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## Formal Educational Training

### 2017

Team Based Learning (IMM course)  
SDU Lecturer Training Programme Winter (January) 2016-Summer (June) 2017

### 2016

MCQ multiple choice questions in teaching and examinations - Pharmacy  
Presence and impact in your teaching – know your body language  
Student Response Systems  
Supervision Roles and Relations

## Administrative tasks relating to education

2018 – present      Pharmacology A for Biomedical students (BSc level), SDU: *“trainee” course coordinator for Pharmacology A for Biomedical students*

2016 - present      Multiple Mini Interviews (MMI) – an alternative admission of medical students, SDU: *planning, execution and evaluation of interview on literacy / understanding of information skills.*

2015 – present      Practical in receptor pharmacology –Pharmacology A for Biomedical Students (BSc level), SDU: *responsible / organizer.*

## Experience of Study programmes, supervision and examination

### Teaching experience

**2019 - present** *In vivo Pharmacology - Copenhagen University, PhD Course 5 ECTS*

### 2014 – present

**Bachelor Biomedicine      Pharmacology A for biomedical students (5 ECTS);** molecular and cellular aspects of pharmacology, methods and measurements in pharmacology, computer simulation practical in receptor pharmacology – *lectures, small class room teaching, responsible for receptor pharmacology practical, MCQ and written essay examination, written examination for the practical.*

Lectures: 8hr (100+ students), Small class room teaching: 3x2hr, coordination of receptor pharmacology practical + evaluation of reports: ~24hrs

**Bachelor Pharmacy      Pharmacology and Physiology for pharmacy students (5ECTS);** molecular and cellular aspects of pharmacology – *lectures, small class room teaching, case/group work evaluation, MCQ and written essay examination.*  
Lectures: 4hr (~50+ students), Small class room teaching: 2x2hr, evaluation of case presentations: 2-4hr

**Master Biomedicine      Pharmacology B for biomedical students (5ECTS);** Just In Time Teaching / brush up of pharmacology A, Imaging in Pharmacology and development of strategies for using personalized medicine – *lectures and case/group work evaluation, MCQ and written essay examination.*  
Lectures: 4hr (50+ students), evaluation of case work: 2-4hrs

**Lab Animal Science (5 ECTS);** genetics and transgenic techniques – *lectures, MCQ examination.*  
Lectures: 3hr (30 – 60 students)

### 2011 – present

#### PhD course:

**Biophotonics (5ECTS);** Applied imaging in vascular research and pharmacology, Fluorescence lifetime imaging microscopy – *lectures, practical, mentoring of student projects, oral examination of students.*  
Lectures: 3hr (30 students), practical's and mentoring: 15hrs, oral exams: 3hrs

*Previous/other relevant experience* with teaching includes since 2001 small class room teaching in biomolecular chemistry for biomedical students, biochemistry for medical students, education of technicians at SDU (responsible for a trainee 2002, 2003, 2009, 2017), mentoring of students (all levels), tutor in study / reading techniques (1998-2000).

### **Supervision Experience**

#### *Main Supervisor*

postdoc x2, PhD students x1, MSc students x8, BSc students x6

#### *Cosupervisor*

PhD students x5, MSc and pregraduate medical students x6

### **Examination experience**

Questions for and evaluation of written exams in graduate as well as undergraduate pharmacology courses, MCQ tests and ConceptTests for pharmacology and laboratory animal science courses, oral examination of MSc project students (with external censor), oral examination of PhD students enrolled in the Biophotonics course (with internal censor), oral evaluation of case presentations in pharmacology and pharmacycourses (with internal censor), evaluation of written reports / questionnaires for receptor pharmacology practical (with internal censor).

## **Methods, materials and tools**

### **Lectures and small classroom teaching**

**Blended learning** is the new normal (H. Vickers, Educational technology Oct 2016) and is incorporated in many of the courses offered from the Center for Teaching and Learning at SDU including the SDU lecturer training programme. Blended learning is the combination between traditional lecturing / class room teaching (one-way teaching) and computer based learning (two / multi-way teaching). There are several pros, and a few cons to consider when using blended learning. The most important advantage is the learning by engagement, i.e. active learning, while a disadvantage is that it takes time to prepare for classes for both the university teacher (new teaching materials and another way of preparation is required compared to traditional university teaching) and students (no laid-back preparations).

To advance the students acquisition of higher order thinking skills (see Blooms Digital Taxonomy <https://www.thinglink.com/scene/317912066432172032>) during my lectures as well as small class room teaching, I use three principles / methods within the concept of blended learning: Just In Time Teaching (JITT), and ConceptTests with Peer Instructions ((Mazur, E. and J. Watkins (2009). Just-In-Time Teaching and peer Instruction, in Just in Time Teaching Across the Disciplines. S. S. a. M. Maier. Sterling, VA, Stylus Publishing, pp39-62).

