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Formal Pedagogical Education

2019 - 2020

Lecturer Training Programme at University of Southern Denmark (270 hours)

Pedagogical courses: Supervision: roles and relations (0.75 ECTS, 2019); Research-based teaching (0.50 ECTS, 2019); Students as learners (0.50 ECTS, 2019); Evaluation and data collection (0.25 ECTS, 2019); Using response systems for teaching (0.5 ECTS, 2019); Questioning – how it can support teaching, learning and assessment (1 ECTS, 2019); Oral Examination in Higher Education (0.50 ECTS, 2020)

2015

Pedagogical process for higher education at PUCPR (2 ECTS)

Educational administration tasks

2019 – present **Educational Committee member** – responsible to address and/or consider suggestions for modifications in new or existing curricula, semester descriptions and course descriptions for the bachelor and master programs in Engineering, Innovation and Business at the Mads Clausen Institute, SDU.

2019 – present **Semester Coordinator** – responsible to define the semester theme, plan the semester projects, and create coherence among the courses on the 4th semester for the bachelor in Engineering, Innovation and Business at the Mads Clausen Institute, SDU.

Teaching philosophy

My main goal in every lecture is to promote critical thinking. More than remembering theories or formulas, I hunger for the students to realise the world is not black or white, and correct answers without a specific context are typically wrong, even for engineers. There is always a grey area where trade-offs stand. Thus, I usually only feel that I did a great job when the students leave the classroom uncomfortable because they fully understood the session's subject and the different aspects of it, however, they still do not have a conclusion given the abundance of situations in which those learnings can be applied, usually not homogeneously.

To get there, I promote research-based teaching and participatory learning. Confronting points of view, I focus on students' active, independent learning. Rather than the regular Q&A in the classroom, I try to engage them in dialogue and further reflections, often challenging their points of view, not because I disagree but to push the boundaries of critical thinking. I like to call it 'productive disagreement'.

I am also focused on integrating teaching and research in a way so that they stimulate each other. I try to engage the students in a topic by creating tasks that require formulating research questions by themselves and applying scientific methods to find the answers, following the meaning of research-based teaching proposed by Healey (2005). I also stimulate them to create a critical thinking approach in evaluating frameworks rather than just using them. For instance, I involve the students in my research projects by bringing my new ideas and frameworks to be discussed in class, first not letting them know I have proposed them to avoid intimidating their critique. Later, creating a loop of discussion about their reflections and only then discussing what led me to that formulation, iterating with their previous comments. This critique helps move the research further with the genuine and authentic students' view, making it simpler to see the strengths and weaknesses. This is also in line with the relationship between student and teacher proposed by Keiding (2010).

In short, as a facilitator, I seek to provide the necessary tools for students to solve practical problems independently and, as a mentor, I seek to guide them to explore new ways of thinking. Paulo Freire (1968) calls it liberation pedagogy, in which professors are no longer the single source of knowledge in the classroom but rather are engaged in helping students move from passive recipients to active creators of knowledge and ideas, becoming critical readers and writers.

Reflections on own teaching practice

For my teaching, I use Bloom's digital taxonomy (2001) when designing my teaching materials and strategies. I want to facilitate students acquire higher-order thinking skills, "analyse, evaluate, create" rather than "remember, understand, apply". But, obviously, depending on the purpose of the course, this is adjusted to meet the target audience's needs. I faced situations where I used the same exercise for different levels resulting in opposite outcomes. When I analysed the problem using Tripp's (1993) methodology related to critical incidents, I realised that I need to create a path for learning instead of just teaching what I think the students should know. Thus, I use different combinations of methodologies and tools depending on the level I'm teaching. I believe that learning is a path, and we need to use the right tools to pave every stage. Thus, I use different approaches to bachelor, specialisation, and master courses.

In bachelor courses, where theoretical knowledge is still limited, I seek to use primarily expository techniques that allow creating this knowledge and other mechanisms that help in the fixation and generalisation of this, such as simulation games and inspiration from practitioners. For specialisation and MBA courses that are focused on the market, I try to stimulate creativity for new approaches. Using primarily hands-on techniques, such as case studies, students can have different perspectives on applying the same tool. For master courses, I explore teaching techniques that allow me for longer and deeper discussions that do not necessarily drive to an exact or optimised answer but rather develop a critical sense, working with uncertainty and ambiguity. With this group, I often use problem-based project work and in-company projects, where students need to work in groups to apply previously existing knowledge, exploring different solutions to the same problem to discuss the cascade effect of their decisions in the project. Theoretical knowledge and deeper discussions often allow them, organically, to come to new conclusions.

