Collaborative project-based learning. An experience with students of the Degree in Geography and Land Management

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Abstract- Collaborative project-based learning (CPBL) is an innovative educational methodology that facilitates meaningful learning and a greater relationship between theory and practice. This paper presents an educational experience developed in the Qualitative Techniques subject of the Degree in Geography and Land Management. It is concluded that CPBL is a methodology that facilitates attainment of competences and contextualized learning, gives thematic coherence and structure to an apparently unstructured subject, increases motivation, makes students be the main architects of their learning, stimulates vocation for research and generates a feeling of participation and relevance. The practice developed highlights the importance of tutoring, continuous evaluation, teaching coordination and the timing of tasks as crucial elements for success.

Keywords: autonomous learning; driving question; continuous evaluation; qualitative techniques; Geography.

1. INTRODUCTION

University education is undergoing a process of construction or re-construction of its identity based on internal and external changes through which it seeks to transform itself and adapt to the needs of today's society and to the new type of university student who occupies its classrooms.

There is no doubt that the process of building the European Higher Education Area (EHEA) is an example of this and that it has posed (and still poses) great challenges to the Spanish university. These challenges include the adoption of a new cyclical system for Bachelor's and Master's degrees, the development of criteria and systems for quality assurance and improvement, the adoption of the European Credit Transfer System (ECTS) and the incorporation into curricula of the development of transversal skills to complement the learning of content (Garrigós and Valero, 2012). But we must also add the development of innovative educational models in which the student ceases to be a passive entity and becomes the architect of their own learning.

Teachers committed to change have seen in the EHEA a great opportunity to improve the quality of the teaching and learning process through the use of active teaching methodologies and formative assessment systems, as opposed to teaching models heavily based on the lecture and assessment by one (or few) exams.

Within these innovative methodologies that seek a greater role for students, we find Project Based Learning (hereinafter PBL). According to Meneses (2013, p. 6) "PBL is a set of tasks based on the resolution of questions or problems through the involvement of the student in research processes in a relatively autonomous manner that culminates in a final product presented to others".

In this regard, Travieso and Ortiz (2018, p. 126) state that "PBL is discovered as a novel proposal that has reached a great boom internationally (...), even though it emerged in the 1960s it is applied today at numerous levels of education" and they state that it is based on a constructivist theory. From this position, knowledge is assumed to be a construction of the student in their interaction with the immediate environment in which they live and especially with the social situations they face.

According to the existing literature, PBL has the following characteristics: 1) the project structures the learning and the learning must be meaningful for the subject competences and for the students' experience and interests; 2) the process starts from the need and desire to learn, 3) the learning must connect the students with reality and foster engagement; 4) the project is organised around the formulation of a guiding question, 5) the students are organised in small self-directed groups that must search for information, discuss content and make decisions in the research process; 6) the teacher must be a facilitator or tutor in all phases, 7) the project is presented to an audience outside the group and 8) the students must be evaluated by the other students and by the teacher based on the prior formulation of rubrics (Vergara Ramírez, 2016).

PBL can stimulate Collaborative Learning (CL) as it requires the participation of small groups. Collaborative Project Based Learning (CPBL) is different from that based on cooperative work (Johnson and Johnson, 1999) as students are able to make consensual decisions, share tasks, learn through peer interaction and assume commitment to the whole project within the group in a self-managed way (Bould, Cohen and Sampson, 2013; Cardozo, 2010; Guerra Santana, Rodríguez Pulido and Artiles Rodríguez, 2019, Maldonado, 2018).

Ultimately, CPBL aims to generate an educational experience for students that allows them to convert the contents

into tools that can be used in other contexts and that involve the rational, relational or emotional dimensions in the learning process. The educational experience occurs when the learning experience has led to a change in the learner at the cognitive, physical, emotional or social engagement level (Pérez Gómez, 2012).