**Just In Time Teaching (JITT)** is a pedagogical strategy where the students are asked to prepare for the lectures using a set of JITT questions, helping them to focus on the most important concepts and terms in the curriculum to be covered during the lecture. Their preparations are ending with a survey, a kind of a readiness assurance test, with 10-20 multiple choice questions focused on concepts necessary for understanding and active participation in the lecture. This makes it possible for me as lecturer to determine which level of understanding the students come with prior to the lecture. The lecture itself then starts where the students are, i.e. we are at common ground and I can help them clarify essential misunderstandings. During the lecture, the curriculum is covered, still on basis on the pre-lecture survey, by use of **ConceptTests with Peer Instructions**. When required, traditional lecturing is used for introducing concepts and clarifying misunderstandings (of a maximum of 10 minutes duration).

**ConceptTests** are designed to test the students understanding of essential concepts in the curriculum. I post these as online quizzes using Poll Everywhere (an online interactive tool where students' responses to questions are recorded and displayed online). I always discuss the answers, whether they are right or not. Depending on the percentwise distribution of answers, the students are asked to discuss their preferences with their peers, and sometimes also asked to also convince their peers that their choice of answer is correct. Following this PeerInstruction, they re-vote. Typically, the percentwise right answers / agreement on an answer increases from e.g. 30% to 90%. The pedagogical rationale behind the PeerInstructions is that students are encouraged to reflect on their initial responses and identify how peer discussion informed their thinking, helped address misconceptions and deepened their understanding. Based on student evaluations, the use of ConceptTests with PeerInstructions is the top-ranking initiative having the greatest positive impact on their learning. Second and third ranks the theoretical parts of the lectures (clarification) and the online materials provided prior to the lecture (Bloksgaard 2017 lecturer training programme development project report "Getting a better grip on pharmacology").

To apply the methods described above I have developed new teaching materials and acquired and applied new teaching methods, among others the use of PollEverywhere. Especially the development of the JITT questions and ConceptTests required some deep pedagogical considerations, focused on constructively aligning the intended learning outcomes in the course curriculum with which questions to use for the students to demonstrate their understanding of key concepts in receptor pharmacology, how to ask these questions, how to proceed with Peer Instructions following a first round of questioning and finally, how to plan lecturing based on the outcomes of the pre-lecture feedback, the outcomes of the ConceptTests and online polls. An advantage using this method of highly active and interactive teaching is that the students become open and dare ask questions in plenum. However, it requires that the expectations from the lecturer, particularly regarding how the students are expected to prepare (and the consequences of not preparing), are made very clear prior to the lecture / confrontation hours.

### **Supervision / mentoring of students**

During my own education, most of the supervision I experienced was by apprenticeship. However, it quickly becomes evident to the student that there might be a definite list of right and wrong ways of doing things. I am aware that nothing is finite in science, but students seek for a list of "standard-answers", which they then try to navigate after. To circumvent this, I use a strategy where I coach the student to try find the answers him/herself and to take leadership of the project to be conducted. I start with a meeting where expectations are clarified, and makes it clear, that the responsibility of learning is on the student, whereas I provide the frame for learning. Coaching is done by asking questions, keeping in mind the Tomm quadrant of questioning (Tomm, K., "Interventive Interviewing: Part III. Intending to Ask Lineal, Circular, Reflexive or Strategic Questions?", *Family Process*, 27: 1-15, 1988), prioritizing questions requiring more complex answers, keeping myself from answering the questions whenever possible. This also means I allow the student to make mistakes with the intention that he/she learn from them. I realize, that my expectations regarding the students' competencies, especially higher order thinking skill (such as "analyze", "create", see Blooms digital taxonomy) are metacompetencies that I have gathered throughout many years of experiences, and which students have to acquire during (and sometimes after) their studies.

### **Educational development and applied research into teaching at university, including educational awards**

**2019 Publication** Implementing collaborative, active learning using peer instructions in pharmacology teaching increases students' learning and thereby exam performance. Carstensen SS, Kjaer C, Möller S, Bloksgaard M. *Eur J Pharmacol.* 2020 Jan 15;867:172792. doi: 10.1016/j.ejphar.2019.172792. Epub 2019 Nov 14. PMID: 31733212

**2016-2017 Lecturer training programme development project "Getting a grip on pharmacology"**.

Conducted in Pharmacology B (MSc level, biomedicine). Documented in format of report and poster (presented 2016-12-07 at SDU). The development project is repeated at the time of writing to gather data for a publication.

