Comparing the use of flipped classroom with problem-based learning with flipped classroom with case-based learning for improving academic performance and satisfaction

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Abstract

Active learning methodologies, such as flipped classroom (FC), generate a higher level of student engagement, greater dynamism in learning and more significant interactions with course content. Some other active methodologies used in the academic environment are problem-based learning (PBL) and case study (CS). There are few studies that analyse FC combined with PBL class activities or with course-based learning (CBL) activities, however, in fact, there are no studies that analyse which combination of activities would lead to better academic performance and student satisfaction. The main aim of this study is to compare FC methodology, combined with PBL activities or with CBL activities, in improving the academic performance of undergraduate social work students. This work also intends to analyse the level of satisfaction with the course and the methodology used. A class level randomisation study was performed. Both groups in the study used an FC active methodology, but group 1 applied this methodology with PBL, whereas group 2 applied it in conjunction with a CBL methodology. The students also had to do activities at home that were related to the PBL or CS methodology. There were significant differences in both categorical and quantitative exam scores, with the group that had applied the FC▦+▦PBL methodology achieving a higher grade in the exam and containing a higher percentage of students who passed or received merit and outstanding grades. In general, there was a good level of satisfaction in both groups and there were no significant differences across all items asked, except for 'It helps critical thinking' and 'It helps to apply theory to assessment', which were evaluated more favourably by the FC▦+▦CBL students.

Keywords

academic performance, case-based learning, flipped classroom, problem-based learning, teaching methods

Introduction

A student-centred model of learning is gaining ground on the model of knowledge transfer by teachers and has been endorsed by the European Higher Education Area. Active learning methodologies are beneficial for achieving student involvement, greater dynamism in learning and more significant interaction with content (Graeff, 2010; Kober, 2015). One of the most commonly used active learning methodologies, which follows a competency-based model, is flipped classroom (FC) (Basso-Aránguiz et al., 2018). Traditionally, activities are undertaken in the classroom, but under FC, they are done outside and prior to the class. This reorganisation means students engaging with learning materials before the class, thereby maximising in-class active learning time and promoting an active role for students, with the teacher guiding and facilitating the learning process (Chen et al., 2018).

FC has been shown to be effective in higher education settings, particularly in areas of knowledge such as sciences and biomedical sciences (Baepler et al., 2014; Chen et al., 2017; Gutiérrez-Fraile et al., 2011; Njie-Carr et al., 2017; Presti, 2016; Sein-Echaluce et al., 2018; Wu et al., 2018) and also in the social sciences (Albert and Beatty, 2014; Roach, 2014) and social work (Gómez-Poyato et al., 2020; Holmes et al., 2015; Oliván Blázquez et al., 2019; Sage and Sele, 2015).

The FC methodology combines autonomous learning (being able to use technological resources such as Google Drive, YouTube, Vimeo or Google Classroom (Basso-Aránguiz et al., 2018)) and face-to-face classroom activities. Specifically, in certain studies developed in the field of social work, FC can be applied through reflective journalism (Sage and Sele, 2015) or readings accompanied by online tools that promote learning communities and prompt further reflection (Holmes et al., 2015). Nevertheless, FC can also be implemented alongside problem-based learning (PBL) or case study (CS). These methodologies have some elements in common, such as organising learning based on a problem, the type of action required from the student or the need for teamwork (Kolmos, 2004). These two teaching methodologies also facilitate learning transfer, avoiding the acquisition of knowledge as entities in a container, out of which they can be transferred as required (Gil-Galván et al., 2020; Sellberg and Wiig, 2020). Learning is not only about internalising knowledge or a set of predefined skills and transferring them to a similar practice, but also gaining an understanding of the relations between the individuals acting and the social and material circumstances in which they act. In relation to this, Engle discusses intercontextuality, and argues that learning between contexts is more likely to occur as learning and working contexts have been framed to create intercontextuality between them. Intercontextuality occurs when learning contexts are created to be connected to one another, and when the content established during the learning activity is considered relevant and creates relations to the new context (Engle, 2006; Sellberg and Wiig, 2020). On the other hand, comparing CBL and PBL, it could be said that PBL sessions typically use one subject and have very little direction to the discussion of the case. The learning occurs as the case unfolds, with students having little advance preparation, often doing research during the case. However, in CBL, both the student and faculty prepare in advance, and there is guidance to the discussion so that important learning points are covered (McLean, 2016).

