Teaching Sabbatical – Lena Öhman Final Report

Visiting Lee Kong Chian School of Medicine at Nanyang Technological university (NTU), Singapore

1. Preparation and planning

My recent teaching background

I am professor in immunology at the University of Gothenburg, with extensive involvement in teaching and supervising undergraduate, MSc, PhD students and post docs. I have experience from course development and acted course leader for several courses on all university levels. During recent years, I have been director of PhD studies at the Institute of Biomedicine and am currently the Head of Department of Microbiology and Immunology with responsibility for planning the department´s teaching activities. During more than 20 years, I headed an independent internationally competitive research group in the area of gut microbiota, immunity and the link to disease profile and therapy outcome in patients with gastrointestinal diseases such as inflammatory bowel disease (IBD) and irritable bowel syndrome (IBS). My main research focus is to establish how the intestinal biosignature, including microbiota, metabolites and the immune system influences disease pathology and predicts disease course and therapy outcome. My specific aim with the STINT teaching sabbatical was to improve my skills in student activating teaching approaches such as team-based learning and flipped classroom, incorporating novel pedagogic methods into undergraduate teaching and examination. I have a broad teaching experience from different types of student activating sessions including facilitating team-based learning (TBL).

Planning Trip

Upon receiving the news, I promptly reached out to the administrative and academic contacts. My academic contact, Associate Professor Sunny Wong, immediately responded in positive terms. At our first digital meeting, it became clear that he had not been informed by his university on the purpose of my stay, i.e. teaching sabbatical. Sunny's involvement in the teaching at LKCMedicine is somewhat limited, but for being senior lead for the Gastroenterology block (approx. 3 weeks). Still, he was very enthusiastic about my visit and did his best to accommodate my stay. We quite quickly settled for the arrangement that I would observe as many different teaching activities as possible related to the two first years of the medical program at LKCMedicine. I chose to cancel the planning trip because of the expected living expenses in Singapore, but also because there was no interest from the host's side. During the whole planning period it was very difficult to get in contact with the assigned administrative staff at the host university.

Visa arrangements

The visa process was very long and cumbersome. The administrative staff at LKCMedicine were not familiar with the process, and several different persons from the LKCMedicine and NTU administration were involved in the process. After first being instructed to fill in all the paperwork for an employment pass, it all had to start over two months later when I was told to apply for a Training Employment Pass (TEP). Finally, in the middle of May, I got an In-Principle Approval (IPA) for a Training Employment Pass (TEP).

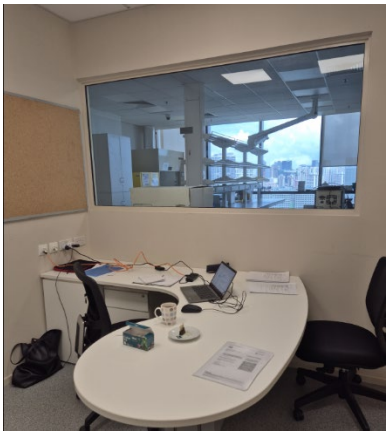
Housing

The housing situation in Singapore is quite problematic. The host university did not offer any faculty housing or help in arranging housing. I ended up with co-housing in a low-rise heritage shop house, renting a room + bath from a company called Figment. It was terribly expensive and not very nice at all. On my arrival I found that my room was infested by cock roaches. I learned the hard way, never to stay on the first floor! During my stay, I moved twice, so in the end I had the experience from living in three separate Figment houses. None of them meet the expectations set by the amount of rent I had to pay.

The heritage shop houses at Petain road are interspersed between high-rise houses, a small park and a shopping centre in Little India.

Arrival in Singapore

When arriving in Singapore in the beginning of August, the first week was spent on administrative matters. Before I was able to officially commence my attachment at LKCMedicine I had to get my Training Employment Pass (TEP) issued. This took around one week as I was required to complete a medical examination and I also had to spend a day with the Immigrations Employment Pass Services Centre to finalize my Training Employment Pass. All costs were to be fully borne by me. After this was accomplished, I got access to my workplace, i.e. Novena Campus at LKCMedicine. I got an office of my own on the 10th floor with spectacular view over Singapore, a stationary computer (with an English keyboard of course-which is difficult to use when you are used to a Swedish version!), and an NTU email account which allowed me to have access to the digital network at NTU and LKC.



