

Teaching sabbatical – final report

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Redefining Medicine, Transforming Healthcare

Preparation and planning

I got to know that I had got a slot in the teaching sabbatical program just before Christmas 2014, at the Lee Kong Chian School of Medicine (LKCMed) at Nanyang Technological University (NTU) in Singapore. After Christmas, I contacted both NTU to arrange for a planning trip in April, and a previous STINT fellow at LKCMed, Gunnar Nilsson from Karolinska Institutet, who had just returned to Sweden after his teaching sabbatical in Singapore. I was able to meet with Gunnar in January 2015, and got a lot of useful information about both the teaching at LKCMed and life in Singapore in general. I also got very professional and friendly help from the HR office at LKCMed during the planning for the first trip to Singapore.

My family (husband and 13-year old daughter) accompanied me to Singapore during the planning trip. We first met with Professor Er Meng Wha, vice-president for international affairs, who introduced us to NTU in general. We were also able to get a preview of the staff housing apartments that were available, and decided to opt for one of those for our stay. I then went on to meet Associate Professor Naomi Low-Ber, vice dean for education and LKCMed, and Professor Lionel Lee, executive vice dean. They were both interested to know about my previous teaching experiences, and also made it quite clear that they did not have any detailed expectations about what I should do, but rather invited me to think about different ways that I could contribute while still developing my own skills. I also got to meet briefly with Claire Cunning, the lead for the 20 week course “introduction to medical sciences” and also lead for written examinations. I didn’t know at that time, but Claire and I came to work closely together during my time at LKCMed. The next day, I had a very useful meeting with the LKCMed HR department, that helped me prepare my application for an employment pass, and also gave advice on different documents from Sweden that I would need once in Singapore. Finally, I spent a full day observing the team-based learning (TBL) pedagogy employed at LKCMed. I will explain the principles of TBL below, as this is an important part of the teaching at LKCMed. The session was followed by a long discussion with Dr Preman Prajalingam, head of educational development and TBL facilitation, about the principles of TBL. Preman had also been sending me some prep material that I had studied before class.

Altogether, we spent 10 days in Singapore, to be able to also investigate different schooling alternatives for our daughter, and for my husband to meet with potential employers. The trip was well planned from the point of me meeting with senior management, but it would have been useful to also meet with the people more directly involved in teaching, to get a better idea of the actual teaching and other activities that were available, and different ways that I might contribute.

Tasks and responsibilities

As I already indicated, I have been relatively free to choose the form of my work responsibilities, attend courses and seminars, and discuss with other teachers and staff at the school. LKCMed is the third medical school in Singapore, following after the

National University of Singapore (NUS) and Duke's Medical School (also connected to NUS), and admitted the first student cohort as late as August 2013. The establishment of a third medical school was initiated by the government and based on the need for more clinical doctors in the Singapore health care system. To establish the medical school, NTU has teamed up with Imperial College in London, and the two universities are equally sharing the responsibility for the education given. Most of the teaching material has been generated at Imperial, but the teaching itself is carried out by NTU faculty and clinical doctors at the Tan Tock Seng hospital. Here, I need to first introduce the TBL approach that is consistently adopted by LKCMed, in order to properly describe my tasks during the autumn term.

TBL is a student-activating pedagogy, based on the principles of the flipped class-room. Generally, this means that students study before they come to class, and the time they spend with the teacher is used to clarify complicated issues or apply the knowledge that they have acquired on their own. This way, less time is spent lecturing about simple topics or principles that the student can understand on their own, and more time is devoted to discussions and application of the knowledge. The TBL method is based on peer learning to a large extent. In a typical TBL session, students are given study material, at LKCMed usually in the form of voice-over power-point slide shows, which should be studied before the class assembles. The TBL session starts with an individual readiness assurance test (iRAT), to check that everyone has a basic understanding of the subject. This usually comprises 20-30 multiple choice questions answered in about 20 minutes. Then the class assembles in pre-formed groups of 5-7 students, and answers the same questions together. This is called the team readiness assurance test (tRAT). In the tRAT, students learn from each other, and usually the weakest group outperforms the strongest individual. When the groups answer the questions, they get immediate feedback about the right answer, to avoid any misconceptions to be strongly rooted within the group. At LKCMed, every student is equipped with an iPad and all tests and study material is provided on-line. This could however be achieved with scratch-cards as well, or other less technical solutions. If there are any questions where the students don't agree with the right answer given, they can appeal and argue for their own alternative answer to be correct. If successful, the appeal will result in points being awarded also for the alternative answer. After the group test and appeals, any remaining questions a group may have about the subject are asked as "burning questions" to the whole class, and can be clarified by other groups, or by "content experts", researchers or clinicians with knowledge of the subject.