Problem-based learning is a student-focused method based on specific problems. This method aims to encourage students to study a problem under the teacher's guidance (Peng et al., 2021). The PBL teaching method is rooted in constructivism (Harland, 2003), focused on work, learning, research and reflection. The student works independently or in a group to reach a solution to a problem

introduced by the teacher, the solution to which will involve developing and acquiring specific skills. These skills can subsequently be transferred to the professional environment since one of the main objectives of this method is that the student learns to solve problems related to professional issues (Gil-Galván et al., 2020). Students can solve problems and acquire knowledge through teacher-directed groups, and many studies have shown that PBL students perform better in problem-solving and autonomous learning (Ma and Lu, 2019).

Case-based learning (CBL) methodology, also called storytelling or case study (CS), is used in a large number of disciplines (Snyder and McWilliam, 2003), social sciences being one of them (Escartín et al., 2015; Fernández García and Ponce de León Romero, 2006). The CS method is founded on theoretical principles based on experiential learning (Banning, 2003). The aim is to create learning contexts that closely resemble professional practice, which will help students to develop the competencies required in such situations. The use of this technique is especially suitable for the construction of diagnostic and decision-making capacity in the field of social problems, where interpersonal relationships play an essential role (Escartín et al., 2015; Leonard and Cook, 2010). Specifically, this teaching-learning method has been defended as an effective tool for developing skills such as critical thinking (Popil, 2011), communication skills or teamwork (Pique Simón and Forés Miravalles, 2012), in addition to seeking an exchange and collective construction of knowledge. Working with CS makes it easier to apply theory to practice, to apply conceptual content to real-world situations, thereby bridging the gap between the academic world and the world of work and providing meaningful learning that improves academic results and student satisfaction (Escartín et al., 2015).

FC, as well as PBL and CBL, usually includes interactive and group learning activities (Bergmann and Sams, 2012; Peng et al., 2021; Pique Simón and Forés Miravalles, 2012) within the classroom since it is here that the processes of acquisition and application of theoretical knowledge are enhanced. During the academic year 2020–2021, these group activities have been minimised since measures have been implemented in universities to reduce COVID-19 infections. These measures have deprived students of the benefits of collaborative learning (Erbil, 2020).

To the best of our knowledge, few studies analyse the effectiveness of FC combined with PBL class activities (Boysen-Osborn et al., 2016; Kang and Kim, 2021; Kardipah and Wibawa, 2020) or with CBL activities (Ding et al., 2021), but there are no studies that analyse which combination of activities would lead to better academic performance and student satisfaction. This is especially relevant in the social sciences since most studies in this area are carried out in health sciences. Furthermore, we must take into account the exceptional situation that higher education has been placed in due to the COVID-19 pandemic.

Therefore, the main aim of this study is to compare the FC methodology combined with PBL activities or with CBL activities in improving the academic performance of undergraduate social work students. It also aims to evaluate satisfaction with the course and the methodology used.

Material and methods

Design

An quasi-experimental study using a class level randomisation with two parallel groups was developed. One group developed PBL activities in the presence of FC teaching, and the other group developed CBL activities in the presence of FC teaching. A FC group was not included without combining it with another active teaching methodology or a control group because, although there was a third group of students in this subject, the teaching team and student profile would have been

different, and as such, biases would have been introduced if this group had been used as a third group (FC or control group). While there are several manuscripts that analyse FC versus traditional lectures, PBL + FC versus FC alone or traditional lectures, CBL + FC versus FC alone or traditional lectures (Boysen-Osborn et al., 2016; Ding et al., 2021; Kang and Kim, 2021; Kardipah and Wibawa, 2020); there is no evidence about the performance of PBL or CBL in presence of FC.

