UTQ Portolio

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Preface

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About me

I am Breno Alves Beirigo, an Asst. Prof. in Stochastic *Operations Research (OR)* working at the University of Twente in the *Industrial Engineering and Business Information Systems (IEBIS)* department. For the last six years, I have worked at TU Delft (NL) in the *Transport Engineering and Logistics (TEL)* section of the *Maritime and Transport Technology (MTT)* department, where I carried out my postdoc and Ph.D. research. Previously, I pursued a BSc and MSc degree in Computer Science at the Federal University of Viçosa (BR).

Research

My interest in the optimization field was sparked in 2011 when I first moved to the Netherlandne-year exchange program at the Hanze University of Applied Sciences in Assen. By then, besides following the "Advanced Sensor Applications" program, I was puzzled by a classical optimization problem when planning my summer vacations: visiting as many western European cities as possible within a month under my meager student budget. In the end, the travel was terrific (my friends and I visited about thirteen destinations), but the planning phase was very laborious, and the itinerary was, most likely, far from optimal.

Going back to Brazil, I took advantage of my frustration to design and solve a travel planning problem, which became the topic of both my graduation project and my MSc dissertation thesis. In parallel with my master's degree, I worked as a lecturer at the Federal Center of Technological Education of Minas Gerais (CEFET-MG). By then, I was teaching IT-related topics (e.g., automation via web, android development, web design) daily for a BSc in Mechatronics Engineering and an IT technical degree.

At the end of 2016, I stop lecturing at CEFET-MG to pursue a Ph.D. at TU Delft. I worked within the "Dynamic Fleet Management" module of the Integrated Cooperative Automated Vehicle (I-CAVE) project, a multi-disciplinary and cross-university joint effort covering all research fields related to developing and deploying autonomous vehicles (AVs). My thesis, "Dynamic Fleet Management for Autonomous Vehicles: Learning- and Optimization-Based Strategies," focuses on addressing the logistical challenges and opportunities arising from adopting shared AV fleets in urban environments. It presents a series of strategies to guarantee service quality throughout operational scenarios throughout the timeline of AV technology deployment.

In my postdoctoral research, the focus has changed from surface streets to water: I worked on the Transportation and Logistics Over Water (TRiLOGy) project. This project aims at improving city livability by efficiently using urban waterways for mobility and logistics applications. My research was mainly concerned with designing optimization models that can leverage stochasticity in the demand and network conditions to route and schedule hybrid (over water and land) fleets of (autonomous) vehicles. Also, we worked closely with Amsterdam Municipality to design dynamic stochastic algorithms for managing fleets of autonomous vessels to (partially) carry out the city's day-to-day logistics services, such as waste collection and freight delivery.

Education

> I enjoy teaching because it allows me to witness first-hand students' skill acquisition process (improving how they solve problems) while honing my skills as an educator, presenter, and researcher.

Throughout my work as a:

- full-time lecturer at the Federal Center of Technological Education of Minas Gerais (CEFET-MG) in Brazil,
- supervisor of master students at TU Delft, and
- mentor of an early-stage Ph.D. student at TU Delft,

I earned extensive pedagogical experience in the design and conduct of a range of different courses and daily interaction with a diverse body of students from different educational backgrounds.

Teaching

Before starting my doctoral studies, I worked for 1.5 years (40h/week) at CEFET-MG in the Department of Informatics, teaching computer science disciplines for a BSc in Mechatronics Engineering (4 one-semester courses) and a career-focused IT technical degree (2 one-year courses). Teaching day-by-day to 50+ students at different levels (high-schoolers and bachelors) taught me that fulfilling the learning objectives is rooted in organization, clarity, and, most importantly, contextualization.

I foster student engagement by tailoring the content to guarantee that they quickly recognize its relevance and applicability. For example, the lessons of my "Web Development" course focused on recreating the features of students' everyday social networks, such as Instagram photo filters or Facebook-inspired databases and user interfaces. Further, when teaching "Automation via Web," I assisted student groups in designing practical projects that embodied all the learning

objectives. This way, they could use their creativity to develop applications appealing to them (e.g., a web-controlled home automation system) while practicing the course's concepts.

