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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 realise the world is not black or white, and right answers without a specif context are typically wrong answers, 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.

For getting 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, many times by confronting their point of views, not because I disagree but to push the boundaries of critical thinking. I like to call it 'the art of 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 it. 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 what has been proposed by me to not intimidate their critique, later creating a loop of discussion about what led me to that formulation and their previous comments. This critique helps in moving 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 focus on using Bloom's digital taxonomy (2001) when designing my teaching materials and strategies. I want to facilitate the students' acquisition of 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 needs of the target audience. I faced situations where I used the same exercise for different levels resulting in opposite outcomes. When I analysed the situation by using the 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 of it. Thus, I use different approaches to bachelors, specialisation, and masters courses.

In bachelor courses, where theoretical knowledge is still limited, I seek to use primarily expository techniques that allow the creation of 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, 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 in the application of the same tool. For master courses, I explore teaching techniques that allow me longer and deeper discussions, that do not necessarily drive to an exact or optimised answer, rather develop a critical sense, working with uncertainty and ambiguity. With this group I often use problem-based project work and in-company project, where students need to work in groups to apply previously existing knowledge, being able to explore different solutions to the same problem so then to discuss the cascade effect of their decisions in the project. Theoretical knowledge and deeper discussions often allow them, in an organic way, to come to new conclusions.

Teaching experience

2020 – present
Master Engineering, Innovation and Business **Smart Product Development (10 ECTS)**: Product life cycle management, product development technologies and tools, digital manufacturing tools, smart prototyping, Desing 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

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

2018 - present
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 in managing and completing a project over an extended period of time. This provides students with tools for independent acquisition of knowledge,
skills and competences 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 as regards problem identification, problem analysis, problem formulation, problem-solving, communication, cooperation the assessment of work processes and the quality of their own work. At the same time, this approach supports students in the development of their communication and collaboration competencies, and in 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 the analysis of scenarios and the application and adaptation of theories learned in the classroom. I seek to develop these projects preferably in small and medium-sized companies so that the results can be seen quickly and clearly by the students.

Simulation games are educational tools where students learn through the application of 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 in order 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 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 (eg. 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 simple and linear responses to complex subjects as often occur when cases are limited to textbook examples.

Reverse assessment of presentations: During group presentations, it is quite common students from the teams that are not presenting to lose their attention and focus. This makes it difficult engaging 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 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 engagement than usual from the students.

Teaching languages

English and Portuguese

Supervision and mentoring of students

As a superviser, my main goal is not to find the right answers to give rather the right questions to ask. During my supervisions I seek to give students the freedom to explore new possibilities, even if it represents more stumbling blocks along the way, meanwhile I keep checkpoints to the coherence of work. During the supervision meetings, I seek to provide open and in-depth discussions on the issues, avoiding easy- standard-answers for problem-solving, 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 along this trajectory. 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 critical sense in the application of theoretical knowledge and to understand more deeply the choices they are making. This type of approach is also more challenging for the superviser, 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

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
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 to better measure the knowledge gained by students and to improve student learning. Thus, aiming to address the constructive alignment proposed by Biggs and Tang (2007), I apply a variety of 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 to the students a list with all possible questions that may appear in the exam, but the context remains open. 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 to reduce the uncertainty the students face on how to approach the content while studying while allows them to train their analysis and responses in many ways, however, 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 improvements. 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 bring 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 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 recently taught are presented.

University, Degree, Course	Year	Mean Student Rating
PUCPR, PgD, DM-1030245	(2018)	97/100
SDU, BSc, OPM5IB	(2019)	4.00/4.00
SDU, MSc, IBSPD	(2020)	3.83/4.00

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 will depend on the context that it has been applied. To keep track of the perceived usefulness of the different method I use in class, I regularly ask students’ feedback and adapt accordingly. This means, for every suggestion they make I try to reflect on the implications and its constructive alignment. In practical terms, I use an adapted Stage-Gate model where I screen the idea feasibility, implementation scope, how to test and validate the assumptions, and feasibility of implementing it. As an example, one of the main challenges I faced in regards to oral project group presentations is while one group is presenting their project the remaining students often do not pay full attention. In this way, the learning goals about sharing experience are not completely fulfilled. For this, I inverted the assessment proposition, making the grades based on peer feedback and questioning rather than the presentation. For preparing them to give feedback and questioning, I have prepared a list of recommendations and general Socratic questions to support

them to make meaningful questions, a rubric with a pre-defined, 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 to critical analysis.

Furthermore, besides students' feedback, I quite often ask permission to colleagues to pay a visit to their sessions. This helps me to learn to new practices I can incorporate to my own teaching. This has worked well, allowing me to test new methods not commonly used in my field. I think there is not an optimum way of teaching and the effectiveness of it will depend on the right tools used in the right context. Thus, I focus on continually master a wider range of tools that allows me to better meet the course learning objectives.