





Relación entre el enfoque inductivo o deductivo del aprendizaje basado en casos en el rendimiento académico, la autoeficacia y la satisfacción de los estudiantes de trabajo social

Relationship between the inductive or deductive approach to case-based learning on academic performance, self-efficacy, and satisfaction of social work students

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Resumen

Introducción: La metodología docente del Aprendizaje Basado en Casos (ABC) es una metodología de aprendizaje activo que genera un mayor nivel de participación de los estudiantes y aprendizajes significativos. El objetivo del presente estudio fue analizar y comparar una actividad de ABC utilizando un razonamiento deductivo (analizar y extraer conceptos teóricos en un caso proporcionado) frente a una actividad de ABC utilizando un razonamiento inductivo (crear un caso introduciendo de forma implícita conceptos teóricos) respecto al rendimiento académico y satisfacción de los estudiantes, así como analizar la relación con la percepción de autoeficacia. **Metodología:** Se desarrolló un estudio descriptivo transversal. 111 alumnos realizaron ambas actividades ABC (deductivo e inductivo). Ambas actividades de aprendizaje versaron sobre contenidos teóricos de psicología de grupos. Las variables recogidas fueron: puntuación de la actividad, satisfacción con cada actividad, calificación del examen teórico y percepción de autoeficacia. Se realizó un análisis descriptivo, correlacional y comparativo mediante t-Student de muestras relacionadas. **Resultados:** Las calificaciones de la actividad ABC inductiva fueron significativamente más elevadas frente a las calificaciones de la

actividad ABC deductiva ($p=0,042$). El nivel de satisfacción de los alumnos en el ítem de ayuda a pensar críticamente fue evaluado más favorablemente en la actividad de ABC deductivo ($p=0,029$). La relación entre la calificación de la actividad de ABC inductiva y la calificación obtenida en el examen teórico fue significativa. No hubo correlación de ninguna de las actividades con la autoeficacia percibida de los estudiantes.

Conclusiones: La actividad de ABC con un razonamiento inductivo es más efectiva para lograr el rendimiento académico y la satisfacción con las actividades evaluadas por parte de los estudiantes es alta.

Palabras clave: aprendizaje activo; autoeficacia; satisfacción; rendimiento académico

Abstract

Introduction: Case-Based Learning (CBL) teaching methodology is an active learning methodology that generates a higher level of student participation and significant learning. The aim of this study was to analyse and compare a CBL activity using deductive reasoning (analyse and extract theoretical concepts in a case provided for this purpose) and a CBL activity using inductive reasoning (create a case by implicitly introducing theoretical concepts) in terms of academic performance and student satisfaction, as well as to analyse the relationship of the latter with the perception of self-efficacy.

Methodology: A descriptive cross-sectional study was developed. 111 students performed both CBL activities (deductive and inductive). Each learning activity dealt with theoretical contents of group psychology. The variables collected were: activity grade, satisfaction with each activity, theoretical exam grade and perception of self-efficacy. A descriptive, correlational, and comparative analysis was conducted using T-Student of related samples.

Results: The grades for the inductive CBL activity were significantly higher than those for the deductive CBL activity ($p=0.042$). The students' level of satisfaction in the item "helps to think critically" was evaluated more favourably for the deductive CBL activity ($p=0.029$). The relationship between the grade of the inductive CBL activity and that obtained in the theoretical exam was significant. There was no correlation between any of the activities and the perceived self-efficacy of the students.

Conclusions: The CBL activity with inductive reasoning is more effective to achieve academic performance and the satisfaction with the activities evaluated by the students is high.

Keywords: Activity learning; Methodology; Reasoning; Academic achievement

INTRODUCTION

The European Higher Education Area shifts the emphasis from a teacher-led knowledge transfer model to a student-centred competency-based learning model. Therefore, active learning



methodologies have gained prominence in the classroom as they provide a higher degree of student involvement, greater dynamism in learning and higher interaction with the contents (Graeff, 2010; Kober, 2015).

One of the active teaching methodologies used in university education, both in science, biomedical sciences and social sciences is case-based learning (CBL) or case study (Escartín et al., 2015; Fernández García y Ponce de León Romero, 2011). This methodology is based on experiential learning, with the objective of creating learning contexts like those that will be encountered in professional practice (Banning, 2003). Therefore, this methodology focuses on the acquisition of competencies that will have to be developed at professional level. There is scientific evidence on the effectiveness of this technique in the construction of a diagnosis, decision making, the development of critical thinking, the improvement of social and communicative skills, and the learning of teamwork (Escartín et al., 2015; Leonard y Cook, 2010; Piqué Simón y Forés Miravalles, 2012; Popil, 2011). These learning activities are especially useful for applying theoretical contents to practice, to real or fictitious situations, providing meaningful learning (Escartín et al., 2015). In addition, this methodology is usually applied in groups, which facilitates collaborative learning and enhances the learning process (Bergmann y Sams, 2012; Peng et al., 2021; Piqué Simón y Forés Miravalles, 2012).