After this "readiness assurance process", the groups get to work with application exercises, where they apply the content they have learned. In the medical school, this is often in the form of patient cases where groups should suggest diagnosis or treatment. The students discuss first within their groups, then between different groups, and only after that will the content experts be called in if there are remaining issues to be clarified. The whole process is led by a facilitator, a teacher that doesn't have to have particular subject knowledge. Instead, the facilitator is in charge of the process in the

classroom, and will lead the discussions, summarize burning questions, and invite content experts to clarify when needed.

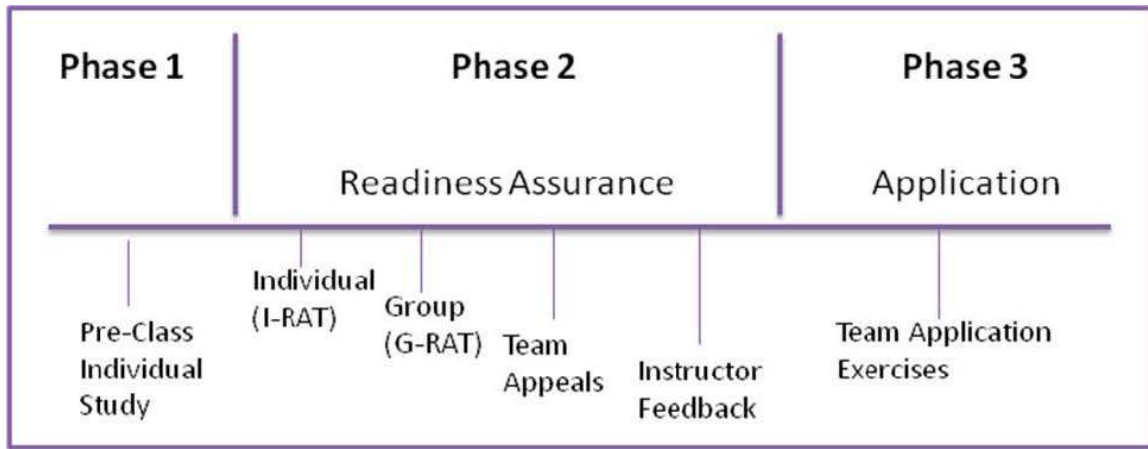


Fig. 1. Brief outline of the workflow during a TBL cycle

My main responsibilities have been to act as content expert during TBL sessions within my field of research and teaching, to revise the teaching material used for studies pre-class, and to revise the iRA and application exercise questions used. In addition, I have contributed to building a bank of exam questions that can be used in the coming years. Within the teacher community at LKCMed, there has not been anyone with my subject background (immunology and microbiology) before, and the revision of the immunology material received from London was much needed.



Fig. 2. Students discussing during an application exercise.

Activities during the semester

My main activities can be divided into actual teaching (in class with students), revision of teaching material, creation of new teaching material, pedagogic education, and education within my subject area.

Teaching activities

I have served as a content expert in TBL sessions on basic immunology, immunity to infections, medical microbiology, and intestinal infections and inflammation. In addition, I have participated in wet labs helping students with general tasks like adjusting microscopes and counting cells.

Revision of teaching material

One of my first tasks, before any actual teaching started, was to revise the all the iRAT/tRAT questions for the immunology block given to year 1 students. This comprised approximately 90 questions, and I did the revision independently with feedback from researchers and clinicians within the field. After these TBL sessions, I have also revised the questions used in the microbiology/immunity to infections block that is taught to year 1 students in January, and written new questions when needed.