Teaching experience

2022 – present

Master Engineering, Innovation and Business **Advanced Supply Chain Simulation (10 ECTS):** design and simulation of supply chains, supply chain strategy, network design, demand forecasting, transportation modes, sustainable supply chains -

lectures, case/group assessments, individual oral examination.

Lectures: 36hr (15-20 students), cases supervisor: 36h, assessment of simulation assignments: 6-12hrs, individual oral examination: ~8hrs

2019 – present

Bachelor Engineering, Innovation and Business **Operations Management 2 (5 ECTS):** operations strategy, quality management, supply chain management, sustainable operations - *lectures, coordination of practitioners' case presentations, individual oral exam.*

Lectures: 32hr (10-15 students), oral exams: 4-6hr

Bachelor Engineering, Innovation and Business **Digital Manufacturing (15 ECTS):** design and simulation of production system, digital manufacturing tools, lean automation, manufacturing technologies - *in-company project, case/group assessment, individual oral exam.*

Lectures: 8hr (10-15 students), in-company case: ~70h, assessment of reports: 10-12h, individual oral exams: 6-8hr

Bachelor Engineering, Innovation and Business **Smart Manufacturing (5 ECTS):** Product life cycle management, automation and digitalisation, Industry 4.0 enabling technologies, simulation to digital twins - *lectures, in-company project, case/group evaluation, individual oral exam.*

Lectures: 16hr (10-15 students), practical in-company case: ~16h, assessment of reports: 4-6hrs, individual oral exams: 4-6hrs

2020 – 2021

Master Engineering, Innovation and Business **Smart Product Development (10 ECTS):** Product life cycle management, product development technologies and tools, digital manufacturing tools, smart prototyping, Design for X - *lectures, case/group assessment, individual oral examination.*

Lectures: 24hr (25-30 students), case supervisor: ~16h, assessment of reports: 4-6hrs, individual oral exams: 10-12hrs

2018 - 2019

Specialisation Industry 4.0 Engineering and Management **Digital Manufacturing (5 ECTS):** Industry 4.0, digital manufacturing tools, advanced manufacturing technologies implementation, simulation, digital twin - *lectures, supervision of in-company case study, case/group assessment.*

Lectures: 16hr (25-30 students), coordination of practical case: 4hr, assessment of case presentations: 4hr

2017-2018

Master Industrial Engineering and Management **Supply Chain Management (5 ECTS):** real-time monitoring and control, integrated scheduling, planning under uncertainty - *lectures, individual written examination.*

Lectures: 4hr (~90+ students), evaluation of reports: ~4hrs

2015

Bachelor Industrial Engineering Production Planning and Control (5 ECTS): manufacturing vs. service operations, capacity management, inventory management, material requirements planning - *lectures, individual written exam.*
Lectures: 20hr (15-20 students), assessment of reports: ~16hrs

Previous/other relevant experience with teaching includes assisting lecturers on Engineering Project Management and Maintenance Engineering specialisation programs (2013, 2014, 2015), mentoring of students since 2016 (bachelor and master levels)

Lectures and classroom teaching methods

Problem-based project work is a model that explores project work based on authentic problems, self-governed group work and collaboration. A group of students work closely together to manage and complete a project over an extended period. This provides students with tools to independently acquire knowledge, skills and competencies at an advanced academic level. We assume that students learn best when applying theory and research-based knowledge in their work with an authentic problem. The objective is to strengthen the students' skills regarding problem identification, problem analysis, problem formulation, problem-solving, communication, cooperation, the assessment of work processes and the quality of their work. At the same time, this approach supports students in developing their communication and collaboration competencies and acquiring the skills required when taking an analytical and result-oriented approach.

In-company project is used in conjunction with problem-based projects. Over a period, students work with an external organisation to complete a business task or focus on a strategic challenge the company may be facing. This gives students a deeper insight into complex systems and dealing with social problems even when applying technical solutions. This is relevant for inserting complexity factors in scenario analysis and applying and adapting theories learned in the classroom. I seek to develop these projects, preferably in small and medium-sized companies, so that the students can see the results quickly and clearly.

Simulation games are educational tools where students learn through applying theory and decision-making to a simulated real-world business scenario. As the problem-based method, simulation games are also an active learning method, but with the potential to simulate real-world contexts to reinforce students' learning. It challenges students to analyse available information and make critical decisions based on theoretical and practical knowledge to solve business challenges (Harvard Business School, 2011). The goal is to allow students to in a few hours to experiment with the application of theoretical concepts and tools in a complex environment, but mainly to show them the consequences of their decisions.

Inspirations from practitioners seek to bring people from companies to talk to students about the assignments and main challenges on the job. The practitioners are selected according to the subject addressed in the class (e.g. quality control class, the practitioner will be a quality manager). The goal is to get students to think about concepts in a way that is applied in the real world and not just limited to the classroom environment. This also encourages them to seek less linear and straightforward responses to complex subjects, as often occurs when cases are limited to textbook examples.