The randomisation was carried out by class groups using a computer-generated random number sequence with no restrictions. One group of students, Group 1 was assigned FC and PBL activities (FC + PBL), and the other group of students, Group 2, was assigned FC and CBL activities (FC + CBL). An independent researcher in the study used a computer programme to perform class group randomisation. The randomisation was performed using class level but the study variables were analysed by individual level. As the intervention was carried out in the classroom following a timetable, individuals were not individually randomised. This procedure for randomising is carried out in studies in which subjects are randomised at a group level but analysed at an individual level (Adams et al., 2004; Donner et al., 1981; Hsieh, 1988), but this lead to read the results from a tentative approximation. The flowchart is shown in Figure 1.
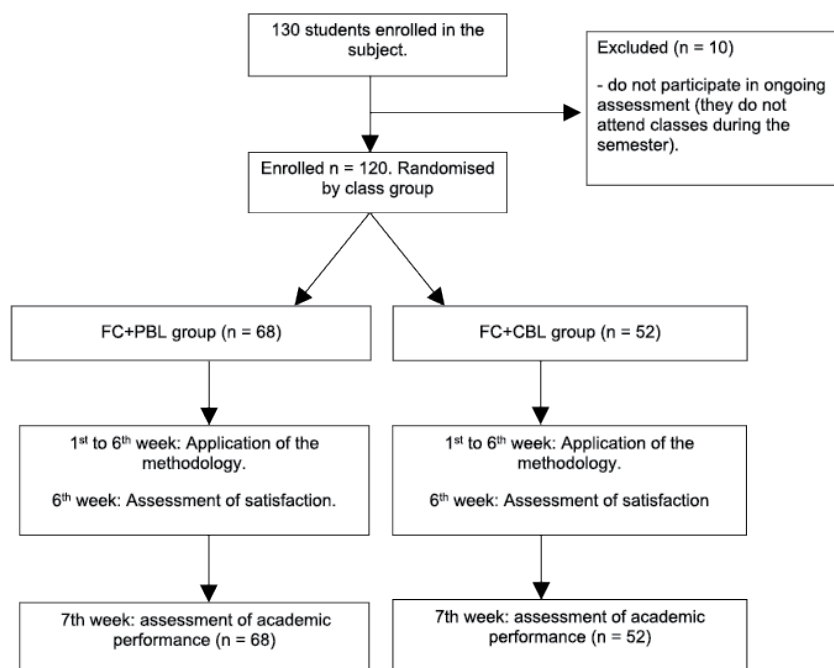

Figure 1. Flowchart.

These innovative teaching projects were created for the 'Social Work with Groups' course, part of the Social Work degree programme at the University of Zaragoza (Spain). The Social Work degree at the University of Zaragoza comprises of 240 ECTS credits spread out over 4 years. The Social Work with Groups course is a compulsory course taught in the second semester of the programme's second year. It is divided into two parts: the first is presented from a social psychology perspective, and is made up of five course curriculum topics; and the second is taught from a social work/social services perspective, which focuses more on the specifics of the profession (four course curriculum topics). This experiment was conducted during the delivery of the social psychology element of the course (five course topics).

The teaching protocol was introduced for 6 weeks in February and March of 2021, during which the five course curriculum topics that fall within the domain of social psychology were taught. These topics are: (1) group meaning and types; (2) group growth processes, cohesion, conflict and group decision-making; (3) group structure; (4) leadership and (5) group characteristics such as communication and empathy. At the university, each student received three teaching contact hours a week: two for theoretical material and one for creating valuable content. The FC methodology was implemented during the theoretical content hours. In the practical lessons, the same teacher worked with both groups and conducted the same tasks, in which both groups of students were trained in CBL and problem-solving activities. This teacher had 8 years of previous experience teaching this subject.

During the 2020–2021 academic year, blended learning had been employed due to the COVID-19 situation. Every class group was divided into two groups. One week, the first group attended face-to-face classes, while the other group attended online classes, and vice versa the following week. During face-to-face classes, the students kept a safe distance from each other, wore masks and no exchange of materials was permitted. Measures to prevent the spread of COVID-19 have meant that learning activities were developed individually, depriving students of collaborative learning during CBL or PBL activities.

Participants and sample size

The participants were students enrolled in the 'Social Work with Groups' course at the University of Zaragoza (Spain) during the 2020–2021 academic year who attended at least 80% of classes.

The sample size was 120 students; 68 of them belonged to group 1 (FC + PBL) and 52 to group 2 (FC + CBL). The imbalance in the number of students between the two groups was caused by the withdrawal of students in one of the groups after a period of confinement caused by COVID-19 in the academic year 2019–2020.

