US-China Education Review A, December 2025, Vol. 15, No. 12, 838-844
doi: 10.17265/2161-623X/2025.12.003

Detection of Territorial Challenges and Co-creation of Knowledge

Òscar Redondo, Mireia Gal í
The Autonomous University of Barcelona, Barcelona, Spain

This paper describes the process of capturing challenges and the co-creation of knowledge at the Universitat Autònoma de Barcelona (UAB) through Challenge-Based Learning (CBL). In collaboration with the quadruple helix—citizens, public administration, universities and companies—real problems in the territory are identified and innovative and sustainable solutions are developed. The objectives of the research are: to examine the process of detecting challenges and their definition adapted to university teaching; to analyse the potential of CBL as a methodology for the co-creation of knowledge between the university and the territory; and to evaluate the impact of the solutions developed on local communities and students. The process includes meetings with the stakeholders involved to identify needs and the co-creation of solutions in collaboration with the students, guided by the teaching staff. The results show the feasibility of the model to solve real problems and improve student engagement.

Keywords: quadruple helix, challenges, learning, innovation, sustainability

Introduction

Challenge-Based Learning (CBL) is a learning methodology based on a real experience: Participants face a specific problem in the territory and, together with the stakeholders involved, explore possible options for improvement, coming up with a possible solution proposal, which ends up being implemented and evaluated (Kohn Rådberg, Lundquvist, Malmqvist, & Hagvall Svensson, 2020; Tecnológico de Monterey, 2015).

This methodology consists of three different phases: engagement, research, and action, all of which include the reflection of the participants, as can be seen in Figure 1.

The person in charge of coordinating a training challenge experience is a facilitator or *teamcher* (a term coined by the ECIU University): a person who is an expert in the subject to be dealt with, who coordinates and energizes the group of participants and is the connecting element between them and the entity that provides the challenge. The working groups are multidisciplinary, and each member contributes with their knowledge and experience to the analysis of the challenge and the formulation of the final proposal. In this sense, this methodology opens the possibility of bringing together students and teachers different subjects from different backgrounds in order to solve a challenge in the territory.

Acknowledgments: We are grateful for the funding provided by the Erasmus+ Programme, specifically within the framework of the European Alliances Initiative, which has funded the ECIUn + ECIU University project (ERASMUS-EDU-2022-EUR-UNIV). Also, to all the people involved at the UAB and the ECIU University.

Òscar Redondo, Institutional Projects Office, The Autonomous University of Barcelona, Barcelona, Spain.
Mireia Galí, Institutional Projects Office, The Autonomous University of Barcelona, Barcelona, Spain.

As for the stakeholder that provides the challenge to be solved, this can be a private company, a public institution, an NGO... in general, any stakeholder that has a strong connection with the territory.

