

## TEACHING PORTFOLIO

### – Teaching philosophy –

A popular aphorism asserts that there are three important aspects of teaching: motivation, motivation, and ... *motivation*. While acknowledging the inability of a pithy saying to summarize the complex interaction between teacher and student, my teaching often *does* revolve around this concept.

First, I need to motivate *myself* in whatever it is that I am teaching. Unless I am motivated by the material I am teaching, what hope is there of motivating my students? In preparing for a course, I ask myself why the entire course is important. What do I expect my students to get from it in a *broad* sense? Most importantly, how do I expect the students to use these skills in the future? For each and every topic, theorem, proof, example, or assignment I ask myself: how does this contribute to the broad goals that I have thought of for the course? *Why am I teaching this?* And I need to find *some* answer.

Once I am convinced, I need to motivate my *students*. This is still challenging when students come from varied backgrounds (with regards to their preparation, intellect, academic prowess, interests, degree they are pursuing, technological expertise, expectations, confidence in interactions, etc). Somehow, I need to motivate *all* my students, *to learn*. In doing this, I need to use my vast range of teaching experiences across three continents, my sensitivity to diverse student backgrounds and abilities, my pedagogical training which takes into account educational research, and a self-reflective feedback-based ongoing thought process.

Most inspiring and helpful in this were my teaching years at Oberlin and Connecticut Colleges, where I absorbed styles and methodology from a talented and supportive faculty who sought absolute excellence in teaching. This was complemented by an intellectually inquisitive student community, which relished being challenged and also challenging the teacher. I was also introduced to the delights of teaching mathematics to liberal arts students, many of whom were in the class under the duress of a quantitative proficiency requirement. Reviving their dormant mathematical curiosity through ideas on voting methods, optimum paths for snow ploughs, logic in language, and using statistics for mendacity was an exhilarating experience. Activity-based teaching is particularly effective in this context; I used plenty of worksheets, and ideas shamelessly stolen from many sources (such as 'random rectangles' from *Activity-Based Statistics* by Schaeffer et. al, which illustrates by group activity—and not explaining—the importance of random sampling over judgment sampling). In Real Analysis at Connecticut College, some proofs were elucidated through gap handouts in which students need to fill in the gaps of proofs. In a method used more usual to the humanities and social sciences, I had students write reaction papers based on carefully selected readings from the textbook; this enabled students to begin thinking about technical issues in definitions *before* coming to class. This idea was sufficiently novel that my article on it was published in the newsmagazine of the Mathematical Association of America in 2008 [45 in CV]. This was an aspect of 'classroom flipping' in mathematics before the phrase was invented!

Student-centered methods are also very successful in lower level mathematical courses. I often develop mathematical techniques (and even definitions), through carefully guided worksheets. When computing the derivatives of trigonometric functions in Calculus I, it is the students who derive the useful limit  $\lim_{\theta \rightarrow 0} (1 - \cos \theta) / \theta = 0$ ; not me. When used subsequently, they have a proprietary interest in that particular limit. In-class group projects, such as the computational ones I use in my Environmental Modeling course in which students work with software, sometimes writing their own commands, is another approach. Assigning challenging out-of-class group projects also helps push students to their limits; these need careful wording to enable and foster mathematical discovery. Having student-run classes on related topics of their choice is another method I sometimes use in upper-level courses, a role-reversal which has led to particularly stimulating classes. These endeavors have led to my office hours being busy and lively. I firmly believe that anything learnt through active intellectual engagement—preferably in an apparently unguided context—remains firmly rooted. I am a facilitator of the learning process, and not its controller.

At different institutions, I have to modify my style based on the students' backgrounds, the course objectives, the class size and the resources. When teaching multivariable calculus or Fourier series to engineering students, my examples are mainly from fluid mechanics and electromagnetics, rather than merely 'mathe-