Creation of new teaching material

Students from previous years had given negative feedback about some of the lectures in the microbiology/immunity to infections in previous years, and based on this I created two new lectures, on “Immunity to infections and microbial immune evasion” and “Vaccines”. These were later filmed and were used as preparation material for the course in January (and coming years). In relation to this, I also participated in making a lecture on “parasitology” together with a clinician from the infectious diseases department.

I have also been active constructing exam questions in the “single best answer” format for both a formative exam in December and the final exam for year 1 in May. In addition, I constructed a bank of questions for my subjects that can be used in the coming years. Single best answer is a type of multiple choice questions, based on a clinical or scientific vignette leading to a question that is not only a factual recall question, but that make the students apply knowledge gained during the course to solve a problem and find the answer that best fits with the preferred solution. Conceiving and writing such a question may take up to several hours.

Pedagogic education

NTU and LKCMed offer a broad choice of pedagogic education and seminars. Most concern different forms of student-activating teaching and techniques for e-learning, which is a preferred strategy at NTU, and I have participated in several of these. I first started an internal course, “LKCMedicine Team-based Learning series” which is mainly aimed at preparing teachers and clinicians for serving as content experts and writing application exercises. It involves three interactive sessions followed by

observation of two different TBL sessions in the school. I also participated in a shorter LKCMed course on writing single best answer questions.

In parallel, I took a more ambitious NTU course called “Implementing Team-Based Learning” given as 5 half-day sessions. This course targets course leaders that want to convert their current course into a TBL format, and the participants represented several different faculties at NTU. The course was given in a very student-activating and hands on manner, and content included formation of effective teams, the application exercise process, and transformation of a course to TBL format.

To further increase my exposure to the TBL pedagogy, I contacted Prof Sandy Cook at Duke’s-NUS, who is very experienced in using TBL, and was specifically recruited to head pedagogic development and research at Duke’s-NUS when they started their medical school in 2005. She was kind enough to spend time with me to discuss both the education at Duke’s-NUS and potential pit-falls when adopting TBL strategies. Previously, I had also heard her give a seminar at LKCMed on the scholarship of teaching, i.e. the way one can use scientific methods to evaluate the different approaches to teaching used.

I also participated in a yearly two-day seminar called Innovations in teaching at NTU, with both internal NTU speakers and invited external speakers. The main theme was innovative technical solutions that can be used for peer learning, with several hands-on sessions for participants to actually try different tools.

During my time in Singapore, the first NTU Nobel prize series seminar was also held. The title was “The future of learning”, and the invited speakers featured 5 Nobel prize laureates that discussed different aspects of university learning with local Singaporean researchers and decision makers during three different sessions.

In addition to these more or less formal courses and symposia, I have also had an opportunity to discuss various aspects of TBL, student assessment and course evaluation with staff at LKCMed in more informal settings. My main contacts have been Dr Preman Prajalngam, head of educational development and TBL facilitation, Dr Claire Canning, lead for the course “Introduction to medical sciences” and head of written assessments, professor Mike Ferenczi, assistant dean and head of the pre-clinical year 1 and 2 of the medical education, and Dr Sandra Kemp, assistant dean for course evaluations.

Education in immunology and microbiology

During my time in Singapore, I have also had the opportunity to improve my knowledge of immunology, microbiology and immunity to infectious diseases. There have been several possibilities to join seminars by invited speakers from all over the world both at NTU, NUS, and A-star, a large life science research institute financed by the Singaporean government. I have also participated in two symposia; Respiratory Pathogens at NTU and Infection and Immunity at NUS. One very interesting aspects of these seminars and symposia has been the possibility to learn more about tropical diseases like malaria and dengue fever, which are serious health concerns in this part of the world.

Initiation of contacts between Sweden and Singapore

During my time in Singapore, I have also mediated contacts between Preman Prajalingam and his team and two Swedish university teachers that have an active interest in the TBL pedagogy. Docent Lena Svensson from Lund University and Docent Sukanya Raghavan from Goteborg University have both been invited to Singapore on my initiative. They have observed TBL sessions and had discussions with Preman and other teachers at LKCMed. This will hopefully form the foundations for a continued effort to introduce the TBL pedagogy in Swedish immunology teaching.

