

Analysis of the feasibility of investment projects in real assets with PBL: a very real experience

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Abstract

This paper studies the application of the PBL methodology in the Corporate Finance I course. The project to be carried out consists of the realization of a report on the feasibility of an investment project for a company that wants to take advantage of a subvention to finance the renovation of the bus fleet towards a more sustainable one. In addition to describing the implementation, this paper analyzes the impact that the introduction of the PBL methodology has in terms of class attendance and participation in the activity and also in the rest of the course. A clear decrease in absenteeism in class and in exams is observed. Moreover, the impact on grades is analyzed, with a significant increase in marks for all the degrees under study. Finally, we interpret the surveys that were passed to the students, showing that the students recognize the value of applying PBL in the subject.

Keywords: *PBL; corporate finance; involvement; qualification; assessment.*

1. Introduction

Project Based Learning (PBL) is an active teaching methodology in which the student learns the concepts of a course by carrying out a project. According to Blank (1997) and Harwell, (1997), the project must be linked to a real-world issue whose purpose is to help the student to learn through cooperative work in search of solutions or answers.

The PBL methodology relies on the active role of the student in the learning process, and the starting point is the realization of a project that they want to carry out (Christie and de Graft, 2017). Students work in groups to identify what they need to learn to solve the project. The teacher's role is to advise, mediate, and collaborate with students. According to Hmelo-Silver (2004), "the objectives of PBL include helping students to develop flexible knowledge, practical problem-solving, learning and collaboration skills, and intrinsic motivation". This way, PBL prepares students more effectively for the future.

Among the advantages of this methodology is the increased motivation and involvement of the students. Thus, Robinson (2013) and Salam et al. (2016), among others, find that the project-based learning approach results in a student-centered environment with higher engagement and motivation. As suggested by Thijs and Verkuyten (2009), the more engaged students are, the more successful they will be in their learning since the lack of motivation and commitment can be barriers to learning if the importance of the work is not clear to the student. A consequence of this higher involvement is the improvement of student scores, as can be seen in Requies et al. (2018) and Abinzano et al. (2022), among others.

This methodology emerged at McMaster University (Hamilton, Canada) in the 1960s to tackle the demotivation of Medicine students. As Servant-Miklosa (2019) points out, that experience eventually became known as 'project-based learning' (PBL) and has since spread throughout the world and not only to medicine but also to a number of fields of education.

Finance is one of the disciplines in which the PBL methodology has been applied. Thus, Young and Legister (2018) apply PBL in the undergraduate subject of International Finance, while Parrado-Martínez and Sánchez-Andújar (2020) apply this methodology to the subject "Finance" of an MBA.

In this paper, we present the application of the PBL methodology in the subject Corporate Finance I of the degree in Business Administration and Management (BA&M) and the double degree in Business Administration and Law (BA&L) of the Public University of Navarre (UPNA). Moreover, we analyze the change in the participation and results of the course with respect to the previous year, in which the traditional methodology with lectures and partial exams was applied, as well as the evaluation of the new methodology. This implementation is part of a project of educational innovation in the Financial Economics area, supported by

the Public University of Navarre, which consisted of the introduction of active methodologies in the four subjects of the field “Basic Finance”.

2. Applying PBL in Corporate Finance I

2.1. Context

Corporate Finance I is one of the four subjects of the Basic Finance field, all of them compulsory, which start in the first year of the Degree in BA&M with Financial Operations. Then, the study of Basic Finance continues in the second year with Financial Markets and Instruments, and ends in the third year with Corporate Finance I in the first semester and Corporate Finance II in the second semester.

The aforementioned Educational Innovation Project started in the academic year 2021/2022 with the implementation of the PBL methodology in Financial Markets and Instruments. Following the success of this implementation and the assessment of its strengths and weaknesses (see Abinzano et al., 2022), it was decided to implement the PBL methodology in Corporate Finance I.

Corporate Finance I is a course in the first semester of the third year of the degree in Business Administration and Management, in three groups, and in the first semester of the fourth year of the double degree in Business Administration and Management and Law, with a single group. This course studies investment in financial assets (Unit 1) and real assets (Unit 2), specifically the evaluation of investment projects. Given the suitability of the PBL methodology, it was decided to implement it in the part dedicated to investment in real assets.