Given that we have two units (class group and students, since subjects are randomised at a class group level but analysed at an individual level) (Adams et al., 2004; Donner et al., 1981; Hsieh, 1988), and given that no studies have been found to analyse the combination of the proposed methodologies using an experimental design, for the calculation of the sample size, we relied on the study of Oliván Blázquez et al. (2019). This study aimed to analyse the effectiveness of the FC teaching methodology against a lecture-based learning methodology (control group) in social work students, in the same subject and using the same variables as the study presented here. In the study by Oliván Blázquez et al. (2019), the mean and SD of the FC group in the academic performance (exam score) was 6.56 (1.58), while in the lecture group (control group) it was 5.42 (1.97). Taking into account these data obtained, and assuming an error of 5%, a probability of success of 95%, a confidence level of 95%, a precision of 5% and adding 10% for potential participant withdrawal from the study, at least 86 students were needed. Since the study was conducted by class groups, 120 students participated in the study, which exceeded the necessary sample size.

PASS software was used to compute the sample size (PASS 14 Power Analysis and Sample Size Software (2016). NCSS, LLC. Kaysville, Utah, USA, ncss.com/software/pass).

Intervention

Both groups applied FC active learning but Group 1 applied it in combination with PBL, whereas Group 2 applied it in combination with CBL.

Following an FC method, both groups' students had to work on the content prior to the theoretical classes that were to be taught. They were provided with theoretical documents related to the subject and videos highlighting the most relevant aspects through an online learning platform. To ensure that it was well-accepted among the students, Rotellar and Cain's recommendations (Rotellar and Cain, 2016) were followed. The students also had to do activities at home and upload them to the online learning platform before class. The kind of work depended on the class group.

Students belonging to group 1 had to do weekly at-home PBL activities related to social work situations and upload them to the online platform before class. During class time, the discussion was about their answers to the questions completed beforehand. These activities were also used during the theoretical teaching hours to actively delve into the content. The activities that were developed were related to conflict management, an occurrence explained by group violence, role conflict, deviation from the norm, the concept of being a black sheep, the identification of a leadership style of a team of social workers, group communication, informal communication in the group and models of social influence.

Group 2 students had to do at-home CBL activities every week related to social work situations and upload them to the learning platform before class. Students were asked to develop and write a case study using knowledge related to the content every week but without explicitly naming it. The content had to be reflected in a fictitious story so that, when analysing the story, it should be possible to detect and extract the theoretical content (Escartín et al., 2015). Thus it could be proved that students had made adequate use of the knowledge acquired. Some of the terms that needed to appear in the story were: Shaw's concept of attraction, Moreland's concept of behavioural integration, phases in the evolution of groups, theories of group violence, group cohesion, conflict resolution, status, roles, theories of deviance from the norm, leadership styles, communication and group communication networks.

Variables and instruments

Primary outcome. The outcome variable of this experimental study was academic performance, assessed by the grade obtained in a theoretical exam in the subject (overall academic performance). This exam consisted of two parts: (a) 20 multiple-choice questions with three response options, taking the chance factor into account (so incorrect answers were discounted in the grade) and (b) five short-answer questions. The multiple-choice questions were distributed among the following issues: group definition and types; group development processes, cohesion, conflict and decision-making in groups; group structure; leadership and group aspects such as communication and empathy. Short-answer questions were related to memorising, problem-solving and case study (identifying theoretical concepts of group psychology in short case studies). The analysis of this variable was performed based on the theoretical overall exam score (main dependent variable), but also was analysed according to the type of question: multiple-choice questions score, short questions score, problem-solving questions score and case study questions score. The analysis of these academic performance variables was included since the PBL and the CBL may be complementary (Escartín et al., 2015; McLean, 2016). Even though they do not have the same specific teaching objectives and the same procedures, both provide the scaffolding for the transfer of learning to other specific contexts. The quantitative rating of each academic score can range between 0 and 10, with a higher score denoting a higher percentage of correct answers. The categorical holistic assessment of achievement goes from fail (between 0 and 4.9), to pass (between 5.0 and 6.9), to merit (between 7.0 and 8.9), to outstanding (between 9.0 and 10).

