

FROM CONCEPT TO APPLICATION

To gain insight into the practical aspects of implementing CBL in the classroom, TU/e innovation Space interviewed three pioneers in CBL: **Isabelle Reymen, Jorge Uquillas Paredes and Miguel Bruns.**

Each of these educators brings a unique perspective and experience to the conversation. They share the struggles and benefits they found in implementing CBL in their classrooms, and offer valuable advice for other teachers interested in adopting this approach. Whether you are an experienced educator or just starting out, their stories are sure to inspire and inform your own teaching practice.

Summary of the interviews

Adopting challenge-based learning can be a significant change for educators, particularly if they are used to more traditional teaching methods. It may require rethinking the curriculum, modifying assessments, and providing additional support for students. However, the benefits of challenge-based learning far outweigh the struggles. The approach offers a more engaging and relevant learning experience for students and prepares them for success in their future careers. As Jorge, Isabelle and Miguel can testify, this approach can help educators meet the needs of a changing workforce and create a more innovative and dynamic learning environment. While the transition to challenge-based learning may not be easy, it is well worth the effort for the long-term benefits it offers to students and educators alike.

Jorge Uquillas Paredes Medical researcher and Digital Twin in Healthcare Coordinator

“At the end of the day, it is all about how much students are going to learn with your method. Students have so many things to learn, and you are the one providing them with this knowledge. You must learn to let go and lose control of how much students are going to learn; you need to know how to filter out what is important and what is not.”



Jorge Alfredo Uquillas Paredes, medical researcher at Eindhoven University of Technology, shared in this interview that he is experimenting with challenge-based learning (CBL) in his courses. When asked about the reaction of the students, colleagues, and people around him, he stated that the faculty liked the idea of spicing up a new course with CBL modules. That’s how Jorge had the opportunity to develop an interdisciplinary CBL course, the Digital Twin in Healthcare.

Jorge believes that students need to take ownership and responsibility for their projects in a CBL course, but often, students are not used to that because they come from high schools where they learn, memorize, take an exam, and move on to the next course. Historically, students’ values and intelligence have been represented by grades, which do not necessarily mean or prove their skills and competency. In a CBL course, students are not lectured and only have one manageable midterm. They need to spend many hours designing their plan, understanding their strengths and weaknesses, and filling in the gaps in their knowledge. They also need to teach their peers things they know, connect with their external stakeholders (in the case of Digital Twin in Healthcare, clinical liaisons), and keep the challenge owner in the loop. These are mature responsibilities that they are not used to, which makes the beginning of the course chaotic and forces students to learn how to deal with uncertainty.

However, Jorge believes that students grow into these responsibilities, and make students more self-directed. For example, in CBL, students develop a skill for finding papers, websites, and products for quality research and design. In the vast world of the internet, they need to learn how to discriminate between good and bad data and information. Therefore, CBL is there to teach them critical thinking.

Jorge continues describing the role of failure in education and research. He believes that failing is more valuable than “getting it right” the first time because real science requires iteration, frustration, and difficulties. In a CBL course, he sees that the progress of the teams is quite heterogeneous. Out of ten teams, two or three can “fly immediately”, but the majority needs more nurturing and help, to learn from their small and big failures.

Jorge considers CBL and hands-on learning as interchangeable because both involve proper problem-solving skills. Being trained as an engineer and medical specialist, he learns different problem-solving skills daily, which he finds remarkably similar to the educational concept of CBL. CBL teaches students to find the best solution possible for different contexts and problems.

However, Jorge also acknowledges the concerns about CBL as an educational concept. The quality of outcomes of a CBL course and the student learning are directly proportional to the quality of the teaching and teachers. So, the people who coach and support students, whether teaching assistants, master or PhDs students, need to be properly trained and it is challenging to teach students to guide other students’ teams. Secondly, teachers need to become comfortable with “not knowing” or “not having everything under control”. Teachers need to keep learning about the latest developments in their field and let go of outdated knowledge. If teachers follow this approach, it is logical to revamp and re-engineer courses every once in a while to renovate their content and the things that are essential for students to learn. Similarly, they should also renovate the way they teach.