**Pedagogical challenge.** The course SU803 is relatively new and in general the students have difficulties grabbing the key concepts in pharmacology. This is not only a challenge at the graduate level, but it becomes increasingly important to have acquired the essential skills in higher order thinking (acc Blooms Digital Taxonomy) along the line of the pharmacist to be able to understand, analyze and not the least discuss (problem based learning) key concepts in the course and to meet the course aim.

**Method.** Implementation of Blended Learning; JiTT, ConceptTests and PeerInstructions for a brush up lecture o Pharmacology A and the lecture "Imaging in Pharmacology...". Prior to the lectures the students were provided online learning resources like the PharmWIKI from Tulane University (written permission achieved), youtube videos and podcasts and a review article. These resources were accompanied by a JiTT assignment/pre-lecture studyguide. During lectures the students were asked to actively participate anonymously in online polls and, when disagreements were clear amongst the students' answers, they were asked to discuss with their peers, and re-vote. The students' perception of the applicability of both the online resources, the JiTT assignments and the activating initiatives (polls and peer discussions) were evaluated using pre- and post-lecture surveys.

**Results.** The implemented initiatives were well received amongst the students, and they indicate that the use of the JiTT assignments was a great help for them in their preparations for the lectures. The use of polls was ranked highest for having a positive impact on the students' learning, second ranked was the use on online resources, and third was the theoretical parts of the lecture with my descriptions and discussions of the topics.

**Conclusion.** The students' perceptions and evaluation of the initiatives implemented during the teaching and my evaluation of the online tests during and after the lectures greatly support the use of blended learning in Pharmacology B. These initiatives support the students' active learning. I am greatly impressed by the impact the implemented initiatives had on the immediate learning of the students. Following this year's exam, data will be collected (outcome of the exam) to support the conclusion.

### **Reflections on own teaching practice and future development**

Traditions are strong in academia, and my training (as well as practice!) as university teacher was, as the supervision received during the first many years (1997-2013), highly influenced by a "we do it like this, this is how we usually teach" way of thinking: you talk, the students take notes, questions are asked during the breaks or after the lecture. Lectures were as a majority not interactive, but time, as well as technology and the pedagogical development of professors (junior as well as senior, see Kugel, P. (1993). "How Professors Develop as Teachers." *Studies in Higher Education* 18(3): 315-328.) as university teachers fortunately has changed this markedly to the better. Focus is now on teaching for active learning, with implementation of technology as a strong learning tool in combination with more traditional academic teaching disciplines (i.e. blended learning).

For my teaching, I always aim at keeping the Blooms digital taxonomy in mind when I design my teaching materials and -strategies. I want to facilitate the students' acquisition of higher order thinking skills: "analyze, evaluate, create" rather than "remember, understand, apply". Furthermore, it is important for me to use my own as well as the students' time as efficient as possible. As university teacher, I have many other responsibilities and interests, and there is only 24 hours in a day. I have by experience found that I am having much more fun teaching and use less time to prepare (at least once the first drafts are done) when using blended learning. Responses by the students are that they use more time to prepare, but learn more by engaging with blended learning in comparison with traditional, non-interactive lecturing.

**Example I (BSc Biomedicine).** How do I improve the students learning of the key concepts in receptor pharmacology using

### **the practical in receptor pharmacology?**

During 2015 I revised our department's wet practical in receptor pharmacology, among others the practical guidelines and theoretical introduction to the wet practical. This was done to facilitate the students' learning about key concepts in receptor pharmacology. The revisions did not provide the desired outcome and the students complained about wasting their time, being too many students / work station and too many could skip partaking in the writing of the report. Consequently, I decided to change the practical into a computer simulation exercise during 2016. The primary reason for changing from a cook-book type of wet practical to a computer simulation exercise was to challenge the students to develop an independent line of thinking in pharmacology: the use of a computer simulation platform allowed me to ask other types of questions facilitating their learning, among others to develop their own experimental protocol. To design a pharmacological protocol, they were challenged to advance to higher order thinking skills, from "evaluation and analyses" (see Blooms Digital Taxonomy <https://www.thinglink.com/scene/317912066432172032>) to critical thinking, evaluation, interpretation, discussion and most important "creating" their own experimental protocols and experimental data. Something that could not be achieved with the wet practical due to technical, economical and ethical (excessive use of rats among others) considerations. The evaluation from the students was very positive. The impact on the exam score is undergoing analysis.

### **Example II (BSc Biomedicine). How do I save time correcting reports while getting the same or better quality of the examination of the students' competencies following the computer simulation exercise?**

In addition to changing the wet practical into a computer simulation exercise, I changed the format of the written exam following the practical. Traditionally, evaluation of the students learning during the exercise was done on basis of written reports, often 25-30 pages long. The students took a lot of effort to write this report, complained it was difficult since it was the first long report they should write during their BSc study, and many groups did not work optimally. Thus, it was difficult to evaluate the single students learning and it took a lot of effort and time from both me and the instructors to evaluate the reports.