2. Context

This paper deals with a didactic experience developed in a classroom at the University of Las Palmas de Gran Canaria (ULPGC) in which it is shown that CPBL is an effective tool for the production of knowledge in university students. The aim of this paper is to describe and analyse the experience and know the students' own perception of the educational process.

The experience is developed in the subject of Qualitative Techniques in the Degree of Geography and Land Management. It is a compulsory subject, taught in the third year, which includes 6 face-to-face ECTS credits (60 hours) and 90 hours of ONLINE learning. The subject has no precedent in previous courses in which methodological knowledge of cartography, geographic information technologies, databases and statistics are predominant. In addition, the students have received hardly any training in qualitative techniques at previous educational levels.

The need to develop an alternative teaching method in the subject stems from two fundamental reasons that undermined the motivation for learning and the results obtained. Firstly, the subject had a certain stigma attached to it, which could be seen in the students' assessment of it. By including techniques that include subjective components of knowledge, students perceived the subject to be less rigorous and therefore of little value in relation to other subjects that were perceived as objective. Secondly, the level of student satisfaction was below the average level for the degree, mainly due to the hasty study of a large number of analytical techniques and the lack of a clear structure in the subject.

Therefore, in order to achieve an improvement in motivation and academic results, the challenge of valuing and giving coherence to the content had to be addressed. Since it was not possible to consider the curricular adaptation of competences, objectives or contents, which are determined in the degree's verification report, a methodological change that prioritised practical activity and the relationship between the different didactic units was chosen.

With this dual purpose in mind, a CPBL methodology was chosen that permitted the development of a practice-based didactic approach which linked all content units through the implementation of the project. But, in addition, this learning tool allowed students to achieve meaningful and long-lasting learning and to have a multifaceted educational experience that included cognitive, emotional and relational aspects. In relation to the first, suffice it to say that, according to E. Dale's learning cone, 90% of what we say and do is remembered ten days after we have said or done it.

It should be noted that collaborative rather than cooperative learning was chosen because it was intended that the students should be the ones to design their interaction structure and be the main decision-makers in the process. In a cooperative project, the teacher has a greater level of control, something that was intended to be avoided (Bruffee, 1999; Delgado, 2016, Monedero and Durán, 2002). On the other hand, the collaborative dimension fitted better with a didactic approach that sought to favour the process over the outcome, as the latter could be affected by contextual factors throughout the semester (Barkley, Cross and Major, 2007).

3. Description

The didactic approach based on CPBL of the Qualitative Techniques subject has been developed in the last two academic years. Previously, a pilot project was carried out during the two previous courses in which PBL was applied first in a cooperative environment and then in a collaborative environment in certain thematic units. The results of this preliminary preparation phase made it possible to implement the CPBL as a structuring didactic element of the entire subject. The subsequent description refers to the 2020-21 academic year.

The teaching methodology is spread over the fifteen weeks of the semester. At the beginning of the course, students are asked to carry out a collaborative project in which they will have to apply the techniques and tools that will be taught in the theoretical part of the course. The teaching project for the subject, the objectives and competences envisaged, the different stages that make up the project, what a collaborative approach entails, the level of commitment required and the assessment method are reported and discussed in class. This introductory phase is of great importance as without the initial understanding and commitment of the learners it will be difficult to achieve satisfactory results.

The students form the different groups and choose the theme of the project according to their personal interests. This must be related to a problem that affects them directly or indirectly or the social reality existing in their geographical environment. Given that the subject is developed in the field of Geography, the subject matter must be linked to this discipline. The final selection of the topics is made after dialogue and agreement among the members of the group with the participation of the subject's teaching staff. In some cases, the teaching staff suggest specific topics related to the Department's research areas or to current geographical issues and invite the students to find the links that these topics may have with the geographical area close to them, with the aim of stimulating commitment to the work and guaranteeing a better result. Throughout this process, the teaching staff acts as an evaluative and supportive element, always avoiding influencing the decision-making process.

In the case of the educational development of the last academic year, the class was divided into five teams of three members and the topics selected were:

- Team 1: Tele-education during the pandemic crisis.