CBL methodology has been widely used in the social sciences, and especially in university teaching in social work (Escartín et al., 2015; Fernández García y Ponce de León Romero, 2011; Gómez-Poyato et al., 2020; Oliván Blázquez et al., 2019; Oliván-Blázquez et al., 2022a; Oliván-Blázquez et al., 2022b). CBL organizes learning based on the guided resolution of a case prepared in advance. It is generally used in groups to also obtain the benefits of collaborative learning and discussion (Kolmos, 2004; McLean, 2016). CBL facilitates the transfer of learning to practice (Sellberg y Wiig, 2020). Case-based learning can be applied in two ways: deductive approach (a case is presented to the students and they have to analyse and extract the theoretical concepts that appear in it); inductive approach (students create a case story following guidelines or in a freer format in which they must introduce the theoretical concepts seen in the subject) (Escartín et al., 2015). It is also interesting to analyse the relationship with the perception of self-efficacy, since this psychological construct predicts performance. The higher the perception of self-efficacy, the better the performance of academic tasks (Bandura, 1977). Self-efficacy can be defined as "people's beliefs about their abilities to produce designated levels of performance that exert influence on the events that affect their lives" (Bandura, 1994). This concept has been studied in educational contexts, analysing its relationship with CBL teaching methodology (Bi et al., 2019; Keshmiri et al., 2021; Ramos-Villagrasa et al., 2017; Zhu et al., 2021). However, this analysis has focused on the improvement of self-efficacy in relation to the development of educational interventions, but it has not been analysed regarding correlation.

To our knowledge, there are few studies that address the difference of the CBL method from an inductive or deductive approach (Newson y Delatte, 2011; Oliván-Blázquez et al., 2022a). Newson and Delatte (2011) analysed CBL with inductive or deductive reasoning from a theoretical perspective in science learning (civil engineering) (Newson y Delatte, 2011). Therefore, it is relevant to deepen the knowledge of the CBL didactic methodology from an inductive or deductive approach, especially in the social sciences.

For this reason, the main objective of this study is to analyse and compare an inductive case-based learning activity and a deductive case-based one for the improvement of academic performance and satisfaction of social work students. In addition, there is the specific objective to analyse the relationship between self-efficacy perception, the grades obtained in both learning activities and the grade of the theoretical exam.

METHODS

Design

A descriptive cross-sectional study of the comparison of related samples conducted. 111 students distributed into 27 groups developed a learning activity based on CBL using a deductive or inductive approach. The deductive approach activities were presented with a case and students had to analyse and identify the theoretical concepts of the subject that appeared in it. Inductive approach groups were instructed to create and write a case story in which they had to introduce certain theoretical concepts of the subject.

These activities were framed within the content of group psychology, which is taught in the subject "Social Work with Groups". This is a compulsory second-year subject of the university degree in Social Work, taught in the second four-month term, and equates to 6 ECTS. It belongs to two areas of knowledge: the area of Social Psychology and the area of Social Work and Social Services. These activities were developed in the classes offered by the area of Social Psychology and took place between February and March 2023.

At the University of Zaragoza, in the degree of Social Work, each student receives four hours of classroom teaching per week: two hours of theoretical material and two hours of activities where students learn how to apply theoretical content to practise (practical classes). The CBL activities indicated in this study were developed during the practical classes. The teacher leading the activities was the same for all students and had ten years of previous experience teaching this subject.

Participants

The participants were students enrolled in the subject "Social Work with Groups" at the University of Zaragoza (Spain) during the academic year 2022-2023 who met the continuous assessment criteria by



attending more than 80% of the practical classes.

To calculate the sample size, we used the study by Oliván et al. (2022a). In this study, the mean and standard deviation (SD) of the rating of the deductive CBL activity was 8.78 (SD: 0.85), and the mean of the inductive CBL activity was 7.55 (SD: 1.59) (Oliván-Blázquez et al., 2022a). Therefore, considering these data, and assuming an error of 5%, a probability of success of 95%, a confidence level of 95%, and adding 10% for possible missing data from participants, at least 48 students were needed. Finally, 111 students participated in the study, which exceeded the required sample size. PASS software was used to calculate the sample size (NCSS Statistical Software, 2016).

