BMT23
5th International Conference
Business Meets Technology.
Valencia, 13th-15th July 2023

CBL TO REVITALIZE DEEP APPROACH LEARNING OF DECISION–MAKING METHODS

Trull-Domínguez, Oscar [a1]; Peiró-Signes, Ángel [b]; and Gómez-Palacios, César [a2]

[a] *Department of Applied Statistics, Operational Research and Quality, Universitat Politècnica de València, Spain ([a1] otrull@eio.upv.es, [a2] cegopa@eio.upv.es)*
[b] *Management Department, Universitat Politècnica de València, Spain (anpeisig@omp.upv.es)*

ABSTRACT: The use of active methodologies in teaching allows students and teachers a profound change in the way they face the teaching-learning process. The traditional approach where the teacher focuses his effort on the content ceases in favour of a new approach in which the student learns by own experience and decision, reinforcing the deep approach to learning. This is essential for some areas of knowledge, such as decision making. A student cannot face a business decision making if he is not aware of how it works. The use of learning based on challenges, applied to a designed experiential activity, allows the student to feel immersed in the business process, in such a way that they pose their own challenges and thereby develop their learning capacity. The support of virtual technologies like beer factory simulator software, increases this motivation. On this occasion we have designed a simulation activity of a beer bottling factory where students set their own challenges and make decisions according to their objectives, playing inside a virtual factory designed in Factory.io. The article describes the procedures to be able to reproduce this activity, as well as the results obtained in the exercise of the activity.

KEY WORDS: *CBL; deep approach learning; decisionmaking.*

1. INTRODUCTION

Learning the methods and tools for business decision-making in the academic field is a challenge for teachers. As a general rule, it is a very difficult process for experienced people, and a level of technical training should be provided to people who have never lived in a business environment. The students lack professional experience that prevents the correct transmission of concepts and procedures. As a consequence, the student follows certain instructions, but does not achieve deep learning.

The Master's Degree in Product and Service Management (MGEPS) has generally had activities developed under Kolb's Experiential Learning Activities (ELA) methodology (Gadola & Chindamo, 2019), since we consider that innovation in educational processes

How to cite: Trull-Domínguez, O., Peiró-Signes, A., and Gómez-Palacios, C. 2023. CBL to revitalize deep approach learning of decision–making methods. In Proc.: *5th International Conference Business Meets Technology*. Valencia, 13th-15th July 2023. 199-203. https://doi.org/10.4995/BMT2023.2023.16743

it is completely necessary. For decision-making subjects, students rely on assumptions; or, if this is the case, in which they have received training in decision-making during the first four-month period, they base them on data collection. As the students are very heterogeneous, the development of the activity is complicated.

Thus, the need to search for new active methodologies to counteract this variability in the group was determined. The challenge-based learning (CBL) methodology involves students from the beginning, starting with a real problem that is simulated in the learning context (Nichols & Cator, 2008). The students determine the challenge from a series of indications given by the teacher, so that the ideas do not wander (Gaskins & Johnson, 2015).

It was decided to apply this teaching methodology to an activity in which the students work simulating the beer filling and packaging process. With the experience of this process, they are presented with a new challenge to solve problems occurred in a virtual factory. In the process, decisions must be made within the uncertainty of not knowing how the process will turn out with a new formulation. Training in decision making is achieved through the questions and actions taken.

Additionally, some virtualization software, like Beer Factory (AKEL, 2023), permits the student to live a real factory situation, in which they "watch" and "feel" the problems occurring in the factory. We implemented this activity using that software.

In this article we show the indications to be able to reproduce the experience, as well as the conclusions obtained from ours. The theoretical concepts developed, the methodology used and the minimum resources necessary for its reproduction are described.

2. METHODOLOGY

Hypothesis and objectives

The starting hypotheses with which the study is to be carried out have the following objectives to improve the subject:

1. Change the activity from the ELA modality to a CBL methodology.
2. Determine if the new activity favors the required learning.

Based on these objectives, the following research question is launched:

RQ: What is the impact of the CBL on the motivation of the Master?

Description of the activity

The activity is organized in 2 sessions of 2 hours and 30 minutes. At the beginning of each session, the methodology to be used is described, indicating how to proceed throughout the activity.

The first session the students are involved in the factory process, using Factory.io. The students learn about the process, and the teacher explains how the performance of the factory goes. Herewith, it is established as a work object (Big Idea) to create a new solution regarding the process to improve the process. As it is the first time we proposed the challenge, we looked for a funny process, and we decided to simulate "duff" brewery (Homer Simpson's most tasted beer). A screenshot of the simulator can be seen in Figure 1.