The welcome by my academic host, Associate Professor Sunny Wong, Programme Director of Microbiome Medicine and his team, was very warm. I have felt truly included into the faculty and have enjoined the many informal chats as well all the invites to dinners, seminars and scientific discussions.

An office with a view, Novena Campus at LKCMedicine.

2. My position and work responsibilities at the host institution

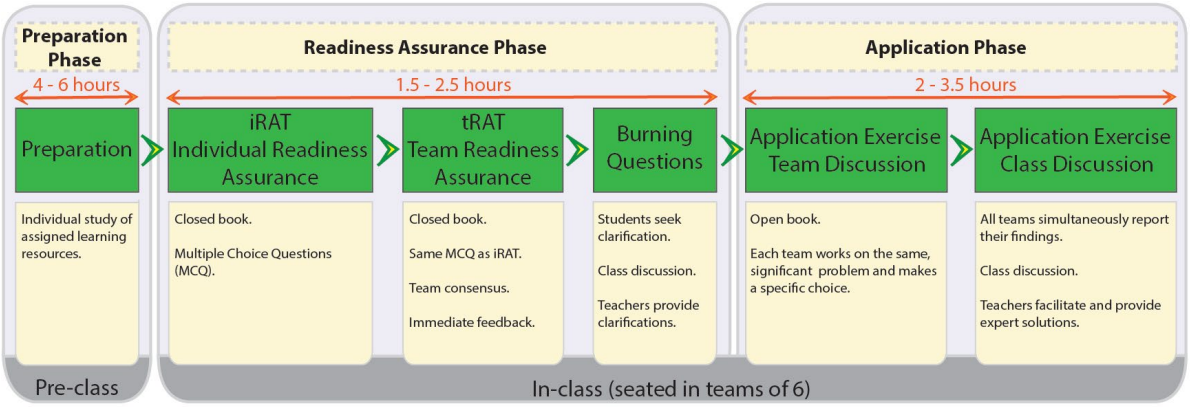
I had no teaching responsibilities at LKC during my sabbatical. The task I gave myself was to attend and observe different teaching activities related to the two first years of the medical program at LKCMedicine. The education for becoming a medical doctor, physician, is four to five years in Singapore. The first two years are primarily focused on preclinical subjects and students have minimal contact with patients. The curriculum of these two years is divided into 20 modules and is taught by a diverse faculty of over 100 members, each module spanning across 3-6 weeks. All lectures are pre-recorded and available for the students on the digital Elentra/LAMS platform. Once or twice a week students meet in full class (184 students) for team-based learning (TBL) sessions where the course material is being discussed. Students also perform course laboratory work and do a scholarly research project under the supervision of an experienced researcher.

Team based learning

At LKCMedicine, team-based learning (TBL) is the cornerstone of the curriculum for the first two years of the medical program. TBL sessions makes up more than 60% of the curriculum in the initial two years. Each class can have up to 184 students, who are organized into teams of six that stay together throughout the academic year. Year 1 and Year 2 students typically engage in 60-80 TBL sessions annually, averaging about two sessions per week. Team-based

learning, created in the 1970s by Professor Larry K. Michaelsen from the University of Oklahoma, involves active, small group-based learning, in large classes. The TBL sessions aim to *"build a strong scientific foundation and connect this knowledge to clinical scenarios and practice".* The three different phases of TBL included a preparation phase, readiness assurance phase and application phase. At LKCMedicine, the preparation phase includes self-studies of study material, including pre-recorded lectures. No live lectures are provided. The readiness assurance phase and application phase are done in the full class sessions, some parts students do individually, others as a team effort. See the overview of the TBL process below.

Overview of the TBL process



Team-centric Learning Spaces

Creating effective team tasks is essential for the success of TBL. For creating an effective application phase, stringent and relevant application exercises need to be developed for each module. The guiding principles in TBL are known as the 4 S's.