- Team 2: Characterisation of a new user profile of natural spaces as a consequence of the COVID-19 pandemic: implications, trends and prospections.

- Team 3: Social perception of the problem of the deterioration of the Maspalomas dune system and possible improvement due to confinement.

- Team 4: The problems of accessibility for people with reduced mobility in urban and rural areas.

- Team 5: Irregular immigration in The Canary Islands.

As can be seen, the first three themes are directly related to the health crisis situation that was being experienced and, more specifically, to the situation of confinement a few months earlier, proposing the analysis of the repercussions that this has had on the sustainability of two types of geographical space (a dune system and a protected natural mountain area) or on the student's own educational performance. The other two themes, focusing on people with reduced mobility and irregular immigration, were linked to the interests of the students, as some students were members of associations or volunteers involved in the integration of people with reduced mobility and the reception of irregular immigrants.

After this initial information, organisation and motivation phase, the project was organised in six phases (Table 1). The first phase was oriented towards making the groups aware of different points of view in relation to the topic they were going to work on by consulting the bibliography and electronic resources, so that they could define the precise objectives of the work in a more appropriate way and even point out hypotheses for analysis. In other words, the guiding questions were formulated in this phase.

The next four phases focused on a specific technique. The development of these phases was in correspondence with the topics covered in the theoretical classes, so that students learned by doing through their research in each of the different techniques. In this way, the groups had to 1) select a qualified informant, prepare a semi-structured interview questionnaire and conduct and transcribe the interview; 2) prepare a questionnaire for a qualitative survey, select the sample and collect and process the information; 3) design a focus group discussion on the topic of the work and transcribe the results; and 4) conduct a final SWOT analysis based on all the information and discussion generated by the project.

The activities were carried out both face-to-face, using a computer room or the classroom, and non-face-to-face. The use of the virtual classroom and, in general, of ICT in the subject was very useful for facilitating coordination and compliance with the planned timetable. In all phases the teacher acts as a facilitator, providing resources and helping to find solutions. From the second to the fifth phase, the method was combined with teaching work to transmit the content of the techniques as a preliminary step to their assimilation through practice.

The last phase of the project involved the production and presentation to the class of a poster summarising the work carried out and the main results (Figure 1). This last phase also involved tutoring the face-to-face activities and culminated in continuous assessment. The students presented how they had developed the project, the steps they had taken, the problems they had to face and how they had solved them, and the main results obtained. The presentation of the poster to the class allowed each group to be evaluated by the rest of the students in a qualitative way, without this influencing the grade. The students generally focused their intervention on the process rather than the result, asking about the difficulties encountered and the decisions made.

Table 1. Phases of the collaborative project-based learning model.

	Description	Observations
1	After the selection of the topic: • Bibliographic research and elaboration of the theoretical framework of the subject. • Justification of interest in the research topic. • Determination of the study area and the objective of the project (guiding questions).	The development of the different phases was monitored and facilitated by the teaching staff of the course during the face-to-face practical activity sessions. Also, as the project progressed, the working groups were required to produce evaluative material. In this way, none of the groups was left behind and continuous work was guaranteed.
2	• Design of an interview. • Selection of an expert to interview. • Transcription and analysis of the interview.	
3	• Design of a survey. • Conducting the survey. • Analysis of the survey.	
4	• Preparation and implementation of one discussion group per project. • Transcription and analysis of the discussion group.	
5	• Conducting a SWOT analysis. • Discussion of strategies based on SWOT analysis.	
6	• Design and production of a poster per team. • Oral presentation and defence of the projects.	This phase had two stages: one, in the classroom, during the practical sessions and tutorials with the different groups, and the other, the presentation of the results in a plenary session, in which the teachers of the subject acted as a panel and each member of the class assessed the work of their classmates.

