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Teaching Portfolio Daniel Wüstner

Formal pedagogical education and training in research supervision

2007	SDU Lecturer Training Program
2011	Project management for researchers and course for PhD supervisors, SDU Denmark
2014	Group leader program, SDU Denmark
2015	CBS Executive Research Management Course

Administrative tasks in relation to teaching

Until 2014 Member of the Study board in Pharmacy at SDU

Teaching experience

I have gathered large experience in teaching ranging from large introductory courses with more than 300 students to dedicated lectures in Master and PhD courses. My teaching at the University of Southern Denmark is located at the interface between biochemistry and biophysics/instrumentation with a shift towards the latter in recent years. I am teaching in Danish and in English both, in class rooms and in lab exercises. Courses are typically taught by two-three professors, and one is involved in several courses over the whole year. The course-responsible teacher implements a teaching plan, learning goals and exam form.

Teaching philosophy

Life science witnesses an ever-increasing demand for interdisciplinary research. Traditional disciplines like protein chemistry or molecular biology are more and more merged with biophysical and bioinformatics approaches, while the opposite is also true. This requires the students to learn from a broad range of techniques and approaches enabling them to choose the most appropriate to solve a particular problem.

Unfortunately, every discipline has its own “language” and “jargon” hindering sometimes a fruitful synthesis of different areas in tackling a particular biological problem. My goals in teaching are therefore not only to promote learning of the major subject but also to develop a sense for the usefulness of problem-solving methods from various bio-science areas. This should contribute to develop the student’s ability of independent thinking and critical assessment. I realized in my own research career that interdisciplinary thinking can be very helpful in studying the complexity of life and in answering unresolved questions. I am trying to implement this experience in my teaching and hope to bring across my own enthusiasm.

Supervision at SDU

I have supervised more than 25 bachelor students and ISA projects, 8 Master students, 4 PhD students and 4 postdocs. The postdoc, former PhD students and Master students went on and obtained good positions in academia and industry. Currently, I am supervising two PhD students.

PhD Opponent at other universities

2012	Aarhus University
2014	Aarhus University
2017	Copenhagen University

Teaching of Courses

Previous Courses

1997-2000	Co-supervision of bachelor students in Molecular Biophysics; Lecturing in Biophysics seminars at Humboldt University Berlin, Germany
2000	Teaching assistant for the Advanced Optical Microscopy course, Woods Hole Maryland, USA (topics: ratio imaging by confocal microscopy)
2003-2004	Co-supervision of Master student in Modelling and Data analysis at Max Delbrück Centrum (MDC), Berlin, Germany
2005-2015	Metabolic regulation (topics: lipid metabolism and transport) for students of Biochemistry and Molecular Biology, Pharmacy and Biomedicine (10 ECTS)
2006	Course on Optical Microscopy in Life sciences within the PhD school of Metabolism (topics: basics of image formation, fluorescent probes, deconvolution)
2007-2010	Introduction to Biophysics for students of Nanobioscience
2008-2015	Molecular mechanisms of eukaryotic metabolism for students of Biochemistry and Molecular Biology (5 ECTS)

2010-2012	Introduction to Biochemistry of Metabolism for all science students (5 ECTS)
2012-2014	Module in Quantitative Biochemistry* (metabolism, concepts of thermodynamics and chemical kinetics, mathematical modelling) for physics students (5 ECTS)
2017-2018	Applications of Mathematics and Physics in Life sciences (application of differential equations in biochemistry) (5 ECTS)

Current Courses

2007-	Bioanalytical instrumentation* (basics of optics for microscopy, image formation and resolution, fluorescence, live-cell imaging, survey of image analysis techniques) for students of Biochemistry, Nanobioscience, Pharmacy and Biomedicine (5 ECTS)
2012-	Advanced microscopy techniques – Master course (photophysics of light absorption, emission and scattering in relation to imaging, live-cell imaging, photobleaching, FRAP, FLIP and particle tracking) for students (5 ECTS)
2012-	PhD course in Biophotonics (5 ECTS)
2016-	Modul on Membrane Biochemistry for students of Biochemistry & Biomedicine (10 ECTS)
2017-	Physical Biochemistry* for students of Biochemistry & Biomedicine (Intermolecular forces, molecular binding processes, diffusion, kinetics) (5 ECTS)
2019-	Modul on Enzyme Kinetics for students of Biochemistry & Biomedicine (10 ECTS)

*****For these courses, I am/was the responsible teacher.

Experience with establishing new courses

I have built up a course on bioanalytical instrumentation together with two colleagues when I was Assistant Professor (Adjunkt) at SDU in 2007, and this course is running successfully since. I am the responsible teacher. In the beginning, I spent a lot of time and effort in preparing lectures which provide the necessary physical background in optics and light properties in order to enable the students to understand principles of microscopy and to acquire the ability to solve problems in this field themselves. This was a challenge since life science students do not have the mathematical or physics background to understand, for example Frauenhofer diffraction and Abbe's image formation theory in physical terms.
On my own, I have built up a course on Quantitative Biochemistry for students in math, physics and computer science, which run successfully, until the common 1st year at the Science Faculty ended. Here, the challenging part was to teach the students some general concepts in biochemistry (metabolism, enzymes, membranes etc.) and to combine that with some mathematical tools for efficient application of their background in this new field. The learning goal was to be able to perform steady state modelling of biochemical networks and to solve simple differential equations to describe biochemical processes.
Three years ago, I overtook the obligation of setting up a course in Physical Biochemistry. The challenge here is to teach students in Biochemistry and Biomedicine essential physical chemistry without being able to provide a lot of theoretical background. At the same time, the goal was to show students that physical chemistry is important and useful in biochemistry and to confront them with modern trends in the field. I am course responsible and developed the curriculum for the course together with a colleague from the department of physics, chemistry and pharmacy. We teach intermolecular forces, equilibrium thermodynamics, some statistical thermodynamics, kinetics, binding processes as well as some material on diffusion and active transport.
Finally, I have participated in designing and teaching a new course focusing on applications of mathematics/physics in life sciences. Here, I taught how to carry out kinetic modelling of cellular processes based on ordinary differential equations. Due to taking over another teaching obligation from fall 2019 on, Enzyme kinetics in a large biochemistry course including lectures, exercises and lab, I will stop teaching in the mentioned math course.

Course material

I use blackboard but mainly computer-based teaching using the program PowerPoint for Windows (Microsoft Inc., USA). I developed graphics and animations for the latter in order to illustrate biochemical processes as well as to visualize physical principles and illustrate image processing algorithms. For teaching of microscopy, I also heavily use video technology, e.g., to present examples of time-lapse fluorescence or differential interference contrast microscopy in living cells. I also write hand-outs and accompanying notes, if necessary. For example, I used a Java based platform developed by Olympus Inc., USA, to directly enable the students for interactive learning on microscopy and wrote questions and comments in form of hand-outs for self-assessment. I was one of the first teachers who implemented the 'clickers' for receiving feed-back from the students during lectures, which is now replaced by PollEverywhere. Finally, I implement Monte Carlo simulations for illustrating diffusion and binding processes in the physical biochemistry course.

Assessments

I have large experience with written exams within large introductory courses, second and third-year biochemistry courses, with various oral exams, assessment by homework problems, labreports as well as with with student presentations and with written reports. Moreover, I evaluated Bachelor thesis, ITEC and Master reports as well PhD thesis' as external reviewer for Århus and Copenhagen university.