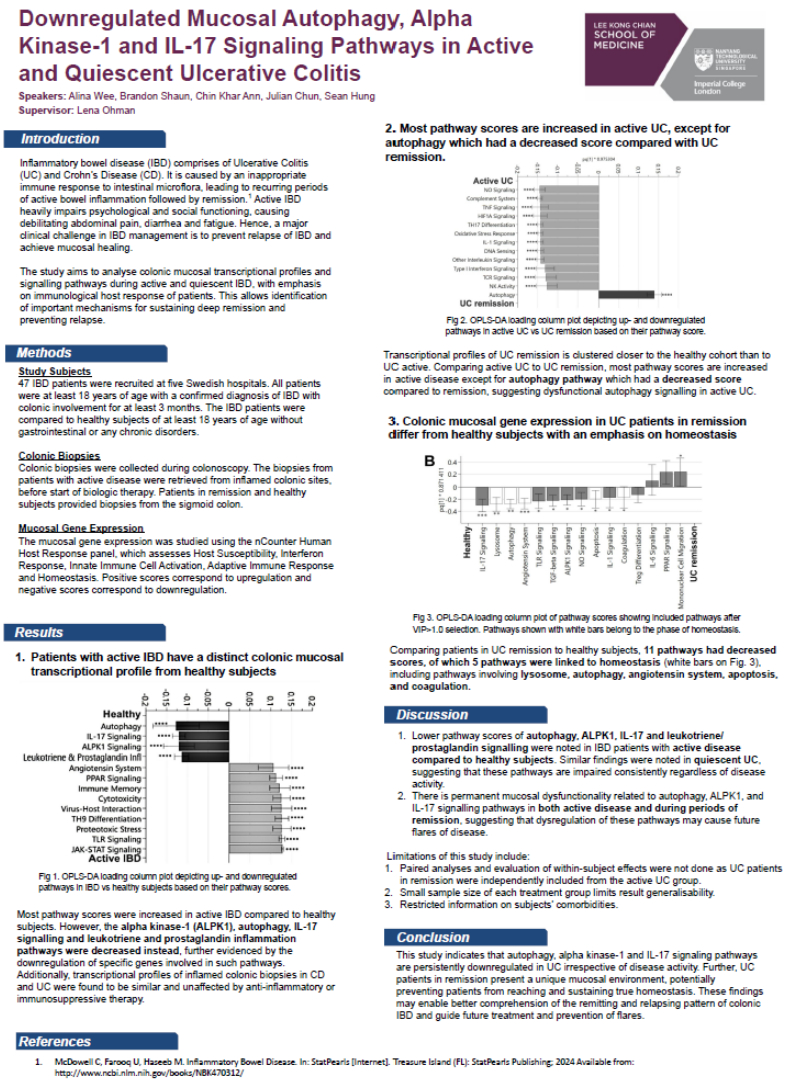
- Significant problem: the problem must be meaningful to the course. The problem should be complex enough not to find the answer in the course preparation material or a google away.
- Same problem: the entire class work on the same problem at the same time.
- Specific choice: requires that teams be able to express their solution to a problem by means of an easy-to-describe choice.

- Simultaneous reporting: requires that responses from all teams are reported to the class at the same time.

The simultaneous reporting stage of the exercise is when each team's decisions or solutions to the problem is shared with the class. All teams reveal their choices simultaneously, ensuring that each team commits to their answer before seeing others. This approach makes the differences in team responses immediately and clearly visible to everyone. The TBL sessions at LKCMedicine were typically scheduled from 10-17, so taking a full day into account. I participated/observed approximately 20 sessions during my stay, with subjects ranging from anatomy, gastroenterology, microbiology, haematology, immunology, infectious diseases and pharmacology.

Student-researcher immersion programme (SRIP)

The SRIP program at LKCMedicine aims to immerse students in the research process, fostering a deeper interest and appreciation for research. Students work in small teams of 4-6, analysing a published article provided by their supervisors. Over eight weeks, students study a research article, engage with their supervisor for deeper understanding, and prepare an e-poster and recorded presentation. As supervisor, I assessed my team's work and met with them twice during the project period. My team worked with a research paper previously conducted by my research group at University of Gothenburg, titled Downregulated Mucosal Autophagy, Alpha Kinase-1 and IL-17 Signaling Pathways in Active and Quiescent Ulcerative Colitis, published in Clin Exp Gastroenterol. 2022 Jul 27:15:129-144.