Additional tasks

During the semester, I have also represented LKCMed as faculty at a number of functions, such as the white coat ceremony when new students are welcomed and the dinner celebrating the 5 year anniversary of the school. I have also contributed to the evaluation of a potential new staff member, and represented the school at an official visit by the vice-chancellor of Umeå University.

Important lessons

Peer learning

The most important lesson from my work at LKCMed is the power of peer learning. My previous focus has very much been on the relationship between the teacher and the student, and the way the teacher can encourage and help the student to grasp the subject and adopt a deep learning style. Here, I have realised that there is a lot that students can learn on their own and with the help of their peers. There are several aspects of peer learning that promote student performance. These include the advantage of getting explanations from someone at the same level of knowledge as yourself, in a language without jargon. The discussion about different possibilities also promotes a constructive learning process where students build their own understanding of a concept or theory. In addition, explaining something to someone else is a very good way of knowing if you have grasped a concept well enough. If you realize that you cannot really explain to a peer, then you also know you need to study more to really understand the issue in question. It is important that students receive immediate feedback during these discussions, so that they don't reinforce incorrect ideas or ways of reasoning. This could be provided electronically or by a more low-tech scratch card, for example. It is also important that students get a possibility to discuss with the teachers if they encounter difficulties with the material or their assignments. Another aspect that shouldn't be overlooked is the social part of peer-learning. During TBL sessions, students actually have fun while learning, with a lot of laughs during discussions. This doesn't happen every day, of course, but compared to a traditional lecture or group discussion, peer learning should be a more enjoyable experience for most students. And if going to class is pleasant and homely, this will increase student attendance and willingness to prepare before class.

Advantages and disadvantages with a centralized course management

During my time at LKCMed, I have also seen some advantages and disadvantages of a central pedagogic strategy and strong centralized leadership. At the Sahlgrenska Academy, where I teach in Sweden, the course leader or course leadership group are more or less autonomous and decide for themselves about the content of the course and the pedagogy used. At LKCMed, on the other hand, the only used pedagogy is the TBL approach, and the learning outcomes and content was all originally assembled at Imperial College in London. This material was based on their existing curriculum, but modified and tailored for use in LKCMed before the start of the first batch of students. All the preclinical material for flipped classroom preparatory work was put together in London by Imperial course leads, and all iRA questions were originally written in London, while the application exercises were written by LKC content experts.

One advantage is obviously that the same pedagogic principles are guiding the teaching in all the different courses, and students don't need to spend energy to decipher the pedagogic intentions of the course leadership at the start of every new course. However, if these principles do not fit a particular student, the lack of change in the pedagogic take between courses, may adversely affect that student's performance. The same really applies to the teachers, once they have learned the principles of TBL, as in this case, they can participate in any part of the education.

However, one disadvantage I experienced at LKCMed is that block leads, or individual teachers, can't easily introduce new items in the curriculum, correct faults in the teaching material, or replace outdated material. Any major changes to the content or any change to learning outcomes has to be decided by a teaching committee comprising the course leads, management, and the head of pre-clinical or clinical education, and then sent to Imperial College for approval. After two years of running any course, LKCMed then have full rights and responsibility for changes, but they must still be approved by the teaching committee. Minor changes in the content can be made independently by block leads, but as all material is provided as movies or voice-over power-point files, such changes usually involves recording a new movie or voice-over. Thus, the resistance to changes obviously becomes quite strong, and will act to conserve old and sub-optimal teaching material.

Comparison between the foreign and the home institutions

Student population

The student population at LKCMed is more homogenous compared to the Sahlgrenska academy, especially with regard to age. Most students are 19-21 years old when they start, usually directly after high school or after the two year military service compulsory for males. As the education is quite costly, tuition fees amount to S\$ 30 000 per year (approximately 180 000 SEK), most Singaporean students come from relatively well off families. Only two slots out of 90 are reserved for unusually bright and promising students, who will receive a stipend to cover the tuition fees. Swedish medical students,

on the other hand, tend to be of more varied ages, and more students have work experience, and even though students from academic homes are overrepresented, I would think that the socioeconomic background is more varied in Sweden.