Secondary outcomes. The secondary variables were, respectively, the student satisfaction with the course and teaching methodology used.

In terms of performance in PBL or CBL activities, the activities that the students did at home and during the lecture were also assessed. The students undertook five activities, one for each of the five social psychology course curriculum topics. The score achieved was the mean of these five marks and ranged between 0 and 10, with a higher score denoting a better performance.

A self-reporting questionnaire made up of seven statements was used to assess student satisfaction with the course and teaching methodology used (Gómez-Poyato et al., 2020; Oliván Blázquez et al., 2019), which were answered on a Likert scale from 0 to 4, with 0 meaning not at all and 4 meaning to a great extent. The statements to be evaluated were as follows: The teaching methodology used has encouraged new knowledge; it has favoured deep learning; it has helped me in thinking more critically; it has helped me in applying theoretical content to practice; it has helped me in applying theoretical content to assessments; it has helped me to understand concepts better; I believe it is an appropriate teaching methodology. A free response section was also included so that students could express themselves openly.

Gender, age, university admittance mark, number of ECTS credits taken during the degree and credits passed were also obtained. These factors were collected to determine if the student groups were equal in these respects at the start of analysis. The study variables and the instruments are shown in Table 1. Figure 2 shows the timeline of the study.

Table 1. Variables and instruments used.

| Variables	Instruments
Primary outcome: Academic performance	Grade obtained in a theoretical exam in the subject ranged between 0 and 10. Categorical holistic assessment of achievement (fail, pass, merit and outstanding).
Secondary outcomes: - Performance in PBL or CBL activities that the students did at home - Satisfaction with the course and teaching methodology used.	The score achieved was the mean of these five marks and ranged between 0 and 10. Self-reporting questionnaire made up of seven statements on a Likert scale from 0 to 4.
Sociodemographic and previous academic variables: gender, age, university admittance mark, number of ECTS credits taken during the degree and credits passed.	Self-reporting questionnaire
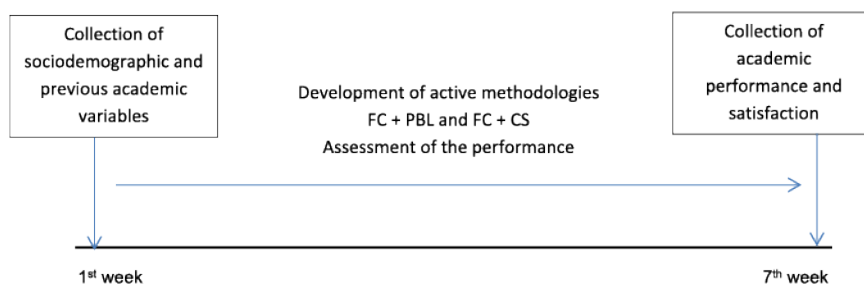
Figure 2. Timeline of the study.

Statistical analysis

The Shapiro-Wilk test was used to analyse the variable distribution in order to determine the type of statistics to be used; all quantitative variables had a non-normal distribution apart from the university admission score and the academic exam score (overall academic performance), the multiple-choice exam score and the short-answer question exam score. As a result, we chose non-parametric statistics to test all measurable variables except those with a normal distribution. However, the mean and standard deviation values and the median and IQR are shown in all tables. Following that, a summary was made and a comparative analysis was conducted of the groups in terms of the variables of gender, age, university admittance score, number of ECTS credits taken within the degree programme and the number of credits passed. This was to decide whether the groups' baselines were comparable. Depending on whether the variable was continuous or categorical, Chi-square and Mann-Whitney's U or Student's T-test statistics were used. To compare FC+PBL and FC+CBL, the main variable and secondary variables were analysed using the Mann-Whitney U statistic and Student's T-tests, based on their distribution.

Statistical analysis was performed with the SPSS 25.0 statistical software package (IBM Corp. Released, 2017), with p-values of less than 0.05 being considered significant.

Ethical aspects

The University of Zaragoza reviewed and funded this research project (call for teaching innovation PIIDUZ 19405), and it has ethical clearance from that body. However, the University of Zaragoza has not interfered in the study or distribution of findings. The teaching approach that was to be established for each group of students was explained at the beginning of the project, and all students gave their written informed consent and decided to participate.