Downregulated Mucosal Autophagy, Alpha Kinase-1 and IL-17 Signaling Pathways in Active and Quiescent Ulcerative Colitis

Speakers: Alina Wee, Brandon Shaun, Chin Khar Ann, Julian Chun, Sean Hung
Supervisor: Lena Ohman

LEE KONG CHIAN SCHOOL OF MEDICINE
Imperial College London

Introduction

Inflammatory bowel disease (IBD) comprises of Ulcerative Colitis (UC) and Crohn's Disease (CD). It is caused by an inappropriate immune response to intestinal microflora, leading to recurring periods of active bowel inflammation followed by remission.[1] Active IBD heavily impairs psychological and social functioning, causing debilitating abdominal pain, diarrhea and fatigue. Hence, a major clinical challenge in IBD management is to prevent relapse of IBD and achieve mucosal healing.

The study aims to analyse colonic mucosal transcriptional profiles and signalling pathways during active and quiescent IBD, with emphasis on immunological host response of patients. This allows identification of important mechanisms for sustaining deep remission and preventing relapse.

Methods

Study Subjects
47 IBD patients were recruited at five Swedish hospitals. All patients were at least 18 years of age with a confirmed diagnosis of IBD with colonic involvement for at least 3 months. The IBD patients were compared to healthy subjects of at least 18 years of age without gastrointestinal or any chronic disorders.

Colonic Biopsies
Colonic biopsies were collected during colonoscopy. The biopsies from patients with active disease were retrieved from inflamed colonic sites, before start of biologic therapy. Patients in remission and healthy subjects provided biopsies from the sigmoid colon.

Mucosal Gene Expression
The mucosal gene expression was studied using the nCounter Human Host Response panel, which assesses Host Susceptibility, Interferon Response, Innate Immune Cell Activation, Adaptive Immune Response and Homeostasis. Positive scores correspond to upregulation and negative scores correspond to downregulation.

Results

1. Patients with active IBD have a distinct colonic mucosal transcriptional profile from healthy subjects

Fig 1. OPLS-DA loading column plot depicting up- and downregulated pathways in IBD vs healthy subjects based on their pathway scores.

Most pathway scores were increased in active IBD compared to healthy subjects. However, the **alpha kinase-1 (ALPK1), autophagy, IL-17 signalling and leukotriene and prostaglandin inflammation pathways were decreased instead**, further evidenced by the downregulation of specific genes involved in such pathways. Additionally, transcriptional profiles of inflamed colonic biopsies in CD and UC were found to be similar and unaffected by anti-inflammatory or immunosuppressive therapy.

2. Most pathway scores are increased in active UC, except for autophagy which had a decreased score compared with UC remission.

Fig 2. OPLS-DA loading column plot depicting up- and downregulated pathways in active UC vs UC remission based on their pathway score.

Transcriptional profiles of UC remission is clustered closer to the healthy cohort than to UC active. Comparing active UC to UC remission, most pathway scores are increased in active disease except for **autophagy pathway** which had a **decreased score** compared to remission, suggesting dysfunctional autophagy signalling in active UC.

3. Colonic mucosal gene expression in UC patients in remission differ from healthy subjects with an emphasis on homeostasis

Fig 3. OPLS-DA loading column plot of pathway scores showing included pathways after VIP>1.0 selection. Pathways shown with white bars belong to the phase of homeostasis.

Comparing patients in UC remission to healthy subjects, **11 pathways had decreased scores, of which 5 pathways were linked to homeostasis** (white bars on Fig. 3), including pathways involving **lysosome, autophagy, angiotensin system, apoptosis, and coagulation**.

Discussion

1. Lower pathway scores of **autophagy, ALPK1, IL-17 and leukotriene/ prostaglandin signalling** were noted in IBD patients with **active disease compared to healthy subjects**. Similar findings were noted in **quiescent** UC, suggesting that these pathways are impaired consistently regardless of disease activity.
2. There is permanent mucosal dysfunctionality related to autophagy, ALPK1, and IL-17 signalling pathways in **both active disease and during periods of remission**, suggesting that dysregulation of these pathways may cause future flares of disease.