Figure 1. Presentation of the results in plenary session. Source: Own elaboration

Assessment was at all times formative, based on the elaboration of a portfolio of tasks and the design of rubrics (Bordas and Cabrera, 2001). It focused both on the process, on how difficulties had been solved and on decision-making, and on the specific results in each task. In relation to the evaluation of the process, given that the students worked in groups, this had to be done throughout the class time by observing the different groups. In order for this evaluation to be formative, the pupils were repeatedly observed.

In relation to the results, it was mainly evaluated how the practical task reflected the assimilation of the theoretical principles of the technique, irrespective of the specific results of its application. For example, in the case of the development of the semi-structured interview questionnaire, what was evaluated was how the interview responded to the theoretical principles of any interview and not so much how it was executed. This assessment was carried out on the basis of the portfolio tasks using specific rubrics previously known to the students. The formative nature required a certain immediacy in the assessment process, given that some competences were assessed repeatedly through different tasks. With the portfolio, assessment was translated into grading, reflecting both the result and the process, with the aim of it becoming a stimulus for reflection in the group.

Once the project was completed, students were asked to answer an ad hoc, self-administered questionnaire through the virtual classroom of the subject, consisting of the following questions, in addition to some personal data, in order to assess the achievements of the learning tool.

1) Do you consider that the project work methodology of the course has helped you to learn about qualitative techniques?

2) Did the way in which the practical activities were carried out motivate you to study the subject?

3) Indicate your level of satisfaction with the methodology used in the Qualitative Techniques course.

4) Would you recommend that this methodology be used again in future courses?

5) Suggestions. Positive and/or negative aspects to be noted.

The first three questions were answered on a five-point Likert scale with 1 indicating complete disagreement and 5 indicating complete agreement. The fourth question was a closed multiple-choice question and the fifth was open-ended. The answers allowed for reflection on the activity carried out and on possible practices for improvement.

Care was taken to ensure that the entire procedure complied with the values and ethical practices required in educational research: voluntary informed consent, right to information, data protection and guarantees of confidentiality, anonymity and non-discrimination.

4. RESULTS

The application of the CPBL methodology contributed to the development of different competences, both general and specific, of the degree and the subject. Among the former, didactic orientation has a direct impact on stimulating knowledge and the ability to apply the scientific method and the capacity for analysis and synthesis, problem solving, decision-making, teamwork, information management and the possibility of applying theoretical knowledge in practice. It also has a clear impact on the development of autonomous learning and on knowledge and awareness of human rights and the reduction of all types of inequality.

Among the specific competences, the didactic approach has proved effective in obtaining some competences such as knowledge of human, economic and social geography, the ability to use geographical information as a tool for interpreting the territory, the ability to combine the temporal and spatial dimensions in the explanation of socio-territorial processes or the ability to relate and synthesise transversal territorial information. The active and collaborative nature of CPBL implies achieving other educational goals that are not directly expressed through competences or objectives such as the development of self-esteem, self-recognition or leadership skills. These competences are not formulated in the curriculum of the subject, but were clearly recognisable. It is common in CPBL for this to happen (Vergara Ramírez, 2016).

Likewise, the development of transversal competences is related to this applied methodology by enabling the student to communicate with different audiences, to use the supports and means of communication especially related to the new information and communication technologies, and to allow, with their professional skills and knowledge, the satisfaction of the interests, needs and concerns of their territory.

The students were motivated at all times by the activities and by the use of the different qualitative techniques in their research, they achieved contextualised and meaningful learning of the contents of the subject. This was corroborated by the self-administered questionnaire. Table 2 shows the means and standard deviations of the items evaluated on a Likert scale. As can be seen, the two items with the highest mean score and lowest standard deviation are those related to the level of satisfaction with the methodology used and with the learning process. Not only is the assessment of learning, motivation and satisfaction high, but homogeneity of opinions is recorded, with low standard deviations and variation rates between 11 and 15%. This highlights the value of collaborative practice, as the students as a whole have been involved.