To improve content retention, I seek to include plenty of examples and eye-pleasing visualizations in my lectures. I painstakingly prepare slides to ensure a clear and intuitive message gets across and design interactive assignments to illustrate concepts vividly. Still, I am aware these are supportive materials and regard my teacher role as a "tour guide" that enthusiastically contextualizes the content. My students have always deemed me friendly and rigorous, with high standards and expectations. This attitude translates to being approachable and providing detailed feedback in reports and assignments, both in the classroom and as a supervisor.

Supervision

At TU Delft, I proposed and supervised MSc graduation projects and literature/research assignments spun off from my work on transportation and, more recently, working as a teaching assistant in the course "Machine Learning for Transport and Multi-Machine Systems." As a supervisor, I seek to tailor the topic and the approach to fit the students' aspirations and preferences, helping them develop a feasible plan to achieve their goals while delivering quality work that complies with the program's requirements. To ensure they are on track and focused, I adopt an Agile methodology of continuous and iterative improvement through constant feedback.

Teaching and supervision at UT

As a teacher at UT, I am responsible for two *Industrial Engineering and Management (IEM)* courses: *Warehousing* (MSc - 4th quarter) and *VBA/Excel* (BSc - 1st quarter and Premaster - 2nd quarter). These courses have a wealth of legacy material, having been lectured for experienced teachers for 5+ years, and present different challenges. While *VBA/Excel* is (mainly) lectured to first-year students fresh from high school, *Warehousing* is geared towards last-year MSc students on the verge of entering the job market. Throughout this UTQ portfolio, I will show how I finetune my approach and materials to adequately cater to the needs and aspirations of these different student bodies.

Finally, as a supervisor, I am involved as a first/second supervisor in both BSc and MSc graduation projects. I supervise students whose project topics lie at the intersection of OR/ML (methods) and transportation/warehousing (context).

Part I

Designing or redesigning teaching

The design of education is the basis of all teaching and organized learning. Without a design teaching is random and not aimed at learning.

> "Teaching is the process of attending to people's learning needs, experiences and feelings, and making specific interventions to help them learn particular things".

Mark K. Smith, in What is teaching? A definition and discussion

1 Warehousing in the MSc IEM curriculum

> Describe how the course ILOs contribute to the module and programme outcomes. Enhance this by making a table or show a diagram how the Programme learning objectives flow to the module learning objectives flow to the course learning objectives. This shows the common thread and how you have carefully considered this when designing.

1.1 Learning outcomes in the context of the program competences

An explanation on how the intended learning outcomes of the course contribute to the outcomes or competences of the degree program.

- Describe how the course ILOs contribute to the module and programme outcomes.
- Enhance this by making a table or show a diagram how the Programme learning objectives flow to the module learning objectives flow to the course learning objectives.
- This shows the common thread and how you have carefully considered this when designing.

[[Pasted image 20230207073302.png]]

1.2 Research and Industry

2. An explanation on how the education connects to ongoing research, or future field of occupation.

Tell us about how your course is at the forefront of innovation and how you keep abreast of new developments while balancing rigor and quality.

1.3 Institutional alignment

3. An explanation on how the education design fulfils the rules, institutional regulations and educational vision of the University or faculty.

Here you can refer to (for example) :

https://www.utwente.nl/en/tom/why-tom/

https://www.utwente.nl/en/ces/celt/toolboxes/student-driven-learning/

https://www.utwente.nl/en/organisation/about/shaping2030/

Also... are there any departmental or group regulations that are unique to your context? Share them.

1.3.1 Regulations

1.3.2 Educational vision

1.4 Aligning learning outcomes to MSc level

4. The level of the intended learning outcomes is appropriate to the place of the course in the program.

Write a short paragraph explaining Blooms Taxonomy. Then explain how you considered Blooms taxonomy when articulating your course's learning objectives.

https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

And how you were careful to make sure he levels were appropriate for your students (i.e. lower levels on pyramid for novices, higher up for M students).