The relation between research and education

The relationship between research and education is quite similar between LKCMed and the Sahlgrenska Academy. Both institutions strive to achieve excellence in both teaching and research, but in both cases recruitment and promotion are more dependent on research achievements than excellence in teaching. At LKCMed, a few teachers are organising the courses and running most of the teaching, with the large majority of the academic staff doing only one or a few days of teaching in an academic year, and spend the rest of their time with research. At the Sahlgrenska Academy, most faculty do more teaching, and course leadership and administrative duties are more divided within the teacher collective.

The relation between teacher and student

In general, the relationship between students and teachers is much closer at LKCMed than the Sahlgrenska Academy. This is probably partly caused by the low number of students, currently 90 per year compared to 270 at Sahlgrenska, and the pioneer spirit among both students and staff that may make them bond a little extra. Another important reason to this is that the same teachers follow the students during their first two years, through the different courses, and get to know them. In Gothenburg, a course is usually not longer than a semester, and then the students are handed over to the next course. Another reason for the close relationship is that the students at LKCMed all belong to one of five “houses”, like in a British university. These are only virtual houses, but every house also has about 5-6 house tutors from the academic staff that will help mentoring the students to handle their studies.

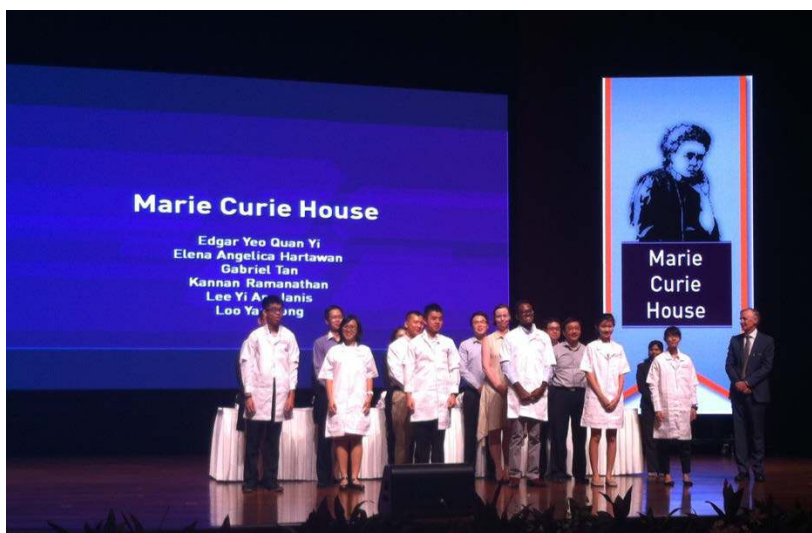


Fig. 3. New students receiving their symbolic white coats from the Dean and their house tutors during the white coat ceremony.

There is also a system in place for early detection of students struggling with their studies for one reason or another, and to help them handle these problems. This is really needed, as there is only one exam per year, and if you fail both the exam and the retake, you have to repeat the whole year once again. If you fail your second yearly exam, then you're expelled. With a system like this, it is vital to detect the students with problems before they fail the exam at the end of the year.

Competence development for teachers

There are ample opportunities for pedagogic development at both NTU and University of Gothenburg. There is a difference in that the pedagogic courses at NTU are didactic, hands-on, and also focus quite a lot on technical solutions, on-line tools, while the ones in Göteborg are somewhat more theoretical. This is of course a bit of an oversimplification, but a clear tendency. Another difference is that the leadership at NTU more actively encourages the academic staff to participate in pedagogy courses, even when they have achieved the minimum required to be allowed to teach. At the Sahlgrenska Academy, it is perfectly OK to participate in courses, but it's more up to the individual teacher to decide if there is time and a need. The courses offered at NTU centrally and at LKCMed are also more frequent and diverse than those in Göteborg.

Teacher recruitment

Common for both institutions, there are seldom recruitments with the explicit purpose of teaching. This may be different to many other faculties, but I think quite common in medical education. Usually the academic staff is recruited mainly based on scientific achievements, and then the faculty available have to teach as well as they can. At LKCMed, there are a few positions as "senior lecturer" with a large teaching commitment. These are generally recruited internally, as far as I understand, and the research performed by the senior lecturers is mainly devoted to medical education research.

