

STINT Teaching Sabbatical Report

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Sabbatical at

**Lee Kong Chian School of Medicine,
Nanyang Technological University, Singapore**



LKC Medicine Clinical Sciences Building, Mandalay Road, Singapore

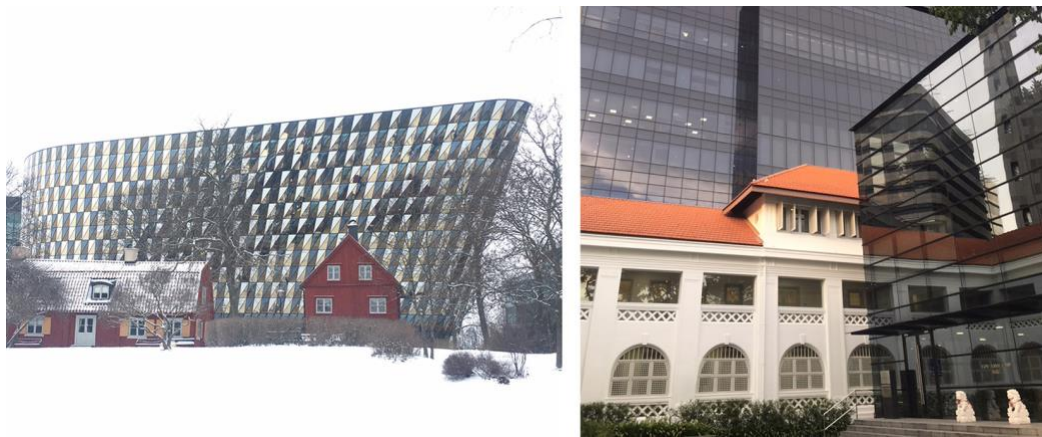


**Karolinska
Institutet**



Background

After some years focussing on my research, I felt it timely to devote some energy to developing and expanding my teaching portfolio. One approach suggested to me by Marie Arsenian-Henriksson, the then head of my department, was the STINT teaching Sabbatical Fellowship. I applied in September 2015 and was delighted to be accepted to the program and to be deployed to the Lee Kong Chian School of Medicine, in Singapore. However, soon after officially accepting the position, my partner and I discovered that she was pregnant and that the baby was due in early September 2016, soon after the sabbatical was due to begin. Upon consultation with Christofer Carlsson at STINT and with Prof Naomi Low-Bear at LKC Medicine, it was agreed that we could defer the sabbatical to Autumn 2017 instead.



Both Karolinska Institutet and LKC Medicine have a strong drive to modernisation but maintain links to the past.

The Lee Kong Chian School of Medicine, Singapore

Singapore has a population of 5.6 million people living on an island of 720 km². For comparison, that is about half the population of Sweden in an area about half the size of Öland. The population is multicultural, with several different ethnic groups taking up significant proportions of the population (approximate numbers: 74% Chinese, 13% Malay, 9% Indian). English is maintained as the working language. In order to meet the healthcare challenges associated with a diverse, rising and aging population, Singapore was until recently importing up to 600 medical doctors per year. Since training doctors at home is more favourable, more medical schools were needed. To address this, the Lee Kong Chian Foundation donated a large sum of money to Nanyang Technological University. That sum was matched by the Singaporean government and the Lee Kong Chian School of Medicine (LKC Medicine) was founded.

Nanyang Technological University (NTU) is the youngest of the two Universities in Singapore, founded in 1991. It has 33,000 undergraduate and graduate students, 4350 faculty and research staff and 2350 administrative and technical staff. It has consistently performed well for being such a young university,

ranking 1st place in the QS rankings for Asian universities in 2018, 1st in the ‘Top 50 Under 50’ every year since 2015 and is overall ranked 11th globally.

LKC Medicine is a partnership between NTU and Imperial College London, UK. It was established in 2013 and in 2018 its first students will graduate with the degree of Bachelor of Medicine and Bachelor of Surgery (MBBS), awarded jointly by NTU and Imperial College London. An objective of the school is to be a model for innovative medical education in the future and there is a strong emphasis on Team-Based Learning throughout the medical program.