Limitations of this study include:
1. Paired analyses and evaluation of within-subject effects were not done as UC patients in remission were independently included from the active UC group.
2. Small sample size of each treatment group limits result generalisability.
3. Restricted information on subjects' comorbidities.

Conclusion

This study indicates that autophagy, alpha kinase-1 and IL-17 signaling pathways are persistently downregulated in UC irrespective of disease activity. Further, UC patients in remission present a unique mucosal environment, potentially preventing patients from reaching and sustaining true homeostasis. These findings may enable better comprehension of the remitting and relapsing pattern of colonic IBD and guide future treatment and prevention of flares.

References

1. McDowell C, Farooq U, Haseeb M. Inflammatory Bowel Disease. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Available from: http://www.ncbi.nlm.nih.gov/books/NBK470312/

The poster presented by my SRIP team.

TBL Workshop Series

I participated in the TBL workshop series, organised by LKCMedicine.

- *Module 1*: Active learning and deep learning for good and effective learning in higher education as a method for students to approach their learning and engage with the content.
- *Module 2:* Good team application exercises should promote students' mastery of basic conceptual material and enhancing higher-level thinking and problem-solving skills.

Pedagogical webinars and seminars by Centre for Teaching, Learning and Pedagogy (CTLP)

I participated in pedagogical webinars and seminars organised by Centre for Teaching, Learning and Pedagogy (CTLP) at NTU.

- Theory after Practice: reflections on team-teaching in a team-based learning and collaborative space. (webinar)
- Teaching with Material Objects: the pedagogic value of teaching with material objects in the classroom. (webinar)
- Three half day sessions seminars included focused on designing learning activities, facilitating learning activities and participating teachers sharing their work on their teaching portfolios.

Meeting with the Medical Education team

During my first weeks I was invited to the Medical Education team at LKCMedicine who gave me a brief introduction to the pedagogic ambition of the school. There was no follow up, contact or feed-back from this team during my stay. This was rather surprising, as my stay was intended to focus on teaching and pedagogy. Apart from the first meeting, none from the Medical Education team reached out during my stay unless I contacted them, and I wonder if they at all had been informed or involved in the decision on accepting a teaching sabbatical scholar.

Curriculum Evaluation Group Year 2 Gastrointestinal System (GI) module and Year 1 'Foundations of Medicine' Module: I took the initiative to be invited to take part in two different evaluation meetings with teachers, facilitators and pedagogy theme leaders at LKC to discuss student feed-back on the different teaching modules. Some very brief discussion on teaching content and material, as well as IRAT and applied exercise questions. The widespread student feed-back that they would prefer to have more intense and shorter TBL sessions were dismissed, with the reasoning that it would couse difficulties in scheduling clinicians in the mornings. Nobody considered the idea to fit in shorter TBL sessions during afternoons.

Examination meeting: I initiated a one-on-one meeting with a teacher responsible for the yearly examination. The teacher is leading the work with the construction good multiple-choice questions for final exam year 1 and year 2.

Research at LKCMedicine

The primary focus of the faculty at LKCMedicine is to perform excellent science, and they do! Scientific ranking and impact are a very important with the main task to register publications, citation and received grants. There are numerous governmental grant calls, and the financing of research is very strong. In a rough compassion, any given project grant renders 10 times more money than a similar grant in the Swedish system.

I have been invited to meetings with > 10 different faculty members research teams at LKCMedicine to be introduced to their research, present my research and to discuss common interests and potential collaborations. I have also given research seminars, both at LKCMedicine and NUS, the National University of Singapore.

The research community at LKCMedicine is very vivid, with lots of invited national and international speakers, with the Excel Seminars as the most prominent. During my stay I have been invited to join all kind of scientific seminars, and also asked to attend several faculty dinners with guest speakers.

One of many informal meetings with Associate Professor Sunny Wong, my academic contact, and faculty members.