Because of the use of computers in the receptor pharmacology practical, group sizes were down to 2-3 students / group. Group work was more efficient and discussions were many – on the scientific parts of the practical. The aim of the practical was and is not to evaluate whether the students can write a report, but to determine whether they understand and are able to apply key concepts in pharmacology. Therefore, I developed a questionnaire in the format of short-answer-questions (max 10 words, in essay questions max 30 words) to replace the written report. To do this, I had to align the questions carefully with the intended learning outcomes of the practical as well as the course in a whole. The evaluation from the students was clear. They had been forced to think, go back to the literature, discuss in the groups how to express themselves in correct pharmacological terms to answer the questions. Most important, they had been able to focus much more on the contents of the exercise and on discussions required to design their own experiment, than on the for them immense amount of work of writing a report. For me, it took less than 1/3 of the time to evaluate their exam (questionnaire) and the quality of the answers was much improved compared to the report, i.e. it was easier to evaluate the exam too. The practical is repeated and the effect reevaluated spring 2018 to support these findings.

### **Development of teaching in pharmacology – 2018 onwards**

I wish to continue contributing to developing teaching in pharmacology and to implementing blended learning in the pharmacology teaching in Odense. I also wish to contribute with further teaching in development of personalized medicine. I have not yet been involved in teaching of pharmacology to the medical students, but wish to contribute to the teaching of medical students as well. To me the most important challenge seems to be alignment between the expectations of the university and university teachers and the a priori competencies of the students enrolled.

It is frustrating experiencing students unable to meet the intended learning outcomes no matter how you try to teach. More frustrating is it, that some does not seem to realize that the education at the university is at a higher level, where you, as a student, is expected to take responsibility for your own learning. The institution and the university teachers can only provide the frame. This, however, we should aim at being the best at, as with anything else we do as scientists and employees at the university.

**Example III (BSc Pharmacy). How do I avoid mismatched expectations?** Mismatching of expectations has especially been visible and problematic in the teaching I have experienced with the students at the BSc of Pharmacy (3rd semester). In one case, despite written instructions, 3 out of 45 students came unprepared for small class room teaching. I learned that my expectations of their academic skills were lightyears from how they had understood my written instructions, e.g. what is required to come well prepared for the confrontation hours. Matching of expectations requires future reflections on practice and discussions with colleagues, also at the Faculty of Natural Sciences, that meet these students both earlier and later in the pharmacy study programme. From my point of view and experiences, the previously acquired skills of the pharmacy students are not in line with prerequisites to follow and meet the intended learning outcomes in the "Physiology and Pharmacology for Pharmacy" course. It will not do it all to change the course contents (again), rather, I imagine, the students need to acquire essential academic skills during the first year of studies that they need for their future studies. For my own teaching I intend to use team-based learning for small class room teaching in addition to the already implemented blended learning during lectures. The pedagogy behind this line of thinking is that the peer, to be able to transfer his/her knowledge to others, must understand the problem. Hereby the students are challenged to also explain why they chose to solve the questions the way they did, i.e. the discussion with other students will inform their thinking and bring their understanding of the curriculum up another level.

For the biomedical students, my experience is that their learning and previously acquired skills are much more aligned with the competencies required to follow the courses in pharmacology offered by the Faculty of Health Science. Still, as

described above, much more can be done to facilitate students' acquisition of higher order thinking skills. My philosophy is, that it is not enough to remember, you must be able to apply your knowledge constructively too. Constructive alignment of the university's expectations and the students' a priori competencies are key and is in question also for the medical students, admitted with a high grade average, as I have experienced it during a colleague supervision of a lecture for 2nd semester medical students.

**Constructive alignment** of the university's expectations and the students' a priori competencies is key in the planning of the Multiple Mini Interviews (MMI) – an alternative admission of medical students at SDU. I have participated in planning, execution and evaluation of MMI on the work station regarding literacy / understanding of information skills since 2016. The University of Southern Denmark admits approximately half of the medical students through an alternative method, referred to as "Quote 2" (Kvote 2 optagelse), a rigorous test schedule, where the students' ability to collaborate, read and reproduce important information, and discuss ethics among others are tested. The first part of the test is a large multiple choice test, adopted after a Canadian Admission program. Applicants with the highest scores are invited back for a full day of further testing, the Multiple Mini Interviews, after which selection of the students to admit to the medical studies takes place. The work station I contribute to is on reading English texts followed by an oral summary of the important points in the text. This work includes development of a rubric for scoring the students. I furthermore participate in the evaluation of students on other stations during the MMI.