Isabelle Reymen
Scientific director, TU/e innovation Space

“Everyone should try to understand that the world is changing. I think this awareness of the need of change is the most important thing.”



In a recent interview with Isabelle Reymen, associate professor at Eindhoven University of Technology (TU/e) and scientific director of TU/e innovation Space, she discussed the challenges of training students for enhanced employability in the industry, innovating higher education courses and curricula, and her vision for education. Reymen has been involved in teaching for 20 years. In 2015, she was asked by the university’s rector and dean to design and set up TU/e innovation Space, which led her to become even more active at TU/e. Reymen has since initiated many more education innovation projects, amongst which the University of the Future project.

Reymen first learned about Challenge-Based Learning (CBL) in 2017 while researching what was happening at the forefront of the engineering world. She mentioned CBL as an alternative term for hands-on learning at a dinner for all the professors at TU/e. Reymen saw a big opportunity in what Apple was doing with their “challenge-based learning” approach and wanted to make education more relevant and impactful following this inspiration. Later, in the Comenius Leadership project, Reymen and her team further shaped CBL based on literature and by involving education scientists. The TU/e CBL Compass evolved out of the initial list of characteristics she laid out to describe Challenge-Based Learning. According to her, Reymen and her team first implemented CBL and then came up with a name.

Reymen has an interest in innovating and designing on a program level, aiming for system innovation, and changing the system through small steps. Reymen aims to make education more interdisciplinary and integrate entrepreneurship into it. Reymen wants students to take ownership of their learning and apply their knowledge to real-world situations.

Reymen believes that higher education should be interdisciplinary and not departmentalized. The TU/e Honors Academy and TU/e innovation space, where Reymen has played a significant role in developing, are examples of interdisciplinary education. Since the TU/e has these great examples of implemented challenge-based learning, Reymen continues to pursue her vision and to create a prototype for an interdisciplinary educational program that integrates entrepreneurship, project-based learning, and innovation. When this will come to life, Reymen believes that education will finally fulfill the purpose of training students to become innovators and entrepreneurs, who are capable of making a positive impact on society.

Miguel Bruns**Theme Lead Interactive Materiality, Future Everyday Group, Industrial Design at TU/e**

"I wanted my students to follow a very strict design process. I ended up having a lot of unhappy students at that time because they wanted to have their own vision and identity and not mine. Hence, I started to revise and reconsider my procedures. I think one of the most important things is the ability to let go and trust the students within a particular context."



Miguel Bruns, Associate Professor at TU/e, in this interview talks about his background and journey with challenged-based learning (CBL). His education and work have focused on designing for the future, which he believes helps him to be open to different perspectives and attitudes. Miguel started his teaching career by being very strict with his students, expecting them to follow a specific design process. He quickly realized that his approach was not successful as it did not allow students to have their own identity and vision. Therefore, he revised his procedures and now focuses on giving responsibility to students and letting them realize that they are studying for themselves, and not to meet some external expectation. Miguel's advice for teachers transitioning to CBL is to let go of control and focus on supporting students to achieve their ambitions.

Miguel believes that the most challenging aspect of CBL for teachers is letting go of their responsibility. He explains that a teacher's responsibility is to support students in achieving their ambitions, and if students do not have ambitions, it is not the teacher's responsibility to help them pass the course. Miguel emphasizes that his focus is on students who want to learn and are willing to put in the effort to do their best. He argues that students who are willing to learn, regardless of their background, can become "an elite" of life-long learners, in terms of their perspective and competence on the subject matter.

Miguel's coaching approach is centered around supporting students who want to learn. His approach involves giving students the freedom to explore and experiment and to trust them to operate professionally within a particular context. He emphasizes that coaching is about helping students achieve their own ambitions and setting ambitions for them, in the form of grades or exams. He wants his students to realize that they are here (at TU/e) because of their own choices and that they need to take responsibility for their learning.

Miguel's experience with CBL has taught him that the most important thing is to trust the students and his advice for teachers who are transitioning to CBL is to let go of their preconceptions about learning and teaching and put more responsibility in the students' hands.