Meeting the Bar in Teaching for Tenure-track Assistant Professors

Abstract

In this Reflection, I share my thoughts on how research-active faculty can meet the basic requirements of being an effective educator. It is especially directed towards Assistant Professors working their way towards promotion and tenure. Easy-to-digest and easy-to-implement steps are outlined herein. These steps if followed, will ensure that the tenure bar for the teaching component is met.

Introduction and Purpose of the Reflection

At research-intensive universities such as the National University of Singapore (NUS), tenure-track faculty have numerous competing demands on their time. In addition to having to be effective educators in their courses, another important success factor is their ability to perform world-class research internationally recognised by peers. The relentless pressure is exacerbated during the pre-tenure years where an Assistant Professor, especially in STEM (science, technology engineering, and mathematics) disciplines, has to set up his or her laboratory from scratch, hire a competent team comprising students and research staff, raise competitive external funding to sustain the lab's activities, publish in prestigious journals and/or conferences, and travel to publicise the lab's research outcomes. As junior faculty, Assistant Professors usually also have young families, an additional demand on their time and energies. With the tenure clock constantly ticking, it is no wonder that Assistant Professors often feel stressed (Nir & Zilberstein-Levy, 2007) and uncertain about attaining tenure.

It is widely recognised that scholarship forms the most salient component of promotion and tenure (P&T) decisions in research-intensive universities (Green, 2008; Parker; 2008; Chen, 2015). In this Reflection, I share my thoughts, with evidence from the pedagogical literature, on how pre-tenure Assistant Professors can do well in the other pillar that determines tenure success—namely, their contributions to education. I speak as a faculty who went through the process of conducting research, teaching, and serving the Department during my pre-tenure years. I speak also having served, after obtaining tenure, on P&T committees and observed common pitfalls in candidates' profiles which I feel could have been rectified though sound advice and mentorship. I hope that as someone who is research-active, this Reflection will be useful for Assistant Professors and other more senior tenure-track colleagues.

Why the need for another paper on "how to teach"? Indeed, there is much literature propounding various theories on teaching effectively through game-changing pedagogies. However, when time is limited, as it is for most tenure-track faculty, one needs to utilise time-efficient strategies to be an effective educator. While the advice here is well-intentioned, not all points are uniformly applicable, so I urge readers to be circumspect yet receptive in adopting at least some suggestions herein.

The rest of this Reflection is structured as follows. I will first share what I think must-do's to be an effective educator. I will then mention some tips colleagues can adopt to facilitate their teaching and will be positively received by students. I conclude by sharing my own experiences in designing teaching modules. Throughout, I will substantiate my points by quoting student feedback from the classes I have taught.

Must-Do's of an Effective Educator

This section outlines three *necessary* conditions which I believe every colleague must have to be an effective educator.

HEART. A necessary condition for teaching effectively is having the *heart* to do so. If a teacher has the intention of ensuring students get something out of a course, students will be able to see and appreciate the former's efforts and will reciprocate by putting in the effort to learn. Öqvist and Malmström's (2018) study has shown that leadership behaviour in educators—manifested as "showing guidance, being supportive, participating in their students' learning processes, and being performance-oriented"—has a positive linear correlation to students' motivation. All these take time and effort. Colleagues can ask themselves these questions: "Do you enjoy teaching and molding the next generation of scientists and engineers? Or are you dragging your feet to the classroom? Are you always rushing after lecture back to the lab or your office to supervise your postdocs' experiments, or to complete your latest manuscript?" Our responses to these questions are good indicators of whether we have the heart to teach. Each of us is called a "professor"—one who *professes* or spreads one's knowledge to the masses. Thus, if we lack the heart to teach, we might be in the wrong profession. While there are numerous demands on our time, we must devote a good proportion of our working hours to caring for students, ensuring they attain the learning outcomes, and even if they do not remember the intricacies of the module, ensure that the *skills* learned in the module—such as discipline, creativity, and resilience—stay with them for life. I emphasised this to Assistant Professors when I conducted a pre-tenure workshop in March 2018 organised by the Office of the Provost (Figure 1), which garnered positive responses from the workshop participants.