Table 2. Results of the evaluation of the methodology carried out by the student body

Item	Average	Standard Deviation
Do you consider that the project work methodology of the course has helped you to learn about qualitative techniques?	4.4	0.49
Did the way the practical activities were carried out motivate you to study the subject?	4.1	0.64
Indicate your level of satisfaction with the methodology used in the qualitative techniques course.	4.5	0.63

The fact that students recommend the use of this methodology in future courses is the best indicator of learning and motivation. The most valued aspects are the practical nature of the methodology, the combination of face-to-face and non-face-to-face activities, the selection of topics and the relation with their experience, the diversity of techniques and topics addressed, the evaluation style and the implementation of a continuous evaluation system and the development of research interests. The recommendations for improvement made by the students focused on the periodisation of activities, teaching coordination and the introduction of specific software for processing qualitative data.

5. CONCLUSIONS

The changes that are taking place in society and in university education demand innovation in the educational process so that students achieve objectives and competences in an optimal and useful way to put knowledge into practice. In the case analysed, the lack of prior training in the contents of the subject and the breadth of topics and competences present in the teaching project made it difficult for the results to be satisfactory in one semester.

Therefore, taking into account the size of the class, a project-based methodology developed in a collaborative environment was chosen. This approach made the student the active element in their learning process, allowed them to develop different types of competences, stimulated motivation for learning and gave internal coherence to the subject in its theoretical structuring, in the relationship between theory and practice and in the teaching-learning process itself.

Moreover, social change in recent years is leading us to a scenario in which it is increasingly necessary for students not only to learn content, but also to learn to use it and contextualise it in the territory. In this sense, CPBL is a methodology designed for the real practical application of what has been learned and the achievement of meaningful and contextualised learning.

The key to the success of this methodological approach lies in seven or eight essential elements (Larmer and Mergendoller, 2010): the choice of meaningful content, the good formulation of guiding questions, the stimulation of the need to know, the autonomy in learning and the students' decision-making capacity in the process, formative and continuous assessment, the use of contemporary technologies, the formulation of appropriate competences and the final presentation to the class or the public.

Taking into account the experience developed, we would like to highlight some essential aspects that should be taken into account for their application in other contexts: 1) the understanding by all parties of the implications of a collaborative process in which each party brings differentiated skills that must be recognised. One of the keys to success is that students must understand what CPBL is and how it will be assessed; 2) the acceptance of differentiated roles on the part of students and teachers. The former must assume their central role in their own learning and the latter must relegate their role as transmitters of content to that of continuous tutoring; 3) the strong relationship there must be between the subject matter addressed and the students' own life experience or interests as a basis for motivation and meaningful learning; 4) the flexibility of the didactic approach according to the circumstances of the research process itself and the development of the contextual circumstances surrounding the educational process; 5) the coherence between the didactic approach and assessment. This must necessarily be continuous and formative, based on results and processes, and must generate equally continuous feedback; and 6) the development of students' awareness that they are primarily responsible for their own achievements and evaluation.

On the other hand, the experience has not been without its difficulties. In this sense, the following should be assessed: 1) the difficulty of applying this methodology in large groups, especially in terms of tutoring and assessment, given the student/teacher ratios in Spanish universities; 2) the excessive dedication that this type of teaching entails for the teaching staff and students; 3) the difficulties involved in getting all students to accept and be motivated to carry out the project, given the diversity of personal situations and 4) how complex it is to transfer an assessment based sometimes on narration to grading, when the education system has enthroned the "objective" grade as evidence of achievement.

Finally, the application of CPBL in the Qualitative Techniques subject has allowed us to reflect on the incomplete fit between the specific competences of the subject and the general and transversal competences of the degree with innovative teaching methodologies. We believe that in general the Geography and Land Management degree seems to be designed to be taught using more traditional teaching approaches and this means that certain competences such as creativity, leadership skills, improving self-esteem, etc. are under-represented. These competences are essential in today's university education and their inclusion in teaching plans and projects must go hand in hand with a commitment to methodological innovation.

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