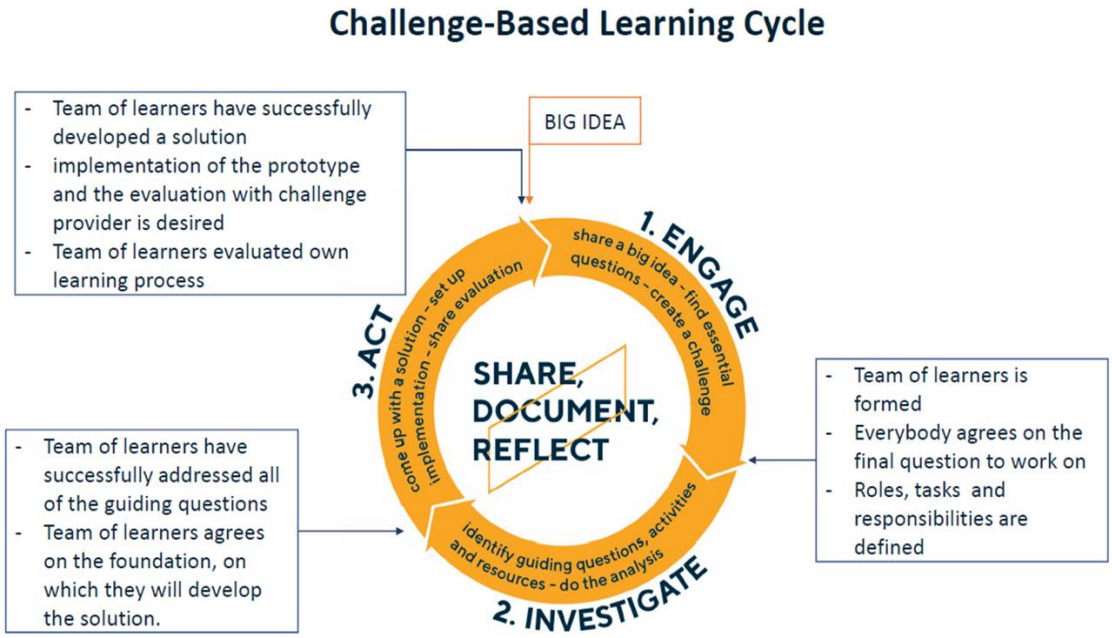

Figure 1. Challenge-based learning cycle. Source: Ellinger and Simon (2020).

In this way, the main objective of the implementation of this methodology is to move towards a university that is much more open to society, and with a real impact on its natural territories (what can be defined as its ecosystem), seeking integrated approaches for the socio-economic development of the territories, creating regions of knowledge in which universities play a leading role as dynamic elements.[1] This approach seeks the active participation of the different social agents (quadruple helix: governments, academia, companies, and civil society) in the development and application of strategies for social and economic dynamization and innovation, always in accordance with the needs and potential of this territory.

In this sense, the process of detecting and capturing challenges so that they can be worked on in the classroom is crucial. Multi-stakeholder collaboration, the definition of the challenge, and its adaptation to the teaching guides are tasks that require a long and well-defined process.

The Universitat Autònoma de Barcelona (UAB) is a member of a European Alliance, the ECIU University. This alliance has allowed the UAB to act as a testing ground for the implementation of Challenge-Based Learning (CBL) in a protected environment. Over time, this has paved the way for parallel curricular integration of CBL across the university, ensuring a smoother adoption process and a broader impact.

The challenges of the ECIU University are mostly aligned with the United Nations Sustainable Development Goal (SDG) Number 11—Sustainable Cities and Communities and have been offered across the consortium as extracurricular activities with credit recognition.

Currently, however, with this initial stage closed, there is already a definitive process for designing challenges, as well as a guide for the implementation of Challenge-Based Learning in the University's subjects

[1] Higher Education for Smart Specialisation, https://s3platform.jrc.ec.europa.eu/higher-education.

(Blanch, Franco, Redondo, & Ronzoni, 2024), which contains the key elements for implementing CBL in a subject and resources linked to the definition and support tools for each phase, as you can see in Figure 2:

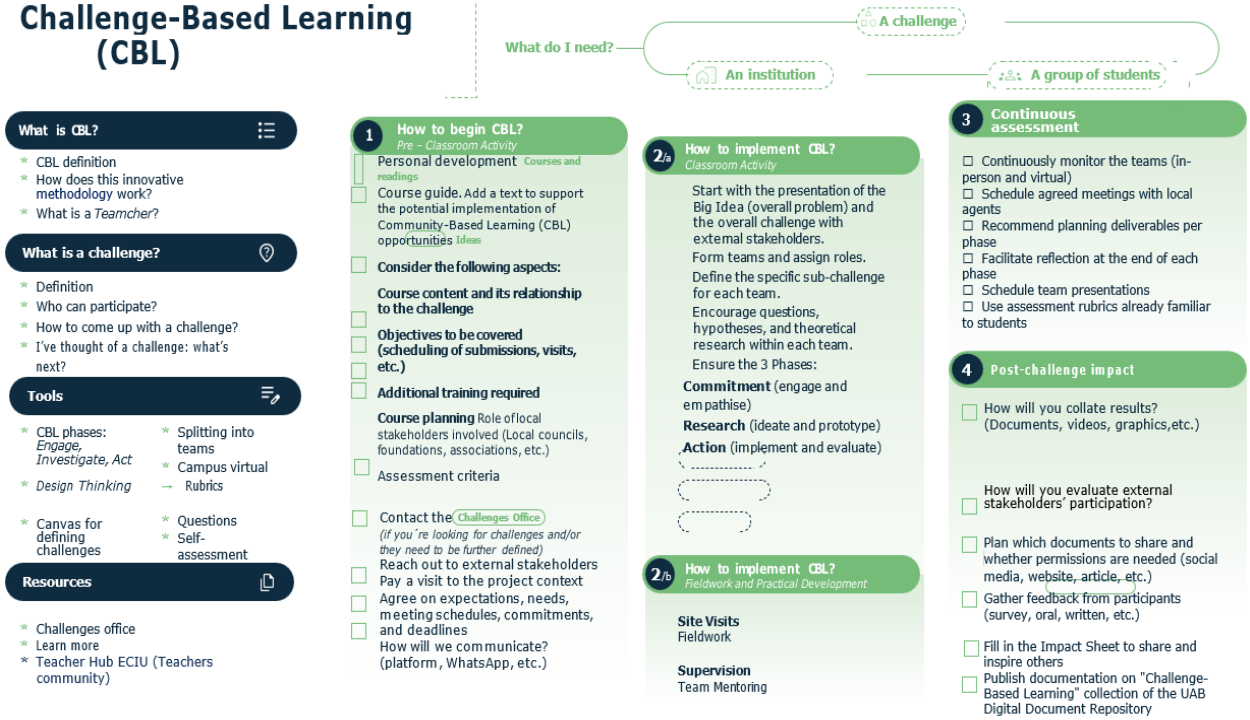

Figure 2. Guide for teachers to implement challenge-based learning. Source: Blanch, Franco, Redondo, and Ronzoni (2024).

Process of Defining Challenges

For the past two years, the Universitat Autònoma de Barcelona has had a Challenges Office that has different tasks, both in terms of research and education. With regard to the latter, the teaching innovation methodologies that require connection with institutions in the university ecosystem (Service Learning (SL) and Challenge-Based Learning (CBL)) have unified the processes of contact with the stakeholders in order to centralise communications for the University as a whole.

In this sense, the Universitat Autònoma de Barcelona itself is becoming a benchmark in the ecosystem when it comes to responding to local problems through the co-creation of knowledge.

Contact With the Stakeholder

Institutions, organised citizens, and private companies contact the Challenges Office in order to raise challenges and needs that they have detected. The person responsible for defining the challenges meets with the stakeholder in order to have more information about it and decide how the University should respond.

Depending on the complexity, as well as the characteristics of the agents involved and the groups of citizens affected, the challenge is faced by different research groups, by involving students from different subjects or within the framework of the ECIU University, always in a multidisciplinary way.

One of the main obstacles that has been encountered is the stakeholder's sense of belonging to an ecosystem. It is often difficult for stakeholders to perceive the Universitat Autònoma de Barcelona not as a consultancy, but as another territorial actor with whom to establish a collaborative relationship to address a shared challenge.

For instance, some small companies have declined collaboration, despite their interest in participating,

because they are unsure whether the potential impact of the collaboration will sufficiently justify the effort and resources they are required to invest.

Definition of the Challenge

During this process, the Teaching and Research Staff expert in the subject, the representatives of the stakeholder, and a person from the Challenges Office, define in an appropriate way according to the academic credits that the subject has, and agree in terms of the point of view when addressing the problem.

This first step makes it possible to identify and understand relevant aspects of the identified problem, such as the degree of incidence, the main actors affected, the associated social and cultural factors, or the sense of urgency to solve it. In addition, it helps to reflect and visualize the desired change that is to be achieved in the territory.

For example, during the first semester of the 2023-2024 academic year, teachers from three different degree programs (Faculty of Education Sciences and Faculty of Psychology) collaborated with the directors of the schools in the Rural Schools Zone (ZER) of Moianès to define the challenge using the template shown below.

The main obstacle encountered during this process was the formulation of a challenge that was specific enough to be addressed within a single semester, while also being broad enough to allow for exploration from multiple disciplinary perspectives and to promote student innovation.