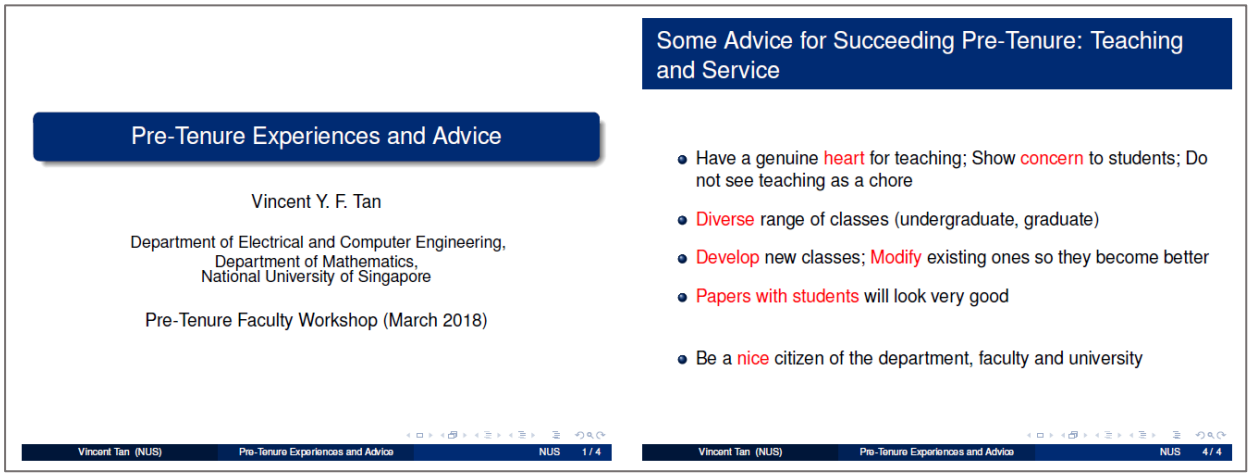

Figure 1. A slide from a presentation to pre-tenure faculty at NUS in March 2018.

PREPARATION. It is incumbent on the professor to *prepare well* before teaching. The worst thing students can experience during class is seeing a professor stumble over his or her notes or struggling to comprehend typo-laden slides. Before the semester starts, one should have carefully thought through all content to be delivered and mapped out a well-structured

syllabus (Revell & Wainwright, 2009). Before each lesson, clear notes or slides could be disseminated; inexperienced colleagues should rehearse. Ending the session punctually also signifies adequate preparation. It is also important to settle logistical issues (e.g. updating the gradebook, clear instructions and submission deadlines for assignments and projects). The student feedback for my courses almost always mention that I am well-prepared. For example, in the Fall of 2019 when I taught MA3110 "Mathematical Analysis II", all 17 respondents gave me a 5.0/5.0 rating for "preparedness". Of course, for more advanced educators, there are other ways to spruce up an educator's lectures and tutorials to make them "unmissable" (Revell & Wainwright, 2009), e.g., making it interactive and being passionate.

DELIVERY. One common pitfall of pre-tenure faculty that I have observed as a P&T evaluator is that of *delivery*. Research-intensive universities bring in an abundance of international talent for their research excellence. It is thus inevitable that our students may be unaccustomed to accents from around the world. A common student complaint is that they struggle to understand their professors' thick accents or staccato speech. This is by no means an indictment of any colleague. Rather, I strongly feel this point has to be raised to minimise such occurrences, which can adversely impact the colleague's P&T prospects. Sanger's (2020) study suggests sharing lecture transcripts which will also help students with auditory processing disorders. There are also numerous opportunities and avenues within the university to correct language and delivery problems. I usually conduct a mid-semester student survey addressing classroom-related aspects, including clarity (Figure 2). In this way, there is still the second half of the semester to rectify any deficiencies.