mathematical.’ When motivating Grade 4 kids via the ‘Mathematicians in Schools Program’ I participate in at Norwood Primary School (Adelaide), it is always through hand-on activities: cutting Möbius strips, simulating Königsberg islands as desks to jump between, etc. I used to carry an enormous telephone directory to my 350-strong numerical analysis class in Sri Lanka, get a student to select a name from it unbeknownst to me, and discuss my optimum strategy of asking questions from her (to which she could only reply ‘yes’ or ‘no’) to locate the name. Through student engagement, the bisection method is thus revealed<sup>1</sup>. In an introductory class, I would place upright dominoes in a row on the table in students’ view, but then place one a little further apart. Rumbblings from the students eventually elicit from them the statements ‘Place them so that if the  $i$ th one falls, then the  $(i + 1)$ st should,’ and ‘You need to topple the first to start the process.’ Mathematical induction can therefore be developed organically *by the students*! Pulling in *applications* in biology, ecology, chemistry, economics and art, in addition to the more obvious ones in physics and engineering, is another task I pursue in every course I teach. I am currently designing teaching materials for usage with clickers in large classes at Adelaide, using technology for student engagement beyond my own courses. Indeed, I often use technology (Mathematica/Matlab both in and outside of class, online quizzes, discussion boards on class websites, in-class student participation through the web, etc) in my classes. This is *not* just for its own sake, but is designed—like all other pedagogical techniques that I use—in a carefully thought-out way to achieve class objectives, improve the grasp of concepts, increase engagement, and provide tools necessary in today’s changing world.

Much teaching also occurs outside the traditional classroom. Self-reflection is paramount in my many curriculum development activities (e.g., cross-listed course on environmental modeling, a one-semester calculus with precalculus course which nonetheless provides intuition in every aspect covered, an upper-level data-driven dynamics course I am mulling over), in which I relish having to think outside the box. I particularly enjoy co-curricular student engagement; at both Connecticut College and Adelaide I initiated the participation of student teams in the Mathematical Contest in Modeling (MCM). I am particularly proud of having trained and advised an Adelaide team which *won* the MCM (and was awarded the INFORMS Prize) in 2015.

A teacher is often also a mentor; this is particularly so in situations in which I advise student projects and undergraduate/graduate theses. This is an important and delicate role, for example when students discuss with me their aspirations for the next stage of their career. It is rewarding to direct students towards opportunities that they may not know of, and to mentor them through challenges leading to their goals. Through these interactions, it is refreshing to continually update my sensitivity to the amazing diversity of the student body, for example by my being an African-Latino/a-Asian-Native-American (ALANA) mentor while at Brown University, and a workplace volunteer for the Aboriginal Summer School for Excellence in Technology and Science (ASSETS) program in Adelaide. Relating to students requires a careful navigation of the balance in being supportive, noninvasive, perceptive, realistic, honest and friendly. A wonderful reward is to see former students achieve ambitious goals; yet another reason teaching will continue to be such a gratifying part of my life.

Good teaching is far from simple. It requires careful preparation, questioning *why* something is taught and focussing it accordingly, re-evaluation of methods based on peer and student evaluations and gut feelings on how a class went, and constant experimentation. This is further challenged by having to understand and imbibe the student ethos at each institution, and—particularly these days—the rapidly changing technosociological environment. This is an unending process, which is why teaching remains fresh for me, and will continue to be so. I am a teacher today because I have been motivated by my teachers; their dedication and skill has exposed me to the beauty of mathematics and the vibrancy of teaching. I too, look to motivate my students. Motivation comes in many shapes and forms; the trick is to provide it in a *contextual* sense. My diverse teaching experiences have made me sensitive to differing student needs, preparation and expectations, so much so that I am continually adapting myself in new directions, and experimenting with new ideas and techniques. This versatility should stand me in good stead as I face new teaching challenges into the future.

A large collection of teaching materials is provided at:

<http://www.maths.adelaide.edu.au/sanjeeva.balasuriya/teachingportfolio.html>

<sup>1</sup>The classroom effect of tearing off and throwing away half of the telephone directory at each instance is tempting, but I have avoided this because of its environmental impact, difficulty in reproducibility, and a lamentable lack of finger strength.

## – Teaching Evaluations –

'Enthusiastic,' 'well-prepared' and 'excellent explanations' commonly appear among my student comments, and statements such as 'the best teacher I have ever had' are not infrequent. A few selected student comments from my courses are given below.