Reverse assessment of presentations: During group presentations, it is common for students from the teams who are not presenting to lose their attention and focus. This makes it difficult to engage them in deep discussions afterwards. In contrast to the frequent assessment based on the group's presentation, I use an assessment approach based on the feedback given and questions asked by the other groups and the answers presented by the group that is presenting. I have three main objectives with this approach: (i) retain the attention of the students while the other groups are presenting, something that rarely happens when there is no expected action from them; (ii) develop critical sense between peers, capability often overlooked in academia and very necessary in the work environment; and, finally, (iii) stimulate them to provide critical feedback for both peers and teachers/supervisors. The method has proved satisfactory for achieving these objectives, presenting relatively greater student engagement than usual.

Teaching languages

English and Portuguese

Supervision and mentoring of students

As a supervisor, my main goal is not to find the right answers to give, but rather the right questions to ask. During my supervisions, I seek to provide students with the freedom to explore new possibilities, even if it represents more stumbling blocks along the way, meanwhile I keep checkpoints to the coherence of their work. During the supervision meetings, I seek to provide open and in-depth discussions on the issues, avoiding easy- standard-answers for problem-solving, and encouraging them to pursue learning independently. Practically speaking, in an initial meeting, I always make it clear that it is their role to seek the knowledge and skills needed to develop the project, while my role is to guide and facilitate the journey. I usually use the example that the project is a bowling game, their role as players is to knock down the most pins, while mine is to create a wall on the lane sides so that the ball does not go into the gutter. My role is to allow them to succeed by pointing out the flaws and asking the right questions, but the quality of work and learning depends on how well

they can reflect and answer these questions. This means, for instance, to indicate possible appropriate solutions instead of defining the best approach for them. This allows them to create a critical sense of applying theoretical knowledge and understanding more deeply the choices they are making. This type of approach is also more challenging for the supervisor, since the set of tools and methodologies that need to be learned and mastered increases given the student's choice for conducting the project, but also assists in the development of meta-competencies over time.

Supervision experience

Main supervisor, PhD students

TU Aye (2022-), TEI/SDU

Co-supervisor, PhD students

JP Oliveira Hansen (2020-), with Arne Bilberg, TEI/SDU

CP Nielsen (2019-), with Fei Yu, TEI/SDU

R Santos (2019-), with Edson Pinheiro de Lima, PPGEPS/PUC-PR

A Assad (2019-), with Fernando Deschamps, PPGEPS/PUC-PR

Main supervisor, MSc and PgD students

A Pisano (2022), MSc in Engineering, Innovation and Business, SDU

A Indukuri (2022), MSc in Engineering, Innovation and Business, SDU

S Khamchang (2021), MSc in Engineering, Innovation and Business, SDU

M Rohla (2021), MSc Engineering, Innovation and Business, SDU

L Dose (2021), MSc Engineering, Innovation and Business, SDU

K Diekjobst (2021), MSc Engineering, Innovation and Business, SDU

T Rathke (2021), MSc Engineering, Innovation and Business, SDU

I Nyandowe & A Poziomkowska (2019), MSc Engineering, Innovation and Business

J Makdisi & DE Qeshmy (2018), MSc Industrial Engineering and Management

J Hultenius & G Magnusson (2018), MSc Industrial Engineering and Management

S Chiodelli (2015), PgD in Maintenance Engineering

E Barbosa (2014), PgD in Maintenance Engineering

B Bortolotto (2014), PgD in Maintenance Engineering

P Schier (2014), PgD in Maintenance Engineering

S Cruz (2014), PgD in Industrial Engineering

Assessment experience

Using an appropriate assessment method helps measure students' knowledge and improve student learning. Thus, aiming to address the constructive alignment proposed by Biggs and Tang (2007), I apply various assessment methods depending on the course description and learning outcomes in each course. For instance, for a fifth-semester bachelor's course focusing on understanding operations management in different contexts, I opt for a written assessment. During the last session, I give the students a list of all possible questions that may appear in the exam, but the context remains open (e.g. the company I will ask them to evaluate or the values they need to use for different variables). The exam brings some of these questions, and I use random cards to define in which context the students need to present the answers. This strategy supports reducing the uncertainty the students face on how to approach the content when studying while allowing them to train their analysis and responses in many ways. On the other hand, it does not take away the critical thinking needed during the assessment.

Types of assessment I am experienced with: written assessment in graduate and undergraduate industrial engineering courses, oral examination in graduate and undergraduate courses (with internal and external censor), MCQ tests for undergraduate industrial engineering courses, oral assessment of case presentations (with internal censor), assessment of written project reports and in-company case studies.