Results

Firstly, a description of the participants was made in terms of the variables of gender, age, university admittance mark and credits passed up to that time. As shown in Table 2, the majority of the participants were female (87.5%), with an average age of 19.93 years (SD: 0.66), who had gained admittance to the degree with an average score of 8.40 (SD: 1.32) and had passed an average of 59.84 ECTS credits (SD: 4.08). To ensure the comparability of both groups, students belonging to groups 1 and 2 were compared using the variables that may have acted as confounders: gender, age and previous academic variables (university admittance mark, credits taken and credits passed). As shown in Table 3, there are no significant differences between the two groups in terms of the variables collected.

Table 2. Description of the variables [AQ2]of gender, age, university admittance mark and credits passed up to the time of the study.

Variables	Total sample N = 120	
	Mean (DT)	Median (IQR)
Age	19.93 (0.66)	20 (0)
University admittance mark	8.40 (1.32)	8.31 (1.96)
Credits taken	59.95 (2.42)	60 (0)
Credits passed	59.84 (4.08)	60 (0)
Gender (% women)	105 (87.5%)	

Table 3. Baseline comparison of the groups using variables of gender, age, university admittance mark and credits passed up to the time of the study.

Variables	FC + PBL group, N = 68		FC + CBL group, N = 52		p-Value
	Mean (DT)	Median (IQR)	Mean (DT)	Median (IQR)	
Age (mean)	19.90 (0.71)	20 (0)	19.96 (0.59)	20 (0)	0.219
University admittance mark	8.47 (1.22)	8.45 (1.26)	8.30 (1.48)	8.01 (2.26)	0.675
Credits taken	59.91 (1.63)	60 (0)	60.00 (3.24)	60 (0)	0.397
Credits passed	59.36 (4.15)	60 (0)	60.47 (3.95)	60 (0)	0.255
Gender (% women)	60 (88.2%)		45 (86.5%)		0.781

Statistics used: Mann-Whitney's U statistic for the comparison between groups when showing a non-normal distribution, except for the gender variable, for which the Chi-square statistic was used.

As shown in Table 4, there were significant differences in both categorical and quantitative exam scores, with the group that had applied the FC + PBL teaching methodology achieving a higher grade in the exam, and also a higher score in the multiple-choice questions, short-answer questions and problem-solving questions. By contrast, the group that applied the FC + CBL teaching methodology scored higher in the CBL activities done at home compared to the group that did at-home PBL activities, and contained a higher percentage of students who passed or received merit and outstanding grades.

Table 4. Comparison between the FC + PBL group and the FC + CBL group for the outcomes of academic performance: quantitative exam score, multiple-choice questions score, short questions score and score according to the type of short question (problem-solving or case study), satisfaction with teaching [AQ3]and the categorical holistic assessment of achievement qualitative exam score.

Variables	FC + PBL group (n = 68)	FC + CBL group (n = 52)	p-Value

	Mean (DT)	Median (IQR)	Mean (DT)	Median	
Quantitative overall exam score	6.58 (1.32)	6.58 (1.29)	5.57 (1.71)	5.45 (3.04)	0.001
Multiple choice questions score	6.42 (1.48)	6.5 (1.74)	5.78 (1.80)	5.83 (2.63)	0.043
Short questions score	6.75 (1.76)	6.70 (2.5)	5.36 (2.06)	5.35 (2.87)	<0.001
Problem-solving questions score	6.69 (3.01)	7.5 (5)	4.22 (2.75)	3.75 (3.75)	<0.001
Case study questions score	7.22 (2.33)	7.5 (3)	7.40 (2.70)	7.5 (5)	0.368
Performance in the PBL or CS activities done at home	7.97 (0.89)	8.1 (0.99)	8.27 (0.98)	8.46 (0.86)	0.002
Satisfaction (quantitative)					
Promoted new knowledge	2.90 (0.70)	3.00 (0)	3.16 (0.60)	3.00 (1)	0.230
Favoured deep learning	2.87 (0.88)	2.00 (1)	3.16 (0.60)	3.00 (1)	0.261
Helps critical thinking	2.39 (0.84)	2.00 (1)	3.05 (0.78)	3.00 (2)	0.011
Helps to apply theory to practice	3.00 (0.89)	3.00 (2)	3.37 (0.59)	3.00 (1)	0.170
Helps to apply theory to assessment	2.87 (0.67)	3.00 (0)	3.26 (0.65)	3.00 (1)	0.049
Helps to understand concepts better	3.22 (0.92)	3.00 (1)	3.57 (0.50)	4.00 (1)	0.249
Good teaching methodology	3.16 (0.96)	3.00 (1)	3.26 (0.65)	3.00 (1)	0.974
Categorical holistic assessment of achievement					
Outstanding	4 (5.9%)		0 (0%)		
Merit	19 (27.9%)		14 (26.9%)		0.002
Pass	37 (54.4%)		18 (34.6%)		
Fail	8 (11.8%)		20 (38.5%)		