2 Teaching design and constructive alignment

2.1 Course redesign

Here, refer to your situation in the course. Maybe you inherited an outdated model, maybe you had bad feedback from SEQ. Tell us the reasons you identified a need to change, then tell what you changed and the intended effect it had. Reflect a bit on how you feel about the changes (are you proud etc?) Maybe make a table, show old vs. new parts and why they are better?

Look up the ADDIE cycle – you probably used something similar –

https://www.learnupon.com/blog/addie-5-steps/

Break down these step and explain your process fully.

2.2 Intended Learning Outcomes (ILOs)

Upon finishing the MSc Warehousing course, students will be able to:

- Explain the role of warehousing in supply chains.
- Identify warehouse types, functions, and operations.
- Discuss major planning, design, management, and control decisions in contemporary warehouses.
- Discuss storage and material handling objectives, principles, and technology.
- Discuss emerging warehousing challenges, trends, and innovations.
- Implement analytical/quantitative methods to optimize a distribution network.
- Implement quantitative methods to optimize warehouse facility design, stock management, and operation.
- Analyze relevant data and evaluate performance metrics to support decision-making in a warehousing environment.
- Synthesize and critically evaluate relevant warehousing research and literature to inform best - practices.

2.3 Aligning modes of instruction and assessments to ILOs

How assignments, modes of instruction and assessments are related to the intended learning outcomes, and demonstrates that the intended learning outcomes are fully covered in a valid and reliable manner.

Constructive alignment is an educational approach that involves aligning learning outcomes, teaching methods, and assessment practices to ensure that students achieve the intended goals of a course. According to Biggs and Tang (2011), it is imperative for learning because it helps to create a clear and focused learning experience for students by linking all aspects of the educational process, from the desired learning outcomes to the evaluation of student achievement. This helps to ensure that students have a clear understanding of what they are expected to learn and how their progress will be assessed, and it enables teachers to design more effective and engaging learning experiences.

Section 3 present ILOs in an ascending degree of complexity, from explaining (ILOS 1, 2, 3)

As emphasized by Newton, Da Silva, and Peters (2020), a pragmatic approach to clearly identify what each ILO mean in the context of the course is to identify the corresponding assessment methods.

he authors advise against assuming a direct correlation between the verb and the level of complexity in learning outcomes. Instead, they suggest mapping learning outcomes to assessment types to give meaning to the outcome and determine its usefulness.

Common verbs associated with Bloom's Taxonomy for a Master's level course include:

1. Analyze: Breaking down information into component parts, identifying relationships among the parts, and examining the structure of the information.
2. Evaluate: Making judgments about the value of information, ideas, or solutions based on established criteria.
3. Synthesize: Combining elements in a new pattern or structure, creating a unique solution or product.
4. Apply: Using information, theories, or methods in a new situation or context.
5. Develop: Improving or refining a product or solution through iterative testing and refinement.
6. Theorize: Developing a unique explanation or understanding of a complex phenomenon or relationship.
7. Critique: Examining information or arguments with a critical eye, identifying strengths and weaknesses.
8. Justify: Presenting reasons, evidence, or solutions to support a particular point of view or decision.

Reference:

Bloom, B. S., Englehart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). Taxonomy of educational objectives: The classification of educational goals. Longmans, Green. Reference: Biggs, J., & Tang, C. (2011). Teaching for quality learning at university. McGraw-Hill Education (UK).

Here insert table showing ILO, learning activity and assessment.

N.B. Ensure the Bloom's verb actually aligns type of activity and assessment.

Intended Learning Outcome	Teaching/Learning Activities	Assessment

3 Designing learning methods and materials

3.1 Activating instructional methods and assignments

A variation of activating instructional methods and assignments in the course that enable and support the student to reach the desired learning outcomes.

Here describe different methods of activating you use, for e.g. Asking open questions, thought provoking questions, using talk partners, embedding tech like wooclap polls/quiz in lessons, using short practise tasks to elicit performance etc.

You can refer to Gagnés events?

https://www.niu.edu/citl/resources/guides/instructional-guide/gagnes-nine-events-of-instruction.shtml

3.2 Guiding students through learning activities

An explanation of how the teacher provides guidance for students to give direction to their learning activities.