As for the contents taught in the subject prior to the implementation of PBL, Table 1 details the units included in the PBL.

Table 1: Contents of Corporate Finance until academic year 21/22.

UNIT 1: INVESTMENT IN FINANCIAL ASSETS. THE VALUATION OF RISK
1. PORTFOLIO THEORY
2. THE FINANCIAL ASSET PRICING MODEL (CAPM)

UNIT 2: INVESTMENT IN REAL ASSETS
3. INVESTMENT DECISIONS IN A CERTAINTY ENVIRONMENT (I): STAND-ALONE INVESTMENT
4. INVESTMENT DECISIONS IN A CERTAINTY ENVIRONMENT (II): INVESTMENT MANAGEMENT
5. INVESTMENT DECISIONS IN A RISK ENVIRONMENT

Both Unit 1 and Unit 2 were taught until 2021/2022 year with lectures, computer practices, partial tests, and a final exam. The former evaluation can be found in Table 2.

Table 2: Former assessment system.

Assessment system	Weight	Character
Final written exam covering the knowledge acquired.	60%	Recoverable
	Minimum mark: 5/10	
Individual theoretical-practical test of Unit 1	15%	Non-recov.
Individual theoretical-practical test of Unit 2	15%	Non-recov.
Group practices in the computer room	10%	Non-recov.

2.2. The project

In order to better engage students in PBL, it was decided to start the course with the real asset investment part, i.e., to invert the order of Units 1 and 2. The content of the former Unit 2 was mostly taught with the PBL methodology, with the exception of some issues, which were taught using the traditional methodology after finishing the project.

Following the steps necessary to build a project that ensures correct learning, suggested by Blank (1997), Harwell (1997), and Dickinson et al. (1998), among others, the project was defined as follows. The project consists of the preparation of a financial feasibility study report for the acquisition of a low-carbon bus by the Navarre company Sociedad de Automóviles Río Alhama S.A. (ARASA) in order to take advantage of the aid of the Government of Navarre within the Spanish aids published in the BOE on November 16, 2021, for the transformation of the passenger transport fleet. The product to be submitted is the report that our consultancy would deliver to the company. This report is composed of a pdf document (6 pages and annexes) and an Excel file with all the calculations and analysis.

The students must carry out the project through the completion of three versions, 0, 1 and 2. For this purpose, the work is established in seven weeks, organized as shown in Table 3.

Table 3: Organización by weeks of the PBL.

Week	Resultado de aprendizaje
1	Presentation, group formation, puzzle, distribution of topics, individual study.
2	Work in groups of specialists. Exercise resolution, individual study.
3	Work in groups of specialists. Exercise resolution, self-assessment.
4	Clarification of doubts. Beginning of Version 0.
5	Presentation and delivery of Version 0. Individual extensions and distribution. Incorporation of the extensions to Version 0.
6	Presentation and delivery of Version 1
7	Presentation and delivery of Version 2. Final individual exercise + basic knowledge test.

The students were organized into groups of three and each member was a specialist in one of the pieces of the puzzle shown in Table 4. Through the virtual platform, the material for each of these pieces was provided, consisting of notes, some basic exercises, and some more in-

depth exercises. In addition, the competing groups had to carry out a more extensive case similar to the project evaluation.

Table 4: Distribution of contents through the puzzle.

Puzzle piece	Contents
A	Initial investment and cost of capital
B	Cash-flow calculation
C	Decision criteria

The assessment of the full course is shown in Table 5.

Table 5: Current assessment of the subject Corporate Finance I.

	Weight	Method of Assessment	Character
Unit1 (PBL)	50%	On-time delivery (20% PBL)	Non-recoverable
		Version 1 of the project (15% PBL)	Non-recoverable
		Version 2 of the project (30% PBL)	Non-recoverable
		Individual exercise (15% PBL)	Non-recoverable
		Test of basic knowledge (20% PBL)	Recoverable
Unit 2	50%	Exam	Recoverable

As for the evaluation of the versions of the project, the students have the rubric of the versions at their disposal from the beginning of the course, so that they can take into account the contents under evaluation and, if necessary, the punctuation.