Statistics used: Student's T-test to analyse the academic score variables, Chi-squared to analyse the categorical holistic assessment of achievement and Mann-Whitney's U statistic for the rest of the variables.

As for the comparison of the 'satisfaction' variable between the groups, there were no significant differences in satisfaction between the two groups of students across all items asked, except for 'It helps critical thinking' and 'It helps to apply theory to assessment', which were evaluated more favourably by the FC + CBL students (Table 4). In general, there is a good level of satisfaction in both groups.

In terms of qualitative assessment of student satisfaction, both groups considered that the teaching methodology used when teaching the subject theory was dynamic and helped them keep abreast of the content. However, in the group of students who developed PBL activities in presence of FC, the issue of difficulty doing the activities at home arose. On the other hand, the group of students who developed CBL activities in presence of FC highlighted that the activities were pleasant, stimulated their creativity and helped them to understand the theory.

Discussion

The students who applied FC + PBL methods achieved higher academic performance than the students who applied FC + CBL methods. However, the students who applied FC + CBL performed better in the PBL activities done at home, and were more satisfied with the teaching methodology, saying that these methods helped to stimulate their critical thinking and helped them to apply the theory to the assessment.

In terms of academic performance, there are no studies that analyse FC + PBL versus FC + CBL, but the existing literature states that students who apply FC + PBL perform better compared with those who undergo lecture-based learning (Boysen-Osborn et al., 2016; Hu et al., 2019; Kang and Kim, 2021; Kardipah and Wibawa, 2020) and even compared with those that learn through FC alone (Chis et al., 2018). Ding et al. (2021) also highlighted that combining FC with CBL activities also improves higher-education students' academic achievement in comparison with FC on its own. Therefore according to available literature (Boysen-Osborn et al., 2016; Chis et al., 2018; Ding et al., 2021; Hu et al., 2019; Kang and Kim, 2021; Kardipah and Wibawa, 2020), FC combined with CBL or PBL is a better teaching methodology for learning in higher education, compared to FC alone or lecture-based learning. However, the results of this study may indicate that the combination of FC + PBL seems to be a better combination than FC + CBL.

It is worth highlighting that the group which applied FC + PBL methods not only performed better in the exam, but also across all question types (multiple-choice questions, short problem-solving questions) apart from the case-study questions (identification of theoretical concepts of group psychology in short case studies) in which there were no significant differences between the two groups.

It should also be noted that the outcome variable, academic performance, is evaluated by looking at the mark obtained in the theoretical exam, which assesses knowledge change according to Kirkpatrick's level 2 measurement (learning) (Kirkpatrick Donal and Kirkpatrick, 1959). Although the exam consisted of multiple-choice questions and short-answer questions (memorising, problem-solving and case-study questions), the acquisition of competencies understood as knowledge, skills and aptitudes was not assessed. Competencies are translated into observable behaviours (Berrocal Berrocal and Pereda Marín, 2001) and are an underlying characteristic of an individual, causally related to good or excellent performance in a specific job and company (Boyatzis, 1982; Forrier et al., 2009). A study developed by Gil-Galván et al. (2020) found that students had a positive attitude towards the application of PBL activities, and thought that this teaching methodology provided them

with a medium-high rate of competency acquisition, even more so among education degree students than among health science degree students.