Describe how you guide learning in and out of the class. Formative assessment? Scaffolding in class? Clarifications on canvas?

3.3 Hybrid education

An argued blend of face-to-face teaching and digitally enhanced or online learning

Reflect a bit on how Covid changed things and what you'd like to keep from this experience.

Hybrid education is very much a hot topic – maybe mention if this is a good option for you? Tell us about how you can make it work and how it can be a benefit for you, the students and the UT.

https://www.utwente.nl/en/telt/online-lectures/Hybrid-education/

4 Finetuning teaching design to students

4.1 Student entry level

An explanation on how the entry level (e.g. prior knowledge, earlier educational experiences) of students is addressed, as well as how the knowledge and interest of the students are taken into account when designing the course.

- Here, make assumptions of what you expect students to have already learnt – back this up by explaining what they have learnt in previous modules/courses. Also, you can mention any other support you offer to facilitate learning – e.g. extra or supplementary reading material on canvas, booster session, etc.
- If you don't know – go and speak to colleagues from previous modules. Tell us who and what you asked and what you found out.

4.2 Student background

An explanation on how the diversity of backgrounds and the needs (e.g. culture, functional impairment, learning preferences) of the students is taken into account in the course design (e.g. in the modes of instruction, selected study materials/literature, composition of project teams, explicitness of expectations).

- Here, tell us about the variety of nationalities for example (in your class) and how you take care to make sure to consider cultural differences like some cultures not questioning teachers – therefore you set expectations early to encourage desired behaviour. Or, you ensure project groups are mixed so that all students get a multicultural perspective in their teamwork etc.
- Tell us how you consider your unique contextual situation and how you have adapted your course to best facilitate learning for the varied audience.
- Have a look into UDL and see if you can mention something about this. (https://teaching.cornell.edu/teaching-resources/designing-your-course/universal-design-learning#:~:text=Universal%20design%20for%20learning%20(UDL,hurdles%20in%20the%20learning%20process.)

4.3 Student development: independent learning and self-reflection

An explanation on how students are stimulated to develop themselves as independent learners / stimulated to think actively for themselves and develop critical self-reflection.

- Independent learning is when pupils set goals, monitor and evaluate their own academic development, so that they can manage their own motivation towards learning – how do you do this? Or how would you like to do this? Nice examples below: https://blog.irisconnect.com/uk/blog/9-tips-for-encouraging-students-to-become-independent-learners/
- Critical self-reflection refers to the process of questioning one's own assumptions, presuppositions, and meaning perspectives (Mezirow, 2006). How do you do this? Nice examples below: https://www.enhancementthemes.ac.uk/docs/ethemes/student-transitions/critical-self-reflection.pdf (see practical strategies)

5 Practical and logistically feasible teaching design

5.1 Course practical details

Name: Warehousing **Level:** Master of Science **Faculty:** Behavioural, Management and Social Sciences (BMS) **Module:** 191820120 (see on Osiris) **Credits (ECTS):** 5

5.1.1 Participating study

- MSc Mechanical Engineering
- MSc Industrial Engineering and Management

5.1.2 ECTS

The Warehousing course has a total study load of **5 ECTS**[1] (140h). Table 5.1 shows the estimated study load per activity (see reasoning behind estimates and workload estimator).

Table 5.1: Warehousing course study load.

Activity	Number	Duration (h)	Workload (h)
Lectures + Q&A	21	2	40
Practicals	10	2	20
Assignments	5	5	25
Required literature (slides, articles, book excerpts)	150 pages	5–10 pages/hour	~16[2]
Quizzes (preparation)	4	6	24
Written report	2	7[3]	12
Final Exam	1	3	3

[1] ECTS: European Credit Transfer System. One ECTS is equal to 28 hours of study.
[2] 7 pages/hour (Page Density: 750 words/page, Purpose: Engage(1/3)/Survey(2/3), Difficulty: Many New Concepts).
[3] 500 words of genre "Research" equal on average 6 hours per page.