The hugely impressive Clinical Sciences Building at Mandalay Road was officially opened by Singapore’s Deputy Prime Minister Teo Chee Hean on 28 August 2017 and I had the pleasure of attending the ceremony. The school also has a building at the main NTU campus, the Experimental Medicine Building (EMB) way out west of the Singapore island.



A commemorative plate given to attendees of the opening ceremony for the Clinical Sciences Building on 28th August 2017. The plate depicts the three buildings that make up LKC Medicine.

Clockwise from 9 o'clock: The Clinical Sciences Building; the Experimental Medicine Building with its bridge to the School of Biological Sciences building at NTU; the Mandalay Road Headquarters.

Planning Trip

In March 2017, I travelled to Singapore for a one-week planning trip. My hosts had prepared a full schedule for me for three days. I spent a fourth day meeting some research colleagues at the Biopolis (A*STAR) institute and explored the city on the Friday.

During the planning trip, I had the chance to meet with some senior faculty members at NTU and LKC, including Prof Er Meng Hwa, NTU Vice President of International Affairs, Prof Lionel Lee, Executive Vice-Dean, LKC Administration and Prof Mike Ferenczi, Professor of Medical Sciences at LKC and Assistant Dean of Years 1 and 2. Mike officially welcomed me to LKC Medicine and gave me an overview of the school and the educational programs. It also emerged during that discussion that the TBL sessions for the virology material were to be held in January and that I would not be present for that occasion.

At LKC, I also met with Dr Claire Canning, Senior Lecturer, and Lead for the Introduction to Medical Sciences course, with whom I discussed more specific tasks that I could engage with. Claire and I would later have offices in the same part of the Clinical Sciences building and she would be enormously helpful for me in my work at LKC. Finally, I met with members of the department of Human Resources. They (particularly Ms Chang Hui Yun) were very helpful with my

application for Singaporean Work Pass and the applications for Long Term Visitor and Dependents passes for my partner and daughter respectively. I also learned that I would have my own office at the CSB and also the use of a 'hot desk' office at the EMB at the main NTU campus, where I would be living.

At NTU campus, I was also able to meet with Ms. Sophia Li Hui, from the Office of International Affairs for a tour of campus housing. I chose to take a Standard two-bedroom apartment for the duration of our stay. However, future STINT fellows working at LKC Medicine should be mindful of the distance between the NTU faculty housing and the CSB. Even using the intercampus bus, the journey takes about 1 hour 20 minutes door-to-door. I have suggested to STINT that future fellows at LKC might receive higher stipend to provide the choice of renting accommodation in the city, nearer their place of work.

Active Learning

One of my hopes for my sabbatical was to be able to introduce more active forms of learning into the courses I teach. Active learning is a blanket term to describe forms of instruction in which the students are given an active role in their learning, for example through class discussions, group projects etc. This form of instruction should motivate the students to engage with the material and to be responsible for their own and often their peer's learning. Compared to students in lecture-based courses, active learning students would be compelled to be more participatory and collaborative in order to progress through the course.

Team-Based Learning (TBL)

TBL is a highly structured form of active learning in which the students are encouraged to thoroughly study the course material before class, followed by a series of individual and team discussions in a long teaching session. In the following sections I describe the structure of a TBL course, with particular emphasis on how it is done at LKC Medicine. The sessions are typically chaired by a Facilitator who is an expert on the format of TBL, but not necessarily familiar with the course material. Content Experts are also present who, as the name suggests, are there to direct discussions, particularly during the Application Exercise section.

Course material

The LKC Medicine students access the course material via the iLKC portal, where all information about the course as well as course material can be found. The page for each block is typically composed of 4 or 5 lectures and some extra reading material. In most cases the lectures exist as movie files of a lecturer firstly introducing the lecture to camera followed by the body of the lecture recorded using smartboard technology. In each case, the slides alone are also available as PowerPoint or PDF files. Each student has been provided with an iPad at the start of the course so that they can access and engage with the material at any time.

For each block, the adequate preparation time is scheduled in the students timetable and so there should be no excuses for unpreparedness. According to the students' course evaluation feedback, the time for preparation varies a lot between students. Some report habitually listening to lectures on 1,5x or 2x speed, while others report spending many additional hours going into depth with extra material online.