Pedagogy and its importance, and the status of pedagogical merits

As is hopefully evident from the rest of this text, pedagogy is very important at LKCMed, as the whole education is based on the TBL pedagogy. This is an active choice to promote student-activating learning patterns and the ability to find and apply new knowledge. But if I should be honest, I also think it's a way to explicitly show that the LKCMed education is modern and progressive in every way. The TBL pedagogy used is modelled after the Duke's-NUS medical education that has been very successful and renowned, since it started ten years ago. At the Sahlgrenska Academy, the situation is obviously different, as there is no central decision on which pedagogy that should be used, but every course leader can decide him or her-self. This creates a large variation, and probably also some conservatism. There is some money available for course development, but most prospective development work is probably hindered by a lack of time by the teacher. Also, most developmental work is the result of individual ideas and achievements by interested teachers, not from guidelines or initiatives from the senior management.

I also have the impression that NTU use learning outcomes more actively than most Swedish institutions. In Sweden, we sometimes write learning outcomes just because we have to. At NTU, the learning outcomes are an important part of the learning process, and focus is much more on what the student should actually be able to do at the end of the course than what they have learned or “understood”. This is also examined to a larger extent, mainly during courses, while the end exam is usually more traditional. However, the students’ performance during the course and in these in-course assessments is more important for their final grade than what is usually the case at the Sahlgrenska Academy.

There is also a strong emphasis on course evaluation at LKCMed. After each TBL session, a number of students complete an on-line form to evaluate the material used, the teachers’ performance, and the facilitator. This feed-back is then used to improve the teaching material and teacher’s instructions for next year, and the specific feed-back on individual teachers is used for promotion talks and salary revisions. This may seem more progressive than it is, most teachers receive excellent reviews from all the students so the feedback can not really be used to identify excellent teachers.

Another important difference between the institutions is that LKCMed has a department for research in medical education. The course evaluation forms are often used to ask other questions as well, to provide a quick and easy access to student’s views of different topics. The pedagogy research at LKCMed is mainly focused on the use of TBL in medical education, and the majority of studies are quantitative. They also encourage the rest of the teaching staff to perform scholarly projects or simpler evaluations of their teaching methods.

As is probably clear from what I have already written, pedagogical merits are good at both institutions, but in both places, scientific merits are more highly rated, and pedagogic merits will seldom help you land a permanent position.

Forms of examination

Examinations differ quite a lot between the two institutions. Both require active student participation in compulsory course items, like TBL sessions, wet labs and ward duty. There is also a formative component in both schools. At LKCMed this is mainly achieved by the iRAT component of the TBL sessions, the students have to have a certain percentage right answers to pass, and the lab reports. At the Sahlgrenska Academy it can be lab reports, smaller examinations (duggor), case reports or group discussions, differing from one course to another. The lay-out of the final exam at the end of each course is also up to the course leadership to decide. They can be essay questions, oral exams, practical tasks etc., or a combination of different types. At LKCMed, there is a final exam at the end of each academic year, comprising several hundred multiple choice questions. This is not as “bad” as it may seem from a Swedish perspective, where we usually apply multiple choice questions to check simple, factual knowledge. The approach at LKCMed is to use a “single best answer” model to write multiple choice questions. These questions should require the students to apply the factual knowledge they already have on new topics that they are not familiar with, and then chose the best of five available answers. Two examples of such questions can be found in appendix A.

Many different teachers are involved in creating questions for the final exams, as they cover a whole year of teaching. One teacher is responsible for co-ordinating all these contributions, and make sure the end result is balanced and reflects the different courses taught. There are also courses available to teach content experts to write “single best answer” questions. The final suggestion for the exam is then reviewed and revised by a local committee, and by a committee at Imperial, London. These committees will also assign the percentage of right answers needed to pass the exam, from a formula that takes into account the difficulty and importance of each of the questions. The results are monitored closely, both for the whole group of students to evaluate the exam as such, and for individual students, again to identify those with potential problems.