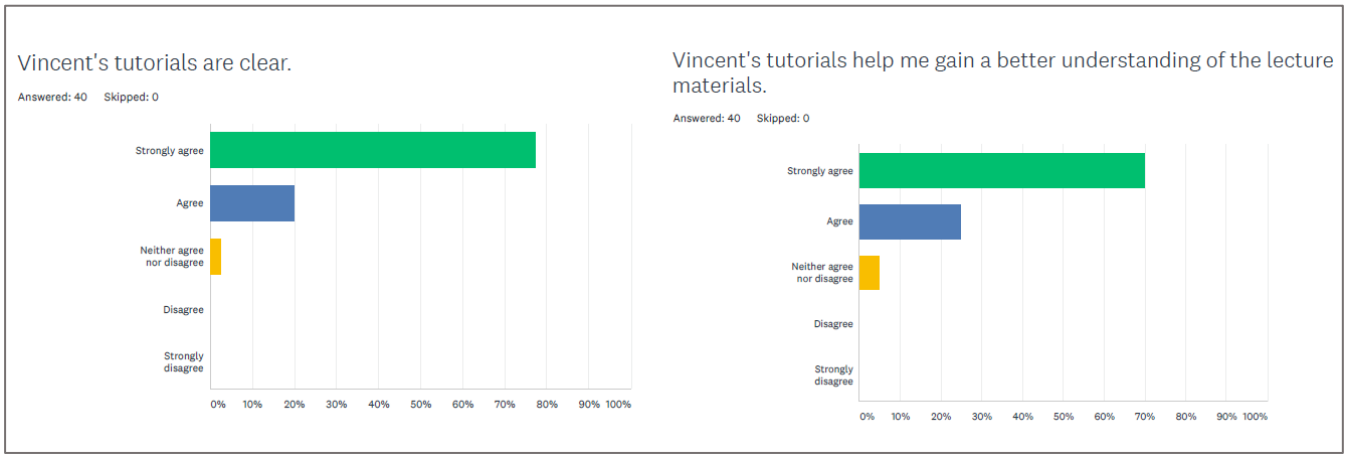

Figure 2. Results of questions in a midterm survey I did for EE2211 "Introduction to Machine Learning" in the Fall of 2020

Tips to Make Life Easier for Yourself

In this section, I share some tips that can help tenure-track colleagues be effective teachers more efficiently. How is effectiveness measured? As the educational aspect of P&T decisions are largely, but not solely, based on student feedback scores (Boring et al., 2016), I will recommend some broad-based strategies to help junior faculty improve on these scores with minimal time and effort. I caution that these scores are only one indicator of effectiveness and their shortcomings (Hornstein, 2017), for example, bias against female faculty (Boring et al., 2016), are well-documented.

TEXTBOOK. While there will be opportunities for Assistant Professors to develop new courses aligned to their research, they have to demonstrate teaching effectiveness in undergraduate core courses[1]. These core courses are offered at most universities, and most disciplines would require their undergraduates to complete a certain number of such courses. As such, the syllabi are well-established as are major textbooks on the subject. While some argue against using textbooks (Klymkowsky, 2017; Carpenter et al., 2006), I personally feel that instead of reinventing the wheel and writing one's own notes (unless absolutely necessary), it is often more beneficial to students and the instructor to follow a suitably-chosen textbook. Widely-adopted textbooks are usually written by discipline experts with extensive teaching experience. The course structure and emphases on certain topics are well-established. Students may find the numerous well-constructed worked examples useful in augmenting their understanding (Weinberg et al., 2012). Hence, choosing a suitable textbook as a foundation for one's course would be time-efficient and beneficial to students' learning. Indeed, in my class EE5137 "Stochastic Processes" in the Fall of 2018, one student indicated that "It's good to follow a good textbook which makes learning easier."

OFFICE HOURS: Having a heart for students is essential to being an effective educator. One way to achieve this is through consultation hours. Attendance at these sessions has been shown to be positively correlated with academic performance (Guerrero & Rod, 2013). I like conducting my weekly consultations at a fixed time slot, for economies of scale. In this case, several students will be present at the same time. The faculty can address this group all at once, addressing difficult homework problems or correcting common course-related misconceptions. This is in contrast to having ad hoc sessions, where typically the faculty will only meet one student each time. Second, having a fixed weekly time slot adds structure to the course, giving shyer students who are less inclined to email the professor for ad hoc consultations the opportunity to ask questions. All in all, students are generally appreciative when such a mechanism is in place. In the student feedback for my EE5137 class in the spring of 2020, one student mentioned that I was a "dedicated Prof–Holds consultation hours weekly to teach students".

ASSESSMENTS. Take-home assignments are essential in undergraduate courses to reinforce concepts taught during lectures and tutorials through practice. Designing and grading such assessments is often time-consuming but necessary to achieve the learning outcomes. So how should one do so? Again, if one adopts a textbook, it includes many well-designed questions offering a range of difficulty. Faculty often balk at using questions from textbooks because cribs (or solutions) may be available online. For me, this is not problematic as my perspective is that students should feel free to work together and if they are stumped by a particular problem, there is no shame in getting hints online. It is better than not thinking about the course at all! I mitigate this by assigning only a small proportion of the final grade to homework (10-15%). Students generally appreciate, though they lament, the heavy workload.

There are many ways to be time-efficient in setting and grading good assessment or exam questions. One way is to set multiple-choice questions (MCQs) which can be machine-graded. However, there are disciplines where MCQs are inadequate in assessing students' understanding of the course material. If so, it is advisable to set exams that *facilitate* convenient grading. Instead of asking students to give an answer using a complicated expression, it is easier to grade if the expression's structure is already given and students fill in parts of it. For example, here are two questions (Q1 and Q2):

> 1) Derive the number of updates of Algorithm A in terms of a, b, and c.
>
> 2) The number of updates of Algorithm A can be expressed as $f(a) + b^k + \alpha c$. Find the function f as well as the constants k and α.