The TBL Session

Individual Readiness Assurance (iRA)

The first activity in the long TBL session is essentially a test for whether the individual students have adequately prepared and understood the course material. Over a period of 30 minutes, the students sit and answer a set of multiple choice questions on their iPads. Their answers are recorded in real time on the Facilitators computer, so that before progression to the next stage, Facilitators have a general idea of a) which students are struggling with the course b) which questions are problematic for the class as a whole and might require detailed discussions in the later sessions. However, for the students, no correct/incorrect feedback is given at this stage, so they are unaware of their performance.

Team Readiness Assurance (tRA)

Once the iRA is completed, the session moves in to the tRA phase. Here the requirement for silence is removed and the team members can start to confer with one another. They should discuss the same set of questions as the iRA and again answer on their iPads, this time as a group. Here, the students can share their thoughts with the group and can come to agreement on the best answer. Once the group answers are entered, immediate feedback is given, so if the group chooses an incorrect answer, they will be given a chance to discuss further and choose again. Again, group performance is recorded in detail by the Facilitators, so that struggling groups can be identified.

Burning Questions

During team discussions in the tRA session it is likely that teams will have issues that they cannot solve in their groups. These issues can be put forward to the rest of the class during the 'Burning Questions' session. Questions are entered directly into the system on the students' iPads and displayed on the overhead screen. The Facilitators can then pose those burning questions to other groups, likely provoking a general, open-book discussion in the class. Issues that cannot be solved in this way can be referred to the Content Experts who should be available at this point to direct discussions in the most constructive way.

Team Application Exercises

Once the class have discussed their Burning Questions and the Content Experts are satisfied that the discussion has been constructive, the session moves into

the Team Application Exercise. Here, a series of more wide-ranging questions are discussed. While the questions in the iRA and tRA are typically aimed towards the lower end of the Bloom's learning taxonomy (*Remembering, Comprehending*), the AE questions should rather be designed to motivate the teams to apply their knowledge to important medical problems, to *Analyse* and to *Synthesise* a plan or action in case study for example. Since other teams are working on the same problem, there is also an opportunity for the teams to *Evaluate* their own thinking after hearing about different decisions that other teams may have made.

My activities during the sabbatical

1. TBL workshops and Teaching Seminar
2. Visits to Duke-NUS Medical School as TBL observer
3. Revising and recording the LKC Medicine Virology Course material
4. Conventional teaching at School of Biological Sciences, NTU
5. Research visits

1. TBL workshops and Teaching Seminar

While at NTU/LKC Medicine I took advantage of a number of courses that were available for academic staff members, described below.

TBL Workshops

The Educational Development and TBL Facilitation department at LKC Medicine organises regular TBL workshops for training of newly recruited staff that will be getting involved with the educational programs.

Workshop 1: Introduction to TBL

Workshop 2: Team Application Exercises Writing

Workshop 3: Content Expert Best Practice

Workshop 4: TBL Class Observation & Reflection

Due to scheduling conflicts I was only able to attend workshop 1 and 3 but found them extremely useful. Workshop 1 was a great introduction to basic principles of TBL. We also discussed the manner in which students learn, discussing peer-learning as opposed to teacher-led classes. In Workshop 3, we met with experienced TBL practitioners and discussed tips and tricks about TBL preparation in order to optimise the learning experience for students. Instead of Workshop 4, I arranged to sit as an observer in Immunology II and III TBLs at the LKC Learning Studio on 7th and 25th September. Future STINT fellows working at LKC Medicine might be advised to look into these workshops and enrol early so as not to miss them. They may well be open to other STINT fellows at NTU.

Innovations in Teaching Seminar at NTU

On 3rd October, I attended a full-day seminar organized by the Teaching, Learning and Pedagogy Division for all teachers at NTU. It included talks from in-house and invited speakers on diverse aspects of higher education, including

remote teaching, virtual & augmented reality technology and others. The keynote Address, 'Assuring Best Practice in Learning and Teaching: Priorities for Institutions, Teachers and Learners in a Connected World' given by Professor Mike Keppell (Former Pro Vice-Chancellor and Professor, Learning Transformations, Swinburne University of Technology), was particularly interesting. This seminar is held annually and future STINT fellows at NTU who might want to attend are advised to email the organisers directly since the online registration system does not recognise temporary email accounts.