Figure 1. Beer factory simulator. *Source: CreativeForge Games*.

Then work in phases of determined time following the CBL scheme. As support, the students have a poster (Figure 2) where they are reminded of the phases.

From this idea, the students raise essential questions, so that they are able to determine the needs and scope of the activity. Questions such as "What do we have to do…? they are not answered. The object of this phase is to determine what needs our big idea (Big Idea) requires so that the challenge is established. The challenge of each group is coordinated with the teacher, so that it makes sense not to wander in the performances.

With the determination of the challenge, the most critical phase of the learning process begins. This starts on session 1. The teacher acts as a guide, but he must do it correctly so that the students can learn. Thus, the "guiding" questions that arise must be related to the theme of the activity. The teacher must provoke this creation of questions.

Figure 2. Reminder poster of the stages of the activity.

To be effective, a series of guided activities (guiding activities) must be carried out that allow the student to deepen the subject of study. The following activities are proposed: Analyze the load/unload process of the malt; determine the format of the bottle and tack-time; measure time and productivity; Determine the main factor to be assessed.

Students have additional resources on the internet that help them determine the questions needed to meet the challenge. In addition, they are provided with ex-professional tools for decision-making. The most delicate moment is the selection of solutions. Each question, activity, and any decision taken results in a series of actions and solutions to be applied. Here the activities carried out are valued. The evaluation of the solutions leads to a single final decision.

Finally, at the end of the second session, the students disseminate their work to other classmates and groups that value the work done. The presentation and the solution adopted are valued. This is part of the evaluation of the subject, so the students put a lot of effort into doing it.

Assessment instruments

The activity ends with a survey that assesses the RQ proposed at the beginning of the section. For this, the Motivational Diagnosis Instrument for Engineering Education (MDI-EE) has been used, described in (López-Fernández et al., 2015), with a scale of values from 1 to 4. This is compared with a previous survey carried out on the students and the increase is valued. in the analyzed dimensions. The sample has been 18 students.

3. RESULTS

The compilation of the survey results are shown in Table 1. The means are used to show the values of the indicators used.

Table 1. Mean of the indicators of the MDI-EE survey carried out.

Status	M1	M2	M3	M4	M5	M6	MGen
Pre	3.15	2.05	1.87	3.03	3.12	2.76	3.01
Post	3.62	2.72	3.13	3.08	3.25	2.99	3.70

It is observed how in general the values of the indicators increase. The MGen indicator of general motivation increases from 3.01 to 3.70, demonstrating that the activity has been motivating for the students. A more exhaustive analysis of the indicators provides the information that the willingness to study (M3) and the perception of reward for the effort made (M2) are the ones that have increased the most.

4. CONCLUSIONS

The use of the CBL methodology in the subject of product development in MGEPS has reinforced the learning of the students, but, above all, the motivation. The basis of the study indicates that the student's willingness to study increases, and that it is reinforced with the rewards they obtain. This indicates that the activity has been correctly planned and the tools (the game was delighting) have been accurately selected. It should be extended to other activities of the same nature. Following the educational innovation project in which the group of authors is immersed, this technique will be implemented in other activities of the same subject, even others. The study has the limitation that it has only been implemented in one course, but similar results are expected in future courses.

REFERENCES

AKEL. (2023). *Beer Factory - Prologue*. CreativeForge Games, PlayWay S.A. https://www.creativeforge.pl/

Gadola, M., & Chindamo, D. (2019). Experiential learning in engineering education: The role of student design competitions and a case study. *International Journal of Mechanical Engineering Education*, *47*(1), 3–22. https://doi.org/10.1177/0306419017749580

Gaskins, W., & Johnson, J. (2015). Changing the Learning Environment in the College of Engineering and Applied Science Using Challenge Based Learning. *International Journal of Engineering Pedagogy (IJEP)*, *5*(1), 33–41. https://doi.org/10.3991/ijep.v5i1.4138

López-Fernández, D., Alarcón, P. P., & Tovar, E. (2015). Motivation in engineering education a framework supported by evaluation instruments and enhancement resources. *IEEE Global Engineering Education Conference, EDUCON*, *2015-April*(March), 421–430. https://doi.org/10.1109/EDUCON.2015.7096006

Nichols, M. H., & Cator, K. (2008). *Challenge Based Learning White Paper*. Apple Inc.