If a student fails this final exam, he/she has a new chance two weeks later, but if they fail again they have to do the whole year again (and pay new tuition fees). This is obviously quite different to the Swedish system. At the Sahlgrenska Academy, there are a few thresholds, where you can't commence the education if you have not passed all the preceding courses, but the time it takes to achieve this is not at all as tightly regulated.

Use of technology and special investments in education at the institution

Technology is an integrated part of the education at LKCMed. Every student is equipped with his/her own iPad, and all TBL questions are made available and answered on the iPad. In the wet labs, microscope cameras and other equipment can be connected to the iPads for instant recording of results, and the course evaluations are also performed on the iPad. There are large investments in the software, and also a large IT department, to ensure smooth operation of the systems. There have also been several large rooms specifically built to harbour the TBL sessions, and they are also equipped with advanced audio-visual technology.

There are some headings that I have not really covered, as they don't really apply to the education of medical doctors. The courses offered are centrally decided and very similar between the institutions, and the programs aim to educate approximately as many doctors as the market requires. Distance education is not used in any of the schools, and many of the practical skills required as a doctor would be impossible to learn off campus.

Action plan

My immediate plan is to stay 3 more months at LKCMed, February to April. I have been offered a position as consultant and will use the time to train as a facilitator and perform a more thorough curriculum review of the microbiology-immunology teaching. In addition, I will propose a method for evaluation of lab-based projects performed during year 4 and record some lectures that will be used as preparatory material for the TBL sessions.

After the summer, I will return to Sweden and resume my position at Göteborg University. I have recently been appointed course leader for a 13 week course in “infection, microbiology, and immunology” given during semester 5 for the medical students, and will be responsible for that course already during the autumn semester 2016. As course-leader, I will introduce more course items based on peer learning, such as the peer-wise software enabling students to write their own question, as well as answering and commenting on other student’s questions. I will also investigate the possibilities to use recorded lectures for some of the course material, and to move some of the existing small group teaching towards the TBL format. One thing that needs to be solved before we do that is the IT solutions that will enable immediate feed-back to students during the tRAT exercises.

I have already been asked to give a seminar to the teachers at the Sahlgrenska Academy, to describe my experience of TBL, and the medical education as such in Singapore, and I will of course be available to discuss these issues with anyone who is interested. In addition, Göteborg University is starting to establish a forum for previous STINT fellows, and I will be an active participant in their activities. The focus of that group is not yet established, as the first meeting was held just before I left for Singapore.

Nationally, there is a slowly growing interest in the TBL pedagogy, not least among immunologists. Already before I left for Singapore, I had invited 3 teachers from Lund University to come and discuss TBL with the teachers at our department. In Lund, they had already started planning for using TBL in master level courses at the Natural Sciences faculty, and as we are also giving such courses, we started discussions on common goals and strategies to cooperate for the future. One of the teachers from Lund actually came to visit in Singapore, and we will now continue our common efforts to establish TBL pedagogy first in first and second cycle courses in immunology, and later on maybe also to students on the medical program.



Appendix A

Bacterium X has three different ways to avoid killing by the immune system:

- A. A ubiquitous surface structure that is very similar to a cell glycan
- B. Production of catalase and superoxide dismutase
- C. Possibility to express several different outer polysaccharides on its LPS

Which of these would be useful to avoid antibody-mediated immune protection?

- A. A
- B. A and B
- C. A and C**
- D. B
- E. B and C

Vibrio cholerae-induced diarrhoea can be prevented by inducing neutralizing antibodies to the cholera toxin and bacterial adhesion molecules. Adaptive immune responses to particulate antigens in the gut lumen, such as *V. cholerae*, are initiated in the Peyer's patches and mesenteric lymph nodes. Which is the order that different cell types are involved in this process?

- Dendritic cell, CD4+ T cell, IgA-producing plasma cell, M cell
- Dendritic cell, M cell, IgA-producing plasma cell, CD4+ T cell
- Dendritic cell, M cell, CD4+ T cell, IgA-producing plasma cell
- M cell, dendritic cell, IgA-producing plasma cell, CD4+ T cell
- M cell, dendritic cell, CD4+ T cell, IgA-producing plasma cell**