4. Comparison between the host and the home

The relationship and/or status of pedagogical merits compared to research merits

The staff at LKCMedicine is organised into three categories: Scientific Faculty (researchers), Science Practicals or Medical Education. The scientific faculty staff run their own research teams, which they finance by applying for research grants. They all have good to very good scientific merits, but less merits and/or interest in pedagogics, or at least these merits seem to be considered of less importance. The medical education staff are responsible for pedagogy, updates on teaching digital platform and study material. This staff have good to very good merits in pedagogics, some also have good scientific merits, usually acquired some years back. The Science Practicals staff prepare all material and do the tutoring of students' lab work, the scientific merits of this staff was unclear to me.

Pedagogy and how teaching is conducted

Both my home institute at University of Gothenburg (GU) and LKCMedicine uses student activating pedagogy, including peer-learning. The main difference it that LKC Medicine only provides pre-recorded lectures during the first two years of education. At GU, students attend the lectures at campus daily. Pre-recoded lectures may become outdated, due to lack of

responsible/knowledgeable staff for updating the material. There is also risk for overlap or gap between lectures if only minor updates are done in a specific recording. At LKCMedicine all seminars are in the TBL format, whereas at GU, seminars are organised as TBL seminars or small group seminars. At the small group seminars, 10-12 students discuss problems related to the course material. The problems to be discussed are handed out to the students before the seminar, to allow students to prepare on their own or together with others. The TBL sessions differ between LKCMedicine and GU. At LKCMedicine, educational officers taking on the task as facilitators of the TBL sessions. The facilitators/educational officers primarily handled the administration and the technical aspects of the TBL session, rather than the actual pedagogics. The TBL sessions at LKCMedicine are long, scheduled for a full day. At GU we schedule for 4-hour long TBL sessions, thus GU seminars are more condensed and the number of IRAT questions much fewer (15 as compared to 30-35). Also, the applied exercises are fewer at GU. My impression is that the questions used at a TBL session at GU are fewer, but still cover the main aspects of the study material, whereas the questions at LKCMedicine may sometimes address also less important aspects, with the intention to cover "everything" in the study material.

Teaching	***GU***	***LKCMedicine***
Lectures	*Classroom lectures*	*Only pre-recorded*
Seminars	*TBL and small group*	*Only TBL*
Facilitators	*Faculty*	*Educational officers*

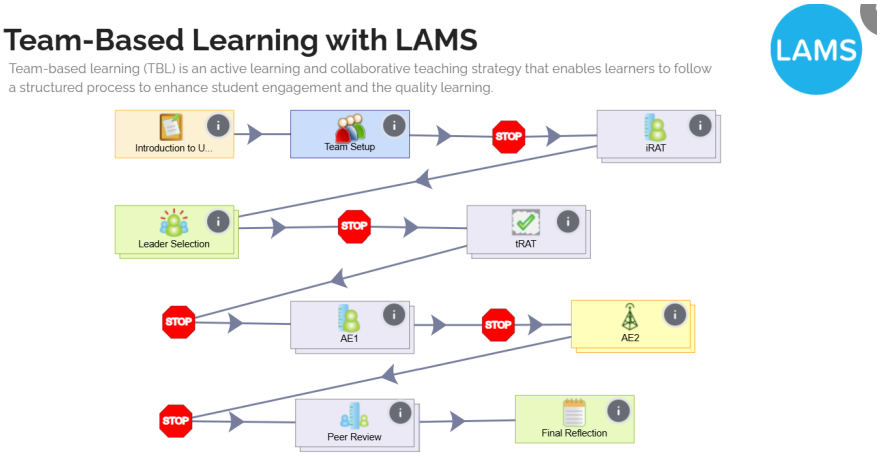
I found that at certain modules many of the IRAT multiple choice questions were not written in the correct format; only one correct alternative and the other alternatives should be wrong. Many IRAT questions were presented the other way around (one wrong alternative, the other correct), making it confusing for the students. I also found that many of the applied exercises were quite easy for the teams to answer. Hence, they were not given a significant problem. The problem should be complex enough not to find the answer in the course preparation material or a google away. Furthermore, the applied exercise questions need to have the correct TBL format, so that the teams answer can be reported similarly. Another important difference between LKCMedicine and GU, and maybe the most important one for the outcome of student performance, is the number of students in the classroom during the TBL sessions. At LKCMedicine, all students, i.e. >180 students participated in the same session, rendering approximately 30 teams working in parallel. At GU, we divide the class into tree parallel session, with approximately 40-50 students in the class.