2. Visits to Duke-NUS Medical School as TBL observer

Duke-NUS Medical School is a partnership between the National University of Singapore and Duke University School of Medicine, North Carolina, USA. The school is situated beside Singapore General Hospital (SGH) very close to the downtown areas of Singapore. The medical program at Duke-NUS differs from other medical programs in Singapore in that it is a graduate medical school and so all the students have a bachelor level degree and are on average 24 years old upon starting the program. Duke-NUS were first in Singapore to introduce TBL in their program and currently the entire first year of their medical education (Basic Sciences) is taught in this style.

Prior to my sabbatical, I contacted their educational department and asked if I could visit for discussions with the TBL organisers and potentially also to observe a TBL session. On 24th August and 4th September, I had the privilege of attending two full-day TBL sessions at Duke-NUS medical school. My host had thoughtfully invited me to two sessions that were aligned with my own research interests (Translational Control and Autophagy).

The visits were very fruitful in that I received an insight into TBL practice at another institution. The organisation of the TBL sessions at Duke-NUS is very similar to that at LKC Medicine with the only major difference being that the session is held in a conventional lecture theatre, rather than in the purpose-built TBL rooms at LKC Medicine. This may seem a trivial issue, but in fact has great significance for those considering to introduce TBL into already established educational programs, demonstrating that extensive physical remodelling of the educational spaces is not necessary.

3. Revising and recording the LKC Medicine Virology Course material

The course material for the virology section of the Introduction to Medical Sciences course (1st year) was composed of two lectures of 70 and 80 minutes each, recorded as voice-over-PowerPoint files by Prof Wendy Barclay of Imperial College London. The lectures covered all the material and adequately addressed all the ILOs. However, the lectures were recorded 5 or 6 years previously, so were rather out of date. For example, no reference was made to the recent Zika or Ebola virus epidemics. The lectures lacked a special focus on viral diseases prevalent in Singapore and South East Asia, such as dengue and chikungunya fevers and other mosquito-borne viruses. Also, parts of the lectures were too detailed for medical students.

During the months of November and December 2017, I prepared an alternative set of lectures covering the same material and addressing the same ILOs. I arranged the material in 5 lectures, each containing between 20 and 30 slides:

- Vir01: Properties of Viruses
- Vir02: Viral Replication Cycles
- Vir03: Viral Pathogenesis and Patterns of Infection
- Vir04: Viral Evasion of Innate Immunity
- Vir05: Viral Evasion of Adaptive Immunity

Each lecture covered basic material and illustrated concepts using examples of pathogenic viruses. I composed the lectures using basic literature, maintaining alignment to the ILOs and to the bank of iRA/tRA questions for the TBL session.

After consultation with Ng Aik Song at the E-Learning department, we decided that I would record the lectures to video at the LKC E-learning studio. Over 4 occasions in mid-December, the 5 lectures were recorded using the smartboard. It was a unique opportunity to record lectures in this way and I am very grateful to the expert direction of Li Meihui and Siti Arfah Ibrahim, Multimedia Specialists at the E-Learning/IT Systems and Services department.

At the E-learning studio, about to record Vir01: Properties of Viruses. The introduction and conclusion slides are recorded face to camera, while the body of the lecture is recorded directly on the smartboard.



Before recording, the content and style of the lectures were approved by Dr Prabha Krishnan, who is responsible for all microbiology material in LKC Medicine courses. The lectures were also approved by Assoc Prof Dahai Luo, LKC and Dr Kassoum Nacro (A*STAR). The lectures will now be available for the students in the Introduction to Medical Sciences course in Autumn 2018/Spring 2019, and I hope in future years. The first TBL session for those lectures will be held in January 2019 and it is my hope that I can return to LKC Medicine for a short visit to participate.

4. Conventional teaching at School of Biological Sciences, NTU

Apart from my contacts at LKC Medicine, I also sought contact with the organisers of the virology course at the School of Biological Science (SBS) at NTU. That course has many similarities with my own virology course in the KI Biomedicine programme. Prof Richard Sugrue, the organiser of the course, had already arranged all teachers for the scheduled lectures by the time I contacted him, but was able to make space in the schedule for me to give 2x 50-minute

lectures to the students on Translational Control in Viral Infection on 19th September at the main lecture theatre at SBS, NTU main campus.

