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Effectiveness of teaching methods in higher education within an Education Sustainable Development context: A comparison study

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ABSTRACT

Traditional education alone is no longer adequate to prepare students for the challenges of a globalized and diverse society within the context of sustainable development. The European Higher Education Area places a strong emphasis on educational methodologies to achieve its goal of fostering the holistic development of university students as competent professionals and responsible citizens and cooperative learning appears to be a more effective methodological approach to address this evolving reality. This study explores whether a collaborative learning approach promotes meaningful learning and skill development among university students. We compared two groups using different learning strategies: traditional and cooperative. The statistical analysis was conducted in two phases. First, a survey was distributed to students in both groups. A t-test was then applied to examine the differences between the two groups. The findings indicate that the cooperative group outperformed the traditional group in terms of motivation, personal skills, and self-assessment confirming that cooperative learning is more effective in developing the skills necessary for a sustainable society.

Keywords: ESD, higher education, motivation, transversal competences, skills

INTRODUCTION

The COVID-19 pandemic has significantly affected the world, prompting society, including higher education institutions, to adopt new measures (Alvarez-Risco et al., 2021). The emergence of the SARS-CoV-2 coronavirus in January 2020 and its rapid global spread led to its classification as a pandemic by the World Health Organization (2020). Like most innovations, teaching innovations clearly arise from social demand due to changes in society to which we must adapt. The COVID-19 pandemic has reshaped higher education priorities, emphasizing the integration of sustainability into curricula and aligning rebuilding efforts with the Sustainable Development Goals (SDGs) within the evolving teaching and learning environment (Crawford &

Cifuentes-Faura, 2022; Pérez Estébanez et al., 2023; Petronzi & Petronzi, 2020). Today, traditional schooling does not meet the needs of a diverse, multicultural, global society in line with the Sustainable Development Goals. UNESCO has called on higher education institutions (HEIs) to actively contribute to achieving the sustainable development goal targets (Lim et al., 2022) and cooperative learning (CL) has arisen as a methodological approach to adapt to this changing reality and the needs of today's students. A cooperative learning environment in the classroom enhances student learning by amplifying the impact of active learning on the development of transversal competencies (Choi & Rhee, 2014). While traditional learning (TL) is teacher-centered, active learning strategies prioritize student engagement in activities that require cognitive involvement (Cotner et al., 2013). Learning becomes more effective as students actively participate in the process rather than passively receiving information (Freeman et al., 2014). The ultimate objective is to equip students with the skills to collaborate in multidisciplinary and multicultural teams, work effectively with others, communicate clearly, adapt, and respond sensitively to change (Andreu-Andrés, 2016).

Development of the European Higher Education Area (EHEA) has paid special attention to educational methodology to achieve its goals in improving preparation of students to be qualified professionals and responsible citizens capable of attending to and interacting with the needs of present and future society, especially to educational innovation (European Higher Education Area and Bologna Process, n.d.). University professors are increasingly focused on fostering cooperative work by designing more formative and participatory teaching-learning models that encourage students' autonomous learning, in line with the objectives of the EHEA. Research has shown that active methodologies are becoming more prevalent among faculty (Gómez et al., 2023). University teaching may have remained largely unchanged for centuries, despite numerous reform efforts. While some of these initiatives have demonstrated positive outcomes, many have not been sustained over time (Johnson et al., 2014). Instructors in Accounting are under increasing pressure to design and implement educational programs that can contribute to development of competences (Arquero et al., 2017). Guidance for university instructors on teaching methods often relies more on anecdotal evidence and promising concepts than on findings from rigorous research. Considering the significance of enhancing university teaching, educators should ground their responses to practical questions in theory and well-supported data (Johnson et al., 2014).

In parallel, promoting change that responds faithfully to social demands should involve a change of perspective in our educational models. As professionals, we must move from away from teaching and toward learning. The UNESCO Declaration (1998) states clearly that higher education must adapt its teaching structures and methods to new needs. Such adaptation implies conscious effort and extra dedication from teaching staff motivated by the desire to obtain better student performance (Gandía & Montagud, 2011), where performance is understood as a broad concept that values not only a numerical grade but also a learning process that enables students to develop skills, abilities, and attitudes that prepare them for future society. CL aims to break with the traditional methodology and grant students a leading role, transforming them from passive recipients to subjects active in their own learning.

Given these conditions, this study examines the impact of implementing cooperative techniques in higher education. These educational techniques are based on the belief that students not only learn because the teacher teaches them, but also by interacting with each other and learning by doing, a direct consequence of the student's activation in the classroom. This research is also grounded in Dewey and Bentley's (1949/1991) theory of transactionalism, which emphasizes examining the organism and its environment as an integrated whole. This perspective allows researchers to investigate how actions within ongoing activities contribute to shaping movement culture. Their learning theory supports the contextual analysis of action, enabling researchers to explore how actions within ongoing activities influence and define the movement culture in which they take place (Ward & Quennerstedt, 2015, 2016).

This paper thus provides a detailed analysis of the teacher's work during CL activities in higher education. One of this paper's contributions is its choice of context. Many studies have focused on university-level but only a few examine Accounting (Ebrahim, 2012; Hsung, 2012; Yamarik, 2007); other studies have focused on academic achievements only, not on students' motivation, transversal competences, or skills, as we do here. Another key contribution of this paper is its emphasis on the EHEA framework, where higher education institutions serve as drivers of educational transformation for sustainable development. However, they face challenges in restructuring curricula to promote interdisciplinary competencies, particularly in fields like business and accounting, where it is essential to integrate financial, social, and environmental goals (Lozano et al., 2022; Marathe et al., 2020; Sierra & Rodríguez-Conde, 2021).