Instruments

The primary variable in this experimental study was academic performance, assessed by the score obtained in both deductive and inductive CBL activities. This grade was assessed between 0 and 10, with 0 being the lowest grade and 10 being the maximum grade. In the case of the deductive CBL activity, the grade was obtained on the number of concepts correctly identified in the text and correctly explained, while in the inductive CBL activity it was based on the correct application of the theoretical concepts in the story created.

The secondary variables were the academic performance obtained in the exam of the group psychology part of the subject, the students' satisfaction with the activity performed and the perception of self-efficacy.

The academic performance achieved in the exam was assessed by means of the grade obtained in the theoretical exam on the subject. This exam consisted of 40 multiple-choice questions with three answer options, considering the chance factor (so wrong answers were subtracted from the grade). Student satisfaction with the activity was collected by means of an ad-hoc questionnaire composed of seven statements evaluated on a Likert-type scale between 0 (not at all) and 4 (very much). This questionnaire has been previously used in other studies (Gómez-Poyato et al., 2020; Oliván Blázquez et al., 2019; Oliván-Blázquez et al., 2022a; Oliván-Blázquez et al., 2022b). The statements to be assessed were the following: "the teaching methodology used has promoted new knowledge"; "it has favoured deep learning"; "it has helped me to think more critically"; "it has helped me to apply theoretical contents to practice"; "it has helped me to apply theoretical contents to assessments"; "it has helped me to better understand the concepts"; "I think it is a good exercise". A free response section was also included so that students could express themselves openly.

The perception of self-efficacy was assessed using the General Self-Efficacy Scale (GSES) (Baessler y Schwarzer, 1996), following the adaptation of Sanjuán et al. (2000). This scale measures the perception of general self-efficacy (not specific to any type of academic activity) (Sanjuán Suárez et al., 2000). It consists of 10 items, evaluated on a Likert-type scale with a range between 0 and 10,

where 0 equals to "strongly disagree" and 10 to "strongly agree". The internal consistency of the adaptation is $\alpha = 0.91$. In this study, the Cronbach's alpha obtained was 0.917.

Grades were also obtained for age, sex, and university admission (range 0 to 14 points). These factors were collected to describe the sample.

The researcher who evaluated academic performance did so based on a rubric for each activity. This rubric collected the number of correct concepts either extracted (deductive CBL) or included in the case history (inductive CBL). It also verified the theoretical concepts that had to appear, which were at least 6 from the following: group concept and typology, group origin, group thinking, factors for group cohesion, interpersonal conflict and type of resolution, roles, role conflict, deviation from the norm, status, leadership, and group communication.

Procedure

These activities were developed in groups, during class time, in consecutive weeks. Both activities focused on the application of theory to the practice of the contents taught in the social psychology (group psychology) part of the subject. These contents were: 1) conception, meaning and types of groups; 2) group development processes, cohesion, conflict, obedience, group violence, and group decision making; 3) group structure: definition, status, roles, norms, and group culture; 4) leadership; and 5) other group characteristics such as communication and empathy.

The deductive CBL activity consisted in the reading of two cases or stories provided by the subject teachers. The students, working in groups, had to read, analyse, identify the theoretical concepts underlying the stories, as well as explain how and where they were found in the story. They were then required to produce a report on these two stories in 120 minutes.

The CBL inductive activity consisted of the elaboration and creation of a story where a group appeared. The story included, in a non-explicit way, concepts seen in the subject. There had to appear at least 6 theoretical concepts from the following: group concept and typology, origin of the group, group thinking, factors that promote group cohesion, interpersonal conflict and type of resolution, types of roles, role conflict, deviation from the norm, status, leadership style based on some theory seen in class, and group communication. This activity was also developed in 120 minutes.

Ethical Aspect

All procedures contributing to this work comply with the ethical standards of the 1975 Declaration of Helsinki, as revised in 2008. Since the project involves the collection and processing of personal data, including personal information; the collection, processing, communication, and transfer of personal data of all participating subjects must comply with the provisions of the General Data Protection Regulation (EU) (GDPR 2016/679) and the applicable national legislation, Organic Law 3/2018, December 5, on Personal Data Protection. In addition, all individuals in the sample have given their

consent for their data to be anonymised and used only for the purposes and publication of the results of this study.