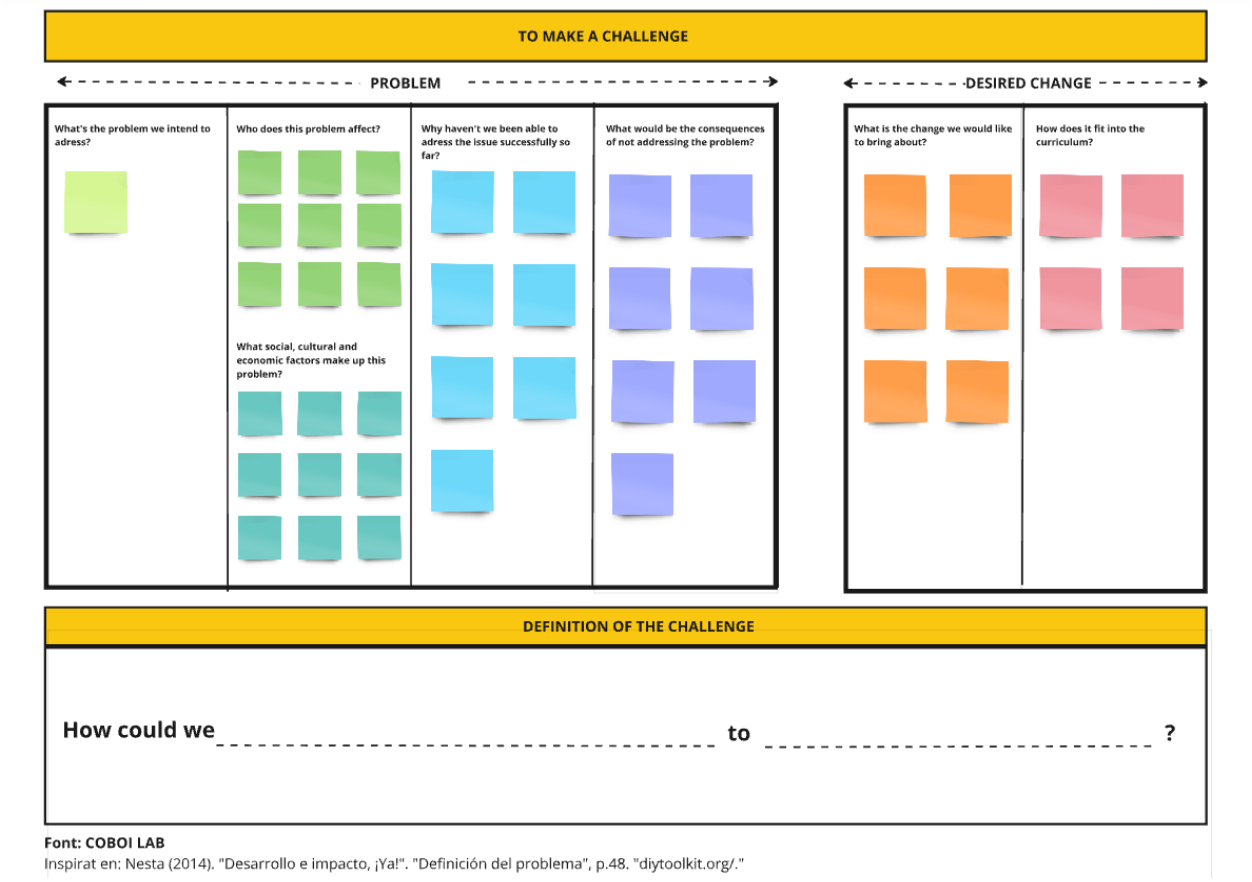

Figure 3. Guide to define a challenge. Source: COBOILAB (2016).

Challenge Work Based on Challenge-based Learning (CBL)

It is at this point that the three phases of Challenge-Based Learning begin, always based on the *Design Thinking Methodology*:

- Engage: The basis of motivation is to work on a "big idea". It can be anything within a social, economic, or environmental issue, such as health or public transport. All participants, teachers, students, and external partners make sure to agree on the final challenge to be worked on and to define initial indicators that allow the impact achieved at the end of the action to be evaluated
- Investigate: The whole team must make sure that everyone understands the challenge and can contribute to solving it with their knowledge and skills. Teams can use micromodules to fill knowledge gaps or acquire new skills that can help them solve the challenge.
- Act: Local stakeholders can use their shared knowledge to design, evaluate, and prototype new solutions. The teams can also offer the proposed solutions, which can include services, products, research questions, start-ups and spin-offs.

Results

During the academic years from 2020 to 2024, the ECIU University has offered 95 challenges for students across all member universities, involving faculty and administrative staff who act as *teamchers* (usually two experts in the subject area).

At the UAB, seven challenges have been proposed: four standard challenges (lasting six months) and three mini challenges (lasting between one and three months), integrated into four courses and three Bachelor's Final Projects. Up to 70 students have participated in teams to address these different opportunities. The challenges represent between one and six ECTS for students, depending on the challenge's duration.

Additionally, 150 micromodules have been offered, covering topics such as language learning, gender, interculturality, etc. These micromodules are recognized with between one and six ECTS.

In the last years, the number of Pilot Faculties that implement Challenge-Based Learning (CBL) has been increasing year after year. Currently, all faculties have subjects that work with this methodology and there is no longer talk of a pilot test, but of a teaching innovation methodology that is present in a generalized way throughout the university. In addition, a Challenge-Based Learning Day is held annually, where stakeholders, teachers, and students participate, in order to reflect on the implementation of this methodology.