Evidence from students evaluation

Student evaluation and feedback of teaching play an important role in modelling teaching practices. Although it does not define teaching effectiveness, it gives us teachers a path for improvement. For each course, I ask for three qualitative and one quantitative teaching evaluation. For the qualitative one, I usually use the 'Keep and Try' technique where each student brings anonymously three points I should keep doing because it helps them in their learning progress and three points I should try a different approach. I apply it during the first session, by the middle of the semester, and finally at the last session. The first one helps me to learn best practices from colleagues, while the second and third support me in changing, adapting and improving my teaching practices along the way. The quantitative evaluation is usually handled by the university following the same criteria structure for all courses. Next, the final and official quantitative assessment results for the courses I have taught over the last five years are presented, followed by quotes extracted from anonymous students' course evaluations.

University, Degree, Course	Year	Mean Student Rating
SDU, BSc, OPM5IB	(2019)	4.00/4.00
SDU, MSc, IBSPD	(2020)	3.83/4.00
SDU, BSc, OPM5IB	(2020)	4.00/4.00
SDU, MSc, IBSPD	(2021)	3.56/4.00
SDU, BSc, OPM5IB	(2021)	4.00/4.00
SDU, BSc, DM	(2022)	3.91/4.00
SDU, BSc, OPM5IB	(2022)	3.85/4.00
SDU, MSc, ASCS	(2022)	4.00/4.00
SDU, BSc, DM	(2023)	3.71/4.00
SDU, MSc, ASCS	(2023)	3.75/4.00

5-year avg course evaluation score		3.86/4.00

"Elias is a very effective teacher, who always brings interesting cases to the lecture and keeps good morale in the class, keeping the students engaged in his lectures." (OPM5IB, 2019)

"I really enjoyed having that course. He is one of few teachers that encourages critical thinking. He also puts a lot of effort in teaching and preparing classes. He always responded to mails. Furthermore Elias was always open for feedback from us and immediately tried to react on that. I learned a lot in this semester." (OPM5IB, 2020)

"Elias gave me a really good overview of how state of the art research and critical thinking works. I really appreciate his approach to teaching focusing on discussions and applying theoretical knowledge on real-life cases" (OPM5IB, 2020)

"Elias has a really well-structured approach, very informative. Elias puts in a lot of effort and gives very clear and fair feedback" (SPD, 2020)

"The course has been extremely interesting and provided a lot of opportunities for open discussion where I have learnt a lot. Elias is very knowledgeable and always helpful with any questions we have, no matter how trivial they are. I have enjoyed this course, and would recommend everyone to take it." (OPM5IB, 2021)

"The best taught course so far for EIB program. Very nice quizzes, recap, factory visits, guest lectures and a lot of practical examples from the theory."; "Elias is an enthusiastic teacher who takes in feedback well and actively applies it to his course." (OPM5IB, 2022)

"A person with great experience and a wealth of information - Always up for a discussion, while bringing a lot of worth to the table." (ASCS, 2022)

"Elias his enthusiasm is contagious and truly has shown us real life applications simulation software. He shared his availability and always responds in a helpful manner to our concerns on the semester project."; "Great approach to students, proficiency in the material was very visible. Very invested and proactive" (DM, 2023)

Furure development

For me, teaching is also about learning. I often try different teaching methods and I learned that, as almost everything in life, its effectiveness depends on the context that it has been applied. To keep track of the perceived usefulness of the different methods I use in class, I regularly ask students' feedback and adapt accordingly. This means that I try to reflect on the implications and constructive alignment for every suggestion they make. In practical terms, I use an adapted Stage-Gate model where I screen the idea feasibility, the implementation scope, analyse how to test and validate the assumptions, and the feasibility of implementing it. As an example, one of the main challenges I faced regarding oral project group presentations is that while one group is presenting their project, the remaining students often do not pay full attention. In this way, the learning goals about sharing experiences are not wholly fulfilled. For this, I inverted the assessment proposition, making the grades based on peer feedback and questioning rather than the presentation. To prepare them to give feedback and questioning, I have prepared a list of recommendations and general Socratic questions to support them in making meaningful questions, a rubric with pre-defined evaluation criteria, and a rubric for feedback and questioning assessment, allowing the students to know also by which criteria their feedback and questioning are being assessed. The overall goal is to replace the presentation focus from oral performance with critical analysis. Furthermore, besides students' feedback, I often ask colleagues to pay a visit to their sessions. This helps me to learn new practices I can incorporate into my own teaching. This has worked well, allowing me to test new methods not commonly used in my field. In my view, there is no optimum way of teaching, and the effectiveness of it depends on the right tools being used in the right context. Thus, I focus on continually mastering a wider range of tools that allow me to better meet the course learning objectives