Data Analysis

Due to the sample size, parametric tests were deemed appropriate, since, in large samples, even if the data distribution is not normal, the statistics tend to be normal (Lubin Pigouche et al., 2005). First, a descriptive analysis [frequencies (n) and percentages (%) for categorical variables; mean (M) and standard deviation (SD) for continuous variables] was performed to determine the characteristics of the sample. Second, the Student's t-test for related samples was used in order to analyse the comparison between both activities (inductive and deductive CBL) in terms of academic performance and all satisfaction items. Third, in order to analyse the relationship between 2 continuous variables (grade of deductive CBL activity, grade of inductive CBL activity, grade of theoretical exam and self-efficacy), correlations were performed using Pearson's correlation coefficient. Statistical analysis was performed using the SPSS 25.0 statistical program (IBM Corp, 2017), with p-values of less than 0.05 being considered significant.

RESULTS

First, a description of the participants was made according to sex, age, and university degree admission grade (Bachelor's Degree in Social Work) variables. As shown in **Table 1**, most of the participants were women (88.8%), with a mean age of 21.31 years (SD: 2.33), who had started the university with a mean grade of 8,98 (SD: 1.67).

Table 1

Description of the sample with respect to the sex, age and university admission grade variables

Variables	Total sample (N=111)
Gender (Women), n (%)	98 (88,3)
Age, M \pm SD	21,15 \pm 2,66
university admission grade M \pm SD	8,98 \pm 1,67

Note. M: Mean; SD: Standard deviation.

On the one hand, regarding the comparison in academic performance and satisfaction between inductive and deductive CBL, as shown in **Table 2**, there was a difference regarding academic performance, which was higher in the inductive CBL activity. On the other hand, in relation to satisfaction, both activities were evaluated with a high grade, and there were no significant differences in the items evaluated, except for "it has helped me to think more critically", which scored significantly higher on the deductive CBL activity.

Table 2

Comparison of both activities (inductive and deductive CBL) in terms of academic performance and satisfaction.

Variables	Deductive CBL, M \pm DT	Inductive CBL, M \pm DT	p-value (IC 95%)
Academic performance	6,51 \pm 1,14	6,83 \pm 1,15	0,042 (-0,61; -0,01)
Satisfaction			
Promotes new knowledge	3,03 \pm 0,76	3,07 \pm 0,68	0,608 (-0,20; 0,13)
Favours deep learning	3,08 \pm 0,67	3,05 \pm 0,68	0,687 (-0,13; 0,18)
Helps to think critically	2,96 \pm 0,85	2,78 \pm 0,87	0,029 (0,01; 0,33)
Helps to apply theoretical contents to practice	3,35 \pm 0,75	3,27 \pm 0,76	0,265 (-0,05; 0,21)
Helps to apply theoretical contents to assessment	3,09 \pm 0,83	3,12 \pm 0,74	0,650 (-,17; 0,11)
Helps to improve understanding	3,16 \pm 0,80	3,22 \pm 0,74	0,426 (-0,19; 0,08)
Is a good exercise	3,31 \pm 0,70	3,30 \pm 0,69	0,899 (-0,16; 0,18)

Note. Statistics used: T-Student of related samples. CBL: case-based learning; DT: typical deviation; IC: confidence interval; M: mean.

Regarding the qualitative assessment of students' satisfaction, they considered both activities as positive, adequate and helpful in order to go deeper into the theoretical contents, but a large percentage of them commented that the deductive CBL activity was more complicated to develop. Finally, in the bivariate analysis performed to analyse the relationship between the grades obtained in the deductive and inductive CBL activities and the grade obtained in the exam, there was a direct significant correlation between the grade obtained in the inductive CBL activity and that obtained in the exam, as shown in **Table 3**.

Table 3

Correlation between the grades achieved by deductive, inductive CBL activities, and the grade of the theoretical exam.

Variables	Activity grade Deductive CBL	Activity grade Inductive CBL	Grade of Theoretical exam	Self- efficacy
Activity grade Deductive CBL	1			
Activity grade Inductive CBL	0,034	1		
Exam grade	0,089	0,219*	1	
Self-efficacy	-0,123	-0,027	0,160	1

Note. Statistics used: P-Pearson; * Significant P-value $P < 0,05$; CBL: Case-based learning.