Notice that since the form of the answer is given, Q2 is only slightly easier than Q1, which could have many equivalent correct answers. Thus, the difficulty is not compromised. However, if Q2 is asked, when the instructor grades the exam, he or she only needs to check whether function f and the constants k and α are correct, or "how correct" they appear to be to award partial credit, which is easier than ascertaining the correctness of each possible answer for Q1. Students in my classes find my assessments challenging but necessary. For example, a student commented on NUSMods about my MA3110 class: "His tutorials and homework assignments are tough, but needed." Other tips on designing and grading assignments more efficiently, without compromising student learning outcomes, are discussed by Cohan (2020).

RESEARCH. One natural way to amalgamate research and teaching during the pre-tenure years is to bring one's research into the classroom (Vicens & Bourne, 2009). This has the double benefit of showing advanced students the state-of-the-art in what they are learning and enticing the better ones to join the Assistant Professor's lab for a final/honours year project or Master's project, potentially leading to publication. However, this should be done carefully and sparingly, as talking up one's research may not go down well with students who are already struggling with the basics. If done correctly, though, it can be rewarding for everyone. The idea here is to integrate teaching, learning, and research. Some students really appreciate this, as evidenced by feedback I received for MA4270 "Data Modelling and Computation" in the Spring of 2018, commenting that "he is able to connect the content of the lecture to his own research and rises interest".

RANGE OF TEACHING. As awarding an Assistant Professor tenure means the university is committed to keeping him or her long-term, this decision is of strategic and paramount importance to the university. The university must be convinced the candidate is able to not only teach courses aligned with his or her research but also undergraduate core classes. One issue an Assistant Professor has to be cognizant of is his or her range of classes taught. One should actively seek out opportunities to teach different courses at different levels (core/elective, undergraduate/graduate) in preparation for P&T.

MENTORS: If one experiences difficulties despite doing all the necessary, seek advice from experienced tenure-track colleagues who excel in both research and teaching (Stenken & Zajicek, 2010). Seeing how they prepare for and conduct their classes, and how they balance research, teaching, and service commitments will be beneficial. What would be

even better is to seek proper advice from colleagues who have served on P&T committees on navigating the nebulously-defined path towards tenure.

Sharing My Teaching and Learning Experience

At NUS, I have had the benefit and pleasure of teaching both core and elective undergraduate[2] as well as graduate courses[3]. I have adopted many of the strategies outlined above in these courses.

Apart from MA4270 "Data Modelling and Computation", the other courses I teach are considered "standard" ones that can be found in other universities. Hence, I followed textbooks closely, often augmenting the textbook content with more examples or detailed discussions. What I did for MA4270 (when I designed from scratch) was to model it on a machine learning course I took as a graduate student at MIT. I found the structure to be logical. That is, a single coherent story, without disparate and unconnected topics, was delivered. This has the benefit of showing students the broader perspective of what they are learning. It was greatly appreciated by the three cohorts of students I taught.

All the courses I teach involve proving theorems, exemplified by MA3110 "Mathematical Analysis", a core undergraduate mathematics course. There are many effective ways to teach analysis to undergraduates. I personally had, as a student, benefited from the many pedagogies in this area. What I find most satisfying is having an instructor lead me through the *thought process* of coming up with a proof, rather than spelling out each step. Students generally find that they do not know how to start a proof, or what prior results they need to solve a problem. Thus, in my teaching, I often start by teasing them with a plausible high-level strategy of the proof, filling in details where needed. It is my hope that this will help students "visualise" the key steps.

Acknowledgements

I would like to sincerely thank the anonymous reviewer, the editor, and the editorial staff of AJSOTL for their comments to streamline the paper.

Endnotes

1. In the STEM area, these are courses that range from "Classical Mechanics" in Physics, "Organic Chemistry" in Chemistry, "Mathematical Analysis" in Mathematics, to "Circuits" in Electrical Engineering.
2. The core undergraduate courses I teach include MA3110 "Mathematical Analysis", while the undergraduate elective courses I teach include MA4270 "Data Modelling and Computation" (which is essentially statistical machine learning).
3. The graduate courses I teach include EE5137 "Stochastic Processes", EE5138 "Convex Optimization", and EE5139 "Information Theory".

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