- *Sanji is one of the best professors on this campus! His enthusiasm is infectious and he is always very patient to all students. It's professors like him that give Connecticut College a good reputation for education standards!* [Conn]
- *He is the greatest lecturer at uni!! His explanations are second to none, there is not one part of his course I do not understand. He can take the most complex of things and make it simple. [He is] also very interesting to listen to, keeping your attention the whole lecture. He says things in multiple ways, guaranteeing that you understand at least one explanation. He has his own slides which are a bonus to his great teaching. He shows clearly what you need to know and is very organised. His examples are clearly explained. He is just fantastic, favourite lecturer by far!!* [Adelaide]
- *Easy and clear to listen to. Explosive enthusiasm is infectious. Best lecturer ever.* [Sydney]
- *Even when he didn't have office hours, he would make time to see me, and he would always work with me till he felt I understood* [Oberlin]
- *Sanji you are an amazing professor and I just wanted to let you know that you pushed me from memorizing the subject to actually getting comfortable with it—from memorizing rote formulas to actually being able to derive and intuitively understand the heart of where equations come from and why they are used. You make me question my thinking and understanding of mathematics everyday... thanks :)* [Conn]
- *[The material] was quite hard, but the lecturer pulled us through with clarity and expertise.* [Sydney]
- *Sanjeeva is the best lecturer I've ever had!!! His explanations are excellent and his enthusiasm is unlike any other! Sensational job, Dr. Balasuriya!!!* [Adelaide]
- *I have never liked math courses, but this course was one of the best classes I have ever had the pleasure of taking. Professor Balasuriya was helpful and enthusiastic about the course, making it that much more engaging. I cannot speak highly enough about Professor Balasuriya and the course!* [Conn]

Evaluations conducted at the end of a course tell only a part of the story; the impact of one's teaching might only be understood by students far in the future, for example when the usefulness of the methods learnt is realized in future work. I have had many students contact me long after taking a course with me, such as the following email (verbatim) from a student I'd taught and mentored 8 years previously:

- *I'm not sure if you remember me, but I had the privilege of being taught by you as an undergraduate student at the University of Sydney. I was very excited, and extremely happy too, when I found out that you had returned to Australia! I do hope I can come visit you at the Uni of Adelaide in the near future! ... I guess what I really want to say is a big THANK YOU for your excellent teaching at Usyd and for supporting me to do my PhD studies in the USA. I am much indebted to you and I wish you much joy and success at the Uni. of Adelaide! But I am sure you'll continue to excel in all that you do! :)*

In every course that I have taught throughout my career in which there was a discernible question rating the *overall performance* of the instructor, the median student rating has always been the maximum possible (i.e., a 5 if on the standard 1, 2, 3, 4, 5 scale).

- Evaluations from MAT212: Multivariable Calculus (Connecticut College) are shown in their entirety in the next two pages.
- Many more teaching evaluations (unabridged) are available at:  
<http://www.maths.adelaide.edu.au/sanjeeva.balasuriya/teachingportfolio.html>

## MAT-212-1-Fall 2012

You are logged in as H. Balasuriya (Logout)

Evaluations ▶ MAT-212-1-201290 ▶ Questionnaires ▶ All-Campus Evaluation - Mathematics ▶  
Questionnaire Report ▶ View All Responses

View All responses (10)

View All Responses View By Response

View Default order Ascending order Descending order Download in text format

View All Responses. All participants. View Default order Responses: 10

## All-Campus Evaluation - Mathematics

1.

What is your Class Year?

Response	Average	Total
First Year	40%	4
Sophomore	50%	5
Junior	10%	1
Total	100%	10/10

2.

What were your reasons for taking this course? Select all that apply.

Response	Average	Total
It satisfies a General Education requirement.	6%	1
It satisfies a requirement for my major, minor, or certificate program.	31%	5
I am interested in the subject.	38%	6
A combination of the above	19%	3
Other	6%	1

3.

How many of the class and/or lab sessions did you attend?

Response	Average	Total
All but two or three attended	44%	4
All attended	56%	5
Total	90%	9/10

4.

On average, how much time did you spend preparing for this course per week outside of the scheduled class and/or lab times?

Response	Average	Total
Under 3 hours	50%	5
4 to 6 hours	30%	3
7 to 9 hours	20%	2
Total	100%	10/10

Please state the degree to which you either agree or disagree with each of the following statements.

5.

The instructor was well organized and well prepared for class.

Response	Average	Total
Strongly agree	100%	10
Total	100%	10/10

6.

The course requirements were clearly stated, either on the syllabus or in class by the instructor.

Response	Average	Total
Strongly agree	90%	9
Somewhat agree	10%	1
Total	100%	10/10

7.

The instructor was responsive to your questions, concerns, or requests to meet outside of class.

Response	Average	Total
Strongly agree	90%	9
Somewhat agree	10%	1
Total	100%	10/10

8.

Tests, assignments, papers and other work were returned in a timely manner.