DISCUSSION

This study analysed the case-based learning activity methodology (inductive vs. deductive) for the improvement of academic performance and satisfaction of social work students. Students obtained

higher academic performance in the inductive CBL activity compared to that obtained in the deductive CBL activity. Therefore, one could consider the activity of creating a story as more effective in terms of academic performance. Both activities obtained a high grade with respect to satisfaction, with a significant difference in the evaluation of the item "it has helped me to think more critically", which is more favourably evaluated in the deductive CBL activity. In addition, the relationship between the perception of self-efficacy, the grades obtained in both learning activities and the grade of the theoretical exam was analysed as well. Also, there is a direct significant correlation between the grade obtained in the inductive activity and the exam grade. In this study, there is no correlation between self-efficacy and academic performance in either activity or in the theory exam. These results partially coincide with the study by Oliván et al. (2022a), as students also significantly considered that the deductive CBL activity favoured critical thinking to a greater extent, although differences were also found in the same sense with respect to the perception that it promotes new knowledge, favours deep learning and the application of theory to practice (Oliván-Blázquez et al., 2022a). In this study we did not analyse the relationship with the subject's theory exam grade or with the perception of self-efficacy.

Regarding academic performance, there are studies that confirm the effectiveness of CBL by itself as a learning methodology in higher education (Escartín et al., 2015; Leonard y Cook, 2010; Popil, 2011). In this study, students achieved a better grade on the inductive activity, i.e., in the activity that implied creating a story introducing the theoretical concepts, than in the activity where they had to extract the concepts from a story provided to them. The main difference can be explained using creativity. Encouraging creative work is fundamental to improve problem-solving competence (Daly et al., 2014). In fact, teamwork, creativity, and problem solving are the most demanded generic skills in the labour market (The Foundation for Young Australians, 2017). However, there is arguably a disconnection between creativity and higher education (Jahnke y Liebscher, 2020), especially in technical degree programs such as engineering (Daly et al., 2014).

Regarding the academic performance evaluated by the grade obtained in the theoretical exam, in the bivariate analysis there is a direct significant correlation between the grade obtained in the that exam and that obtained in the inductive CBL activity. It should be noted that CBL activities train students to identify theoretical concepts in hypothetical or real cases, working on skills or competencies, and preparing them for performance in the workplace (Boyatzis, 1982; Oliván-Blázquez et al., 2022a). Competencies are translated into observable behaviours (Berrocal y Pereda Marín, 2001). These results would indicate that CBL activities that involve inductive reasoning would be more effective for passing the theoretical exam. However, the exam, which consisted of 40 multiple-choice questions, assessed the change in knowledge according to Kirkpatrick's second level (learning) (Kirkpatrick y

Kirkpatrick, 2006).

As for the perception of self-efficacy, according to the results of this study, there is no relationship with the grades obtained on either the CBL activities or the exam. This result should be treated with caution, as it assesses general self-efficacy, not self-efficacy in relation to academic activities, and there are no studies that analyse this variable in cross-sectional studies. The literature endorses the idea that the development of certain teaching methodologies improves the perception of self-efficacy in experimental studies (Bi et al., 2019; Keshmiri et al., 2021).

Regarding satisfaction, all items assessed scored high in both activities. This is relevant because students' perception and satisfaction is related to the performance of the activity (Maqableh et al., 2021). There is a significant difference between the two activities in the item "it has helped me to think more critically", where the deductive CBL activity scored significantly higher. This result is consistent with the study by Oliván et al. (Oliván-Blázquez et al., 2022a).

This study presents strengths and limitations. Among the strengths we can find the deepening of the CBL teaching methodology in higher education, including variables such as self-efficacy. Another strength of the study is the sample size, which can be considered adequate to create scientific evidence. There are also certain limitations such as the fact that this study used a general scale to assess self-efficacy, since there is no specific scale to assess the perception of self-efficacy in these activities, and finally another limitation is the fact that it has only been developed in one university.

CONCLUSIONS

These findings make a significant contribution to the didactic methodology of CBL in university education, and especially in the social sciences. The inductive approach to the case-based learning activity proved to be a more successful technique in terms of students' academic performance in the activities conducted. In addition, it showed a significant correlation between the highest grades in the inductive activities and those obtained in the theoretical exam. However, no correlation was observed between the different scores on the activities or the subject exam and self-efficacy. Regarding satisfaction, all groups of students showed high satisfaction, but the deductive reasoning CBL activity was considered a better teaching methodology to enhance critical thinking. The implementation of these methodologies was easy and feasible.

AVAILABILITY OF DATA AND MATERIALS

Data related to this study are available upon reasoned request to the corresponding author.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTIONS

FM-L and RS-A devised the study and conducted the fieldwork; MJS-R performed the data analysis and interpretation; FM-L wrote the manuscript; all authors read, reviewed, and approved the final manuscript.

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