3. Results

3.1. Students' involvement

In line with the results obtained by Robinson (2013) for laboratory Science students, and by Salam et al. (2016) for ICT students, we obtain that student involvement improves considerably with the introduction of PBL in the course. On the one hand, class attendance in the four groups analyzed was practically 100% during the time in which the project that addresses Unit 1 is being developed, with a drop of approximately 30% when switching to the traditional methodology in Unit 2. On the other hand, participation in exams was higher compared to participation in the evaluation in the previous course. In Table 6 we appreciate that for the BA&M groups, the participation in the unit studied with PBL is higher in the course where the PBL methodology is applied, and also the participation in the whole course.

In addition, we notice that the increase in participation is higher for the part seen with PBL than for the whole course. In the case of the double degree in BA&L, there are no differences, since participation was total before applying this methodology, which is in line with the results obtained for these two groups in Abinzano and Gonzalez (2015).

Table 6: Students' non-attendance before and after PBL.

Group	2021/2022			2022/2023		
	Students	Non-attendance		Students	Non-attendance	
		Former Unit 1	Whole		PBL	Whole
BA&M	155	14.19%	1.94%	170	1.76%	1.18%
BA&L	29	0.00%	0.00%	21	0.00%	0.00%
All the groups	184	11.96%	1.63%	191	1.57%	1.05%

3.2. Qualifications

In terms of scores, Table 7 also shows a considerable improvement with the implementation of the PBL.

Table 7: Mean and standard deviation of marks before and after PBL.

Group	2021/2022				2022/2023			
	Unit 1 (former Unit 2)		Whole subject		Unit 1 with PBL		Whole Subject	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
BA&M	4.8305	1.9024	5.1171	1.8860	7.3050	1.2880	6.2385	1.3890
BA&L	7.3401	1.7051	7.2688	1.4916	8.9350	0.3770	8.6108	1.2011
All the groups	5.2797	2.1018	5.5303	2.0049	7.4870	1.3241	6.5694	1.5353

While the mean for the overall group of Unit 1 (former Unit 2) was 5.2797 before implementing the PBL, with the implementation it rises to 7.4870, this difference being significant at 1%. In addition, the standard deviation has also been reduced. As for the overall results of the course, the mean has also increased by more than one point out of 10, and with lower dispersion. Individually, we can see that although the involvement has not changed for the students of the double degree (see Table 6), their achievement, measured by their marks, has changed, which implies a better use of active methodologies by the students. These results are consistent with the ones obtained by Requies et al. (2018) and Abinzano et al. (2022).

3.3. Students' survey

After finishing Unit 1, we passed to the students a survey with different questions, in order to know their opinion and thus to detect possible problems to be fixed. Table 8 shows the aggregate responses to some of the questions.

Table 8: Results from the survey of all the groups.

	Not at all	A little	Quite a lot	To a large extent
To what extent do you think PBL outperforms traditional teaching as a learning method?	5.93%	24.58%	46.61%	22.88%
To what extent do you think that PBL has helped you learn about the evaluation of investment projects?	0.85%	22.03%	49.15%	27.97%
To what extent do you think that PBL has allowed you to get in touch with the financial reality of companies?	3.39%	20.34%	55.93%	20.34%
	Yes	No		
Would you recommend the PBL methodology in university studies?	80.51%	19.49%		

We observe that students recognize the additional contribution of PBL, and most of them would recommend the methodology.

3.4. Feasibility of the idea

We must emphasize that the idea of the project was very well received by the students, as it was something identifiable as real. In fact, a few days after the end of the PBL activity, a story appeared in the press about the launch of new electric bus lines from the company analyzed. In addition, the characteristics of the investment to be made by the company were easy to understand for the students, as it is a sector they know closely as the users they are.

4. Conclusions

In this paper, we describe the application of the PBL methodology to the part of investment projects of the Corporate Finance I course. In addition, we analyze the impact of this implementation in terms of class attendance, and participation in exams, resulting in a reduction in the number of absences. Moreover, we analyze the effect on marks, observing a significant increase in scores for all the degrees studied, not only at the PBL level, but also with effects on the entire course. Finally, we interpret the surveys and find the contribution of PBL valuable and that students would recommend this methodology for other courses.

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