Delving into the similarities and differences between CBL and PBL, it may be considered that PBL is similar to CBL; in fact, CBL is compared and contrasted with PBL in order to better define CBL. PBL is centred around a clinical case; the objectives are usually less clearly defined at the outset of the learning session, and learning occurs in the problem-solving process. The teacher's role in terms of guidance is less intrusive in PBL than in CBL, and PBL is considered more challenging to use. CBL is effective for students who have already acquired foundational knowledge, whereas PBL invites the student to acquire foundational knowledge as part of researching the clinical case. On the other hand, CBL has the advantage of being flexible in terms of how the case study is used and is considered to induce a deeper level of learning by activating more critical thinking skills (McLean, 2016). However, both the CBL and PBL methods have been mainly applied in medical science.

As regards the scores for the activities done at home every week, the students who performed at-home CBL activities, writing a case study using content-related knowledge without explicitly naming it, obtained a significantly higher score than the students who performed PBL activities. This may be related to the students' perception of and satisfaction with the activity (Maqableh et al., 2021). These data are confirmed by McLean (2016), who showed that students reported that they enjoyed CBL more than PBL because there were fewer unfocused tangents.

In our study, even though satisfaction with the methods was high in both groups, the students who applied the PBL activities considered that these activities were sometimes tricky, which supports the idea that PBL is considered more challenging to use (McLean, 2016). The students who performed CBL activities perceived that these activities improved critical thinking, which corroborates several other studies (McLean, 2016; Mena Araya, 2020), and fostered their creativity. Research shows a disconnect between creativity and higher education (Jahnke and Liebscher, 2020), especially in technical degree programmes such as engineering (Daly et al., 2014). Engaging the creative process is essential in problem-solving (Daly et al., 2014). In fact, teamwork, creativity and problem-solving stand out among the most in-demand generic competencies (Foundation of Young Australians, 2017). However, literature on how teachers can support the development of these competencies is scarce and does not account for the specificities of each degree (Scott-Ladd and Chan, 2008).

However, these results must be interpreted with caution, not only due to the quasi-experimental design, but also due to the blended learning model that could have decreased engagement, and because all activities had been carried out individually due to the COVID-19 situation. To avoid virus transmission at the university, teamwork had been replaced by individual work, and therefore collaborative learning had been reduced.

This study presents strengths and limitations. Among its strengths are the novelty and contribution of this research to evidence on active teaching methodologies in the social sciences, since studies in these fields are limited. However, there are certain limitations to this research. The most significant limitation is the quasi-experimental design, performing a class level randomisation but an individual assessment. This was done in order to facilitate the dynamics of the class and avoid contaminations, but therefore future research with individual-level randomisation must be performed for appropriate causal inference may be done. Another relevant limitation is that these methodologies had been implemented independently due to the COVID-19 pandemic situation, but they have been enhanced through collaboration and mutual learning. Another limitation is that the research was only conducted at one university, with only two randomised class groups. A third limitation is the absence of a control group, and although there are data for this same subject and university, with

the same teacher, using an FC teaching methodology compared to lecture group (control group) (Oliván Blázquez et al., 2019), the data were obtained in circumstances that were different from those of this academic year, due to the COVID-19 containment measures. This makes them incomparable. Other confounding variables, such as income and job background, were not included, notwithstanding the assumption that these groups are similar in terms of sex, age, credits taken and obtained and degree admittance score. Students who have jobs alongside their studies normally do not participate in ongoing assessment. Another limitation is the sample size. The sample size is 120 participants, and the groups were unequal in size. To obtain more meaningful scientific data, the sample size must be increased, and the groups must be comparable in size. Moreover, the assessor who analysed the sample variables was not blind to the task, though they did not interfere with the findings because they were derived from multiple-choice questions that either used a rubric or a numerical scale varying from 1 to 4 or 0 to 10.

Conclusions

In contrast to the FC+CBL approach, the FC+PBL teaching methodology was shown to be a more successful technique in terms of student results measured with quantitative and categorical assessment in university-level social work education. However, there were substantial variations in satisfaction with the course and the approach used (quantitative and categorical). Students who followed an FC+CBL teaching methodology were more satisfied. Implementing these methodologies would therefore strengthen students' skills and, as a result, improve the quality of their future professional work.

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Author biographies

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