Of a class of 113 students, only approximately 20-30 students turned up for the lectures. Most sat at the very back rows of the lecture theatre. The students seemed very attentive but not participatory. Not a single question or comment was posed by a student in either of the two lectures and only one student came to me after class to ask a specific question. I tried to provoke some reactions in the students but was met with silence. A few times I asked 'have you covered this before' and received no answer, even when holding eye contact with those students sitting in the nearest rows. Even after I remarked about the silence, practically begging for a reaction, silence persisted. In conversations with other teachers at the department and with other Singapore-based STINT fellows, I came to understand that this is perfectly normal in Singapore.

Student Feedback on Teacher performance

Prof Sugrue informed me that faculty evaluations at SBS have a strong focus on student's feedback on teaching performance. Since students' evaluations are so important for faculty promotions, I asked for ad hoc teacher evaluation from the class and received feedback from 16 students. I received a score of 4.2 out of 5.0, with generally positive comments including some students expressing that I should be given more classes to teach. I would have liked that too.



Singaporean students appear terrified of being called upon to speak in class. The majority of students in lectures I attended sat in the back rows. Pictured is the SBS Virology course students. Front left, Prof Richard Sugrue.

Student presentations about current viral disease outbreaks

The ProMED-mail server is a web-based monitoring system for rapid global spread of information on outbreaks of infectious diseases that affect human health. For example, on the day of writing, the server is reporting an outbreak of rabies in Lebanon and measles in unvaccinated children in the Philippines. As part of the Virology course at SBS, students were placed into groups of 4 or 5 and asked to prepare a 20-minute presentation describing a recent virus outbreak. Groups were asked to use the ProMED-mail server to identify current outbreaks and to employ the course material, literature and their own literature review to provide background information to describe the molecular biology, pathogenesis, epidemiology and treatment options for the infection.

I was invited by Prof Sugrue as Expert Observer for these presentations. Over 4 half day sessions, I watched between 15 and 20 presentations about current

outbreaks of viral diseases in all parts of the world and participated in discussions with the students. It was a very enjoyable experience and in fact marked the only occasion that I was able to engage with Singaporean students during my entire sabbatical. The work had motivated the students to use their generalised course material to synthesise information about specific infections. The group work is an excellent way for the course to be more internationalised, turning the attention away from diseases of local importance and gaining an understanding of the global fight against infection.

5. Research visits

During my sabbatical, I was able to find time to meet with several excellent scientists and to present my research work at a number of Singaporean institutions including:

16th March (during planning trip), I gave a research seminar entitled '*Structural and biochemical characterisation of the interaction between alphavirus protein nsP3 and the host stress granule protein G3BP*' at A*STAR, hosted by Prof Lisa Ng. Also, later in the sabbatical period I was able to meet with Prof Ng on several occasions and we have recently submitted a joint grant application to enable a PhD student from my research group at KI to perform part of her work at Prof Ng's laboratory in 2019-2020.

20th October, lecture '*Multiple roles of alphavirus nsP3 protein in modulation of cellular responses to infection*' at Duke-NUS, host Prof Linfa Wang.

23rd October, lecture (same title as above) at School of Biological Sciences, NTU, host Prof Richard Sugrue.

Actions upon returning to KI

1. Spread the word at KI about STINT Teaching Sabbatical.

Before that conversation with the MTC Prefect in September 2015, I had myself not heard of the STINT Teaching Sabbatical program before, even though I have been involved in education at KI for over a decade. Applications to the program from KI have been few over the years so there is clearly some scope to improve the spread of information. I will spread information about the program at the institute and work to increase the number of applications from KI in future years.