During the 2023-2024 academic year, more than 30 subjects and 20 Bachelor's Thesis were carried out with this methodology, thus involving more than 500 students from the University. Below in Table 1 you can see different information from the last year:

Table 1

Data on the Implementation of the CBL at the UAB for the 2023-2024 Academic Year. Source: Own Elaboration

Data for the 2023-2024 academic year	
Areas involved	18
Teachers	70
Students	525
ECTS	174

At the curricular level, an example to highlight is the challenge that was carried out jointly between the

Faculties of Education Sciences and Psychology, with the collaboration of the ZER-Moianès Llevant (a network of rural schools in Catalonia), consisting of finding ways to transform the teaching of the written language and thus improve the writing of students. About 200 students from different subjects participated, coordinated by five teachers from the University, over the course of a semester.

To date, there is already a network of more than 800 agents in the territory who have adapted to the UAB's academic calendar when it comes to proposing challenges and collaborating in the design of the University's own teaching guides.

Conclusions

The experience of offering and implementing challenges has been highly valued by both the university, the students, and the stakeholders involved. The students have especially highlighted participation in real challenges and teamwork, underlining how this methodology has allowed them to learn in a more meaningful way, especially when they have had the opportunity to travel and get to know first-hand the communities where the challenges are located.

The initial barriers related to time and the integration of challenges in curricular subjects have been overcome thanks to the accumulated experience, facilitating the sustainability of implementation and the use of support tools for better planning.

In relation to the stakeholders, there are some barriers that still need to be overcome, such as the weight of each member of the driving team when it comes to agreeing on the same point of view in tackling the challenge. The stakeholder still does not conceive of the definition of the challenge as a process where everyone has the same representation, where knowledge is generated in equal parts, understanding that the important thing is to respond to the Sustainable Development Goals (SDGs) together, involving the different actors and groups affected.

In this sense, the conception according to which the University is the only institution that generates and transfers knowledge to the outside world continues to prevail within the ecosystem, although the first changes that are moving towards the co-creation of knowledge can already be observed, especially by City Councils and NGOs.

On the other hand, stakeholders positively value the implementation of Challenge-Based Learning, as well as its greater involvement in university education. To date, there is already a network of more than 800 stakeholders who have adapted to the UAB's academic calendar when it comes to proposing challenges and collaborating in the design of the University's own teaching guides.

References

Blanch, S., Franco, D., Redondo, O., & Ronzoni, M. (2024). Guide to implementing ABR at the UAB. *DDD*. Retrieved from https://ddd.uab.cat/record/291917/

ECIU University. (n.d.). Retrieved from https://www.eciu.eu/

Ellinger, D., & Simon, S. (2020). Workshop basic principles in challenged-based learning.

Höffken, J., & Lazendic-Galloway, J. (2024). Engaging for the future: Challenge-based learning and stakeholder partnerships in sustainability education. *Sustain Earth Reviews, 7*, Article 20. Retrieved from https://doi.org/10.1186/s42055-024-00087-6

Kohn Rådberg, K., Lundquvist, U., Malmqvist, M., & Hagvall Svensson, O. (2020). From CDIO to challenge-based learning experiences—Expanding student learning as well as societal impact? *European Journal of Engineering Education, 45*(1), 22-37. Retrieved from https:// 10.1080/03043797.2018.1441265

Service Learning Network of the Catalan Universities. (2019). *Guide 0. Doing service learning at the university.* Service Learning

Network of Catalan Universities and Catalan Association of Public Universities. Retrieved from https://www.apsucat.cat/wp-content/uploads/2024/03/GUIA-0_Fer-aprenentatge-servei-a-la-universitat_DEF-1.pdf

Sukackė, V., Guerra, A. O. P. D. C., Ellinger, D., Carlos, V., Petronienė, S., Gaižiūnienė, L., … Brose, A. (2022). Towards active evidence-based learning in engineering education: A systematic literature review of PBL, PjBL, and CBL. *Sustainability*, *14*(21), 13955. Retrieved from https://doi.org/10.3390/su142113955

Tecnológico de Monterey. (2015). Observatory of educational innovation of the Tecnológico de Monterrey. Retrieved from https://eduteka.icesi.edu.co/pdfdir/edutrends-aprendizaje-basado-en-retos.pdf