Activity	Number	Duration (h)	Workload (h)
		Total	**140**

5.1.3 Facilities

Lecture rooms are expected to feature blackboards and electric sockets and host 80-100 students (lectures, practicals) and 200 students (quizzes). The rooms for quizzes are required to be more spacious because students will work in groups to answer questions (see details about team-based learning (TBL) in Section X). More space allows adequate group separation and helps minimize cheating.

5.1.4 Teaching team

Lecturers

- Breno Alves Beirigo (b.alvesbeirigo@utwente.nl)
- Derya Demirtas (d.demirtas@utwente.nl)
- Lin Xie (l.xie@utwente.nl)

Student assistant

- Josien Mourik (j.b.mourik@student.utwente.nl)

5.1.5 Course overview

The course spans ten weeks (see a weekly summary in Table 5.2). We are expected to have two 2-hour lectures (L) and one 2-hour practical (P) each week. The four quizzes will take place during lectures and will be hosted in more spacious lecture rooms.

Finally, we have two closing activities before the exam: the project presentations and a Q&A session.

Table 5.2: Warehousing (2023) course overview (*L = Lecture, P = Practical*).

Wk	**Date & Time**	**Room**	**Type**	**Topic**	**Lecturer**
17	Apr	SP1	L	Syllabus/ Introduction	Derya, Lin, Breno
		SP1	L	Distribution network design: Distribution tradeoffs / Facility location I	Breno, Derya

Wk	Date & Time	Room	Type	Topic	Lecturer
18	May	SP1	L	Facility location II	Derya
		SP3	L	Facility location	Derya
		SP3	P	Facility location	TAs, Derya
19	May	TL 3330	L	*Assessment 1*	Breno
		HR N109	L	Warehouse performance optimization	Breno
		NH 207	P	Warehouse performance optimization	Breno
20	May	CU B209	L	Warehouse performance optimization	TAs, Breno
		NH 209	L	Warehouse design: facilty layout	Breno
		SP 1	P	Warehouse design: facilty layout	TAs, Breno
21	May	CR 3C	L	Warehouse design: Unit-load warehouse layout	Breno
		CR 3C	P	Warehouse design: Unit-load warehouse layout	TAs, Breno
		CR 3C	L	*Assessment 2*	TAs, Breno
22	Jun	OH 211	L	Warehouse operation (storage): Inventory management	Breno
		OH 211	L	Warehouse operation (storage): Slotting	Breno
		OH 211	P	Warehouse operation (storage): Slotting	TAs, Breno
23	Jun	RA 2334	L	Warehouse operation (storage): Slotting	Breno
		CR 2K	L	*Assessment 3*	TAs, Breno
		SP 1	L	Warehouse operation (order-picking)	Lin
24	Jun	RA 3334	P	Warehouse operation (order-picking)	Lin
		CR 2M	L	Warehouse operation (order-picking)	Lin
		SP 1	P	Warehouse operation (order-picking)	Lin

Wk	Date & Time	Room	Type	Topic	Lecturer
25	Jun	WA 1	L	*Assessment 4*	TAs, Lin
		SP 3	L	Warehouse challenges, trends, and innovations	Breno
		SP 3	P	*Project presentation*	Breno, Derya, Lin
		SP 3	L	Q&A	TAs, Breno, Derya, Lin
26	Jul	CR 3C		***Final exam***	TAs, Derya, Lin, Breno
27	Jul	CR 3C		***Resit***	TAs, Derya, Lin, Breno

5.2 Teaching logistics

Both lecturer and student activities (e. g., grading, giving feedback) can be dealt with realistically in the available time.

- This can be incorporated into the above paragraph, but you could make this very clear by making a type of time line with the various activities that you and the students undertake over the 10 weeks. Include the "behind the scene tasks" such as lesson preparation, setting of exams, marking, etc.
- Reflect on your workload and your practice.
- Do you have any goals to improve or insights you gained?

References

Newton, Philip M., Ana Da Silva, and Lee George Peters. 2020. "A Pragmatic Master List of Action Verbs for Bloom's Taxonomy." *Frontiers in Education* 5. https://www.frontiersin.org/articles/10.3389/feduc.2020.00107.