2. Keep working with Internationalisation of the Biomedicine program

Internationalisation of a curriculum has been defined as 'The incorporation of an international and intercultural dimension into the content of the curriculum as well as the teaching and learning arrangements and support services of a program of study' (Betty Leask, Keynote address at the Karolinska Education Congress 2018). Some educators at KI have recently received funding from STINT Strategic Grants for Internationalisation to support their program 'Internationalisation of the Curriculum – A Framework for Action 2017-2020'

(<https://ki.se/en/lime/internationalising-the-curriculum>). One of the programs they will be looking at is our own Biomedicine Bachelor's degree program.

In redesigning the virology course, I intend to introduce a similar assignment to the ProMED-mail assignments in the NTU School of Biological Sciences virology course (see activity 4, above). This is not only an excellent pedagogical activity to motivate students to employ higher order thinking in their virology education but also to instil in them a sense of the global fight against infections rather than a west-centred view of viral threats.

3. TBL in Biomed course?

An obvious question arising from my sabbatical is whether it would be feasible to introduce TBL into my virology course within the KI Biomedicine programme or other courses. The Infection and Immunity course has always been taught in a very conventional style, with the approximately 60 students sitting in lecture theatres for the majority of the classes. There are also seminars, tutorials, laboratory and group work, but they form a minority of the course work. The course could very well benefit from the introduction of more active learning occasions. But is TBL the way to do it? Would it work for KI Biomedicine students the way it appears to work for LKC Medicine students?

Although I'm generalising, students in Singapore appear to be highly disciplined. It was reported very infrequently that students had failed to adequately prepare for the TBL sessions. Another trait of Singaporean students which may contribute to the success of TBL approaches in that environment is that they tend to avoid participating in class if possible. In lectures, the students are extremely passive and expect to listen and take in the information presented, in preparation for reproducing it in later examinations. In a TBL course however, students have no option but to contribute since their grades depend on it.

Although there are always students at the back rows of lectures in Sweden, I have not detected a general culture of passivity in the classes I have taught. If something is unclear, questions will be asked and teachers will have to explain better. It's rare in my experience in Sweden that a lecture ends without 1 or more students coming to the front to discuss some concepts after the class. This makes me wonder if Swedish students really need to be forced to actively participate through a TBL approach.

However, the main challenge as I see it for introducing TBL in KI education is the amount of resources needed for establishing and maintaining a TBL course. LKC Medicine has enormous resources at hand for teaching staff. There are teams of full time TBL Facilitators who organise the sessions so that the Content Expert's time is minimised. Changing a KI course to a TBL style would require participation of every teacher in the course. Most of the teachers in the Infection and Immunity course at KI Biomedicine program are primarily researchers, funded by external grants. Very few of us (happily, I am one) receive any portion of our own salaries specifically for our teaching. Most teachers in our courses participate *pro bono*, taking time away from their research. What is the motivation for those teachers to set aside the many hours it would take to change their style of education? As a course organiser, I feel it is already enough

to ask them to prepare and deliver one or two lectures, or spend an afternoon working or discussing with students in lab demonstrations or tutorials. Therefore, it is doubtful in my mind that the resources currently available to KI teachers would be anywhere close to enough for an efficient, rewarding, high quality TBL course to be set up.

As I wrote above, TBL is a highly structured form of active teaching and it may be overly ambitious to expect to be able to introduce it into ongoing educational programs. Nevertheless, many lessons can be learned from the TBL approach to learning and it may be feasible to introduce some form of 'miniaturised' TBL or at least to have more group activities in the course programs. I look forward to working with my fellow course organisers to achieve this.

Thanks

I am very grateful to STINT for the marvellous opportunity of the Teaching Sabbatical fellowship. I felt extremely welcome at NTU and LKC Medicine and am grateful for all the administrative help, in particular from Ms. Chang Hui Yun. Dr Claire Canning was a great source of help and a good friend at the office at CSB. Thanks to Li Meihui and Siti Arfah Ibrahim at the E-Learning studio, for your patience during the long recording sessions. Thanks to Prof Richard Sugrue at NTU for kindly finding space for me to teach in his course and for interesting scientific discussions.

Thanks to Julie Gold for being a great neighbour and friend to my family and I and for lots of fun chats over noodles at Canteen 9. Finally, huge gratitude to my partner Alva and our daughter Nina Jane for spending those 5 months with me in Singapore and for making it an unforgettable experience.



Blue Sky Thinking. The view from my office at the Clinical Sciences Building