Response	Average	Total
Strongly agree	100%	10
Total	100%	10/10

9.

The instructor's comments and feedback on your work were constructive and useful.

Response	Average	Total
Strongly agree	60%	6
Somewhat agree	30%	3
Strongly disagree	10%	1
Total	100%	10/10

10.

The instructor taught in a way that helped you take responsibility for your own learning.

Response	Average	Total
Strongly agree	100%	10
Total	100%	10/10

11.

The assignments in this course gave you the opportunity to synthesize or apply the knowledge you acquired.

Response	Average	Total
Strongly agree	80%	8
Neither agree nor disagree	10%	1
Somewhat disagree	10%	1
Total	100%	10/10

12.

As a result of this course, you either mastered a considerable body of material or developed intellectually and/or artistically in a significant way.

Response	Average	Total
Strongly agree	80%	8
Somewhat agree	20%	2
Total	100%	10/10

13.

The Instructor used class time effectively.

Response	Average	Total
Strongly agree	100%	10
Total	100%	10/10

14.

The Instructor demonstrated enthusiasm for the course.

Response	Average	Total
Strongly agree	90%	9
Somewhat agree	10%	1
Total	100%	10/10

15.

The instructor was able to communicate material clearly.

Response	Average	Total
Strongly agree	80%	8
Somewhat agree	20%	2
Total	100%	10/10

16.

The Instructor allowed adequate class time to answer questions.

Response	Average	Total
Strongly agree	80%	8
Somewhat agree	10%	1
Neither agree nor disagree	10%	1
Total	100%	10/10

17.

The textbooks or other required materials were appropriate for the course.

Response	Average	Total
Strongly agree	80%	8
Somewhat agree	20%	2
Total	100%	10/10

18.

I would recommend this course to other students.

Response	Average	Total
Strongly agree	60%	6
Somewhat agree	20%	2
Neither agree nor disagree	20%	2
Total	100%	10/10

19.

I would recommend this Instructor to other students.

Response	Average	Total
Strongly agree	90%	9
Somewhat agree	10%	1

20.

Please share any other thoughts you have about the course and the Instructor. Feel free to elaborate on your responses to the previous questions.

#	Response
1	The instructor is fabulous. He explains everything in great detail. He explains how we get from one step to the next, and derives formulas for us in class so that we understand why something is true (as opposed to just giving us the formula and not explaining it). He is upbeat, cheerful, witty, and is always willing to help. I would definitely recommend this professor to anyone looking to take a math course.
1	Sanjee is an excellent professor. Multivariable Calc isn't the easiest thing to grasp when a student sees it for the first time, but he was able to clearly present it and make understanding it a bit easier. He also made sure that the class covered vector derivatives, something that is extremely important for physics majors and is left out of many multivariable calculus classes. This was greatly appreciated.
1	Instructor was great I liked him a lot. The course had huge volumes of material. The exams and last few quizzes were very hard especially on the final questions
1	I greatly enjoyed Multivariable Calculus with Sanji. Having taken Calc 1 and 2 during my senior year, I knew I wanted to continue my calculus education and this class was perfect for that. I loved the set-up of a quiz each week with the homework serving as a study guide rather than being collected and graded. For me, this class was the perfect balance of enjoyable and challenging. I look forward to taking more classes with Sanji!
1	I took Multivariable to appease my mom's requests but I could not be happier that I did. I really do like math but Sanji's enthusiasm for the course just made me enthusiastic about it, which I never thought possible. He spent class time clearly explain every topic and it was so straightforward that it made me wonder how math was hard for anyone to understand. On top of the classes themselves being so great, the homework, quizzes, and exams, were all straightforward in the way they were presented making it so easy and allowing me to take my grades into my own hands. If I got a bad grade, I knew it was my own fault and I knew exactly how I could fix it. I don't regret taking this class in any way and it even inspired me to possibly minor in mathematics.
1	Awesome professor - tough but a great teacher. Really enjoyed having him and would definitely recommend him to other students. Very accommodating and flexible.
1	I only have good things to say about this class and professor Sanji. He was an excellent teacher. The best teacher I've ever had. I am so excited to have him again next semester.
1	Sanji you are an amazing professor and I just wanted to let you know that you pushed me from memorizing the subject to actually getting comfortable with it--from memorizing rote formulas to actually being able to derive and intuitively understand the heart of where equations come from and why they are used. You make me question my thinking and understanding of mathematics everyday...thanks :)