Use of technology/IT in education

The digital platform at LKCMedicine is very good and advanced. The LAMS-platform for the TBL session is extremely helpful, where the teachers can follow the students as well as the teams' performances in real time. At GU, only the IRAT (individual multiple-choice questions) are done digitally using the CANVAS learning platform, the rest of the TBL sessions are done old school,

using scratch cards for immediate feedback on teams' performance on the IRAT, and flash card when reporting answers to the applied exercises in full class.

The digital LAMS-platform for the TBL session at LKCMedicine



Forms of examination

At LKCMedicine, only multiple-choice questions (only one correct alternative whereas the other alternatives should be wrong) are used for the examinations. At GU a combination of self-correcting questions, mostly multiple-choice questions but also other formats, as well as essay questions are used for examination.

Extent of educational programme to labour market needs

LKCMedicine trains doctors offers both undergraduate and graduate programmes. The school´s primary clinical partner is the National Healthcare Group, a leader in Singaporean public healthcare. There is a great need for medical doctors in Singapore, as the population becomes older and thereby in more need of health care.

What knowledge of importance for your role as teacher/researcher have you gained during your time as a STINT-fellow?

I have learned that quality of TBL sessions is very much affected by class size. The larger the size, the more quality becomes dependant on having a very good and distinct study material. The TBL sessions were not favoured by extending the time allocated. The long sessions, stretching over a full day, became less focused, and it was hard for the students to keep concentrated. I do not encourage the routine of having educational officers taking on the task as facilitators of the TBL sessions. The facilitators/educational officers primarily handled the administration and the technical aspects of the TBL session, rather than the actual pedagogics. Due to the large class size, it was very hard (read almost impossible) to have a discussions of the study material in full class. This is in my mind a major drawback. Several of the faculty members attending as content experts did not seem familiar with the study material (the pre-recorded lectures), TBL session material (IRAT and applied exercise questions) or the overall pedagogical model of TBL. Furthermore, the lack of knowledge of the curriculum rendered

many of the faculty members to give mini-lectures on topics related to their expertise. Often the topics were outside of the current curriculum, and more appropriate for year 3 and 4 students.

Lessons learned:

- Limit class size, to allow for discussions and a good work climate (limiting noise, increasing focus)
- Pre-recoded lectures quickly become outdated, due to lack of responsible/knowledgeable staff for updating the material.
- Study material, IRAT and applied exercise questions, for TBL sessions need be constantly assessed and updated to be relevant and stringent.
- IRAT and applied exercise questions need to have the correct TBL format.
- Facilitators benefit from having content expertise, without expertise they risk becoming somewhat of a lame duck, both in the eyes of the students as well as content experts.

5. Important lessons and recommendations

The sabbatical at LKCMedicine in Singapore was a very interesting experience for me, and the knowledge from observing the teaching at LKCMedicine will have an impact on how we run our TBL sessions at the medical program at GU: keep running parallel sessions with the intention to limit number of students in the classroom, continue with classroom lectures, and stress the importance of continuous updates of study material to maintain the relevance for the curriculum. A digital platform supporting the TBL sessions is helpful for teachers but not needed for good learning outcomes.

There were no clear goals regarding my visit from LKCMedicine, and very little initiative related to pedagogical aspects/education was taken from the host institution. In contrast, the ambition related to research interactions was very high, due to the personal engagement from Associate Professor Sunny Wong who was assigned as my academic contact. I am very grateful for the commitment of Sunny Wong; without him my sabbatical would have much less interactive and interesting! A most important lesson is that the successful sabbatical is *extremely* dependent on the personal engagement of the host institute staff, and that is something that you as visiting fellow have no power over, so you are left with hoping for the best. I wish for and suggest that STINT representatives would intensify the interactions and better prepare the host institute about the aim of the sabbatical. This would indeed be very helpful for future STINT fellows.