, and I am ready to support students through their struggles (if they are not struggling then I am clearly failing to teach them what being a mathematician is like). My students know that they are supported because they receive feedback on every assignment that reinforces what they are doing correctly, points them to where they can do better, and encourages them to constantly improve throughout the course. I make opportunities for out-of-classroom discussions abundant by making students aware of all of their resources (such as office hours and tutoring centers) at the beginning of the course and by personally inviting students to use these resources I think they would benefit from them. The main technique I use to guide student self-learning in my office hours is the Socratic method, which can help train students to examine their own thinking. If the department runs a math tutoring center I like to be present in order to encourage my students to work together. This also gives me another way to informally evaluate the progress of my students and the effectiveness of the tutoring center. In short, my level of support needs to match the level of effort I expect from my students.

The students in my calculus II class in the summer of 2014 were particularly successful. I decided to lecture and supplemented my lectures with extended problem-solving sessions which explored topics such as the multitude of methods that can be used to evaluate trigonometric integrals or the details of how to use series to obtain decimal approximations of irrational numbers. I also chose to entice the class with demonstrations of more advanced material. For example, after the class had some understanding of series and convergence I introduced the Riemann Zeta Function and hinted at some of the deep mysteries that sprout from this function. The addition of challenging homework led to office hours that were well-attended, leading to many one-on-one and small group discussions where I could pinpoint misconceptions and give exercises tailored to improve each student's mastery of the material and ability to solve novel problems. One student wrote in their course evaluations, "You know what it is [still] like to not completely understand the materials and how to get a grip onto it." which tells me that this student has a better idea of what it means to be a mathematician after succeeding in this course.

In summary, students in any course that I teach take an active role in their education because I expect them to engage in self-learning. This emphasizes skills that are crucial in any mathematical pursuit and fosters a learning environment which encourages everyone to participate.