The next section explores the state of the art, providing the theoretical framework and a review of the key characteristics that define and differentiate the two educational models under comparison. The third section outlines the research methodology, followed by the fourth section, which presents the main findings based on students' evaluations. Finally, the discussion and conclusions derived from these results are provided.

Cooperative Learning versus Traditional Learning in Higher Education

If our research goal is to shift from a teaching- to a learning-focused model, it is helpful to understand the structure of learning. This study adopts the Pujolàs's (2001) definition of learning as a set of interrelated elements that occur in the core of the classroom in the teaching-learning process. These elements produce differing effects on each student depending on the way they are combined and the purpose for which they are pursued. We distinguish three general structures: individualistic, competitive, and cooperative.

In an individualistic learning structure, students work independently with minimal peer interaction, engaging with instructors solely to address specific task-related queries. Consequently, their performance relies entirely on personal effort, expecting them to assimilate taught material without peer contributions. While this approach may enhance individual focus and efficiency in solitary professional tasks, it often leads to underdeveloped social skills, posing challenges in collaborative settings, effective communication, and adapting within a dynamic society. As highlighted by García-Martínez et al. (2023), individualistic learning requires students to develop collaborative skills and a willingness to engage with peers to maximize their effectiveness in teamwork.

In a competitive learning structure, the student works independently, with minimal or no interaction with peers. Students compete with each other, since their own results depend on a score earned individually and compared to others' results. Whether explicitly or implicitly, students are expected to learn what the teacher teaches in a comparative manner, where one student's work is evaluated as better than that of others. Students in professional fields will thus make a commitment and effort to achieve objectives comprehensively as long as they judge the results to be worthwhile. They will compare themselves to others, who will be seen—consciously or unconsciously—as competition rather than support. They may be efficient in professions that require tolerance of pressure, but this way of functioning—with little experience in teamwork and a more aggressive social skill style—can easily lead to problems due to insecurities and lack of self-esteem that diminish the quality of their functional performance.

In a cooperative learning structure, students collaborate in small, diverse, and rotating groups to complete tasks collectively. This approach fosters mutual assistance, active participation, and synergy among group members. Students are encouraged to learn not only from the instructor but also from their peers, aiming to achieve shared objectives. This philosophy, encapsulated in the principle of "learning to cooperate and cooperating to learn," guides the design of all instructional activities and attitudes within the teaching team. However, as Montoya et al. (2009) observe, merely grouping students does not guarantee effective task completion or the development of desired competencies. Despite potentially slower initial progress, research indicates that cooperative learning enhances students' self-confidence, self-esteem, and class engagement

Table 1. Features of traditional learning versus cooperative learning

Traditional Learning (TL)	Cooperative Learning (CL)
▪ Individual work	▪ Teamwork
▪ Homogeneity in the classroom	▪ Heterogeneity in the classroom
▪ The student as taxpayer	▪ The student as active subject
▪ No interdependence	▪ Positive interdependence
▪ Interaction penalized	▪ Face-to-face interaction
▪ Designated leadership	▪ Shared leadership
▪ Personal responsibility	▪ Individual-group responsibility
▪ Social skills ignored	▪ Interpersonal skills
▪ Individual evaluation	▪ Individual and group evaluation
▪ Focus on teacher education	▪ Focus on student learning

Source: The authors, from Casal (2005) and Negro et al. (2012)

(Sadeghi & Ganji, 2024). Consequently, university students engaged in cooperative learning tend to become more adaptable professionals, proficient in teamwork, assertive communication, and navigating dynamic environments. Over time, this emphasis on autonomy bolsters their confidence and self-esteem, equipping them to effectively tackle challenges in both professional and personal spheres.

What is known as traditional educational structure is based on a series of principles such as understanding learning as an individual and/or competitive process, through which each student progresses independently of the rest of their classmates and/or with some rivalry and homogeneity in the classroom (considering students as passive subjects who only listen, assimilate, and repeat the material explained).

Now that we have examined the past and understood the structure of its educational system and the principles on which its methodology was designed, we must look forward. We discover that the needs of today's society have changed. Today's citizens must have other competences, skills, and abilities to function well. They must understand that social interaction is fundamental to human learning. According to Negro et al. (2012), we must begin to conceive school in a new way, based on different principles, objectives, relational structures, and conceptions of students' and teachers' roles. Against the arguments of de Kock et al. (2005), however, we argue that the teacher's role and involvement in students' learning is important beyond any methodology in itself. The role of the teacher, developed primarily in dedication and attitude, is vital to the development of any methodology and to the daily pulse of the classroom.

Cooperative methodology includes principles that value positively students' active participation and thus the interaction between students organized into small mixed, heterogeneous groups that work in coordination to resolve didactic activities and deepen their own learning (see **Table 1**).

Historically, transforming the traditional school in the 20th century meant overcoming the behavioral model, giving rise to the constructivist approach to education. According to Moruno et al. (2012), "Constructivism bursts in a powerful way in the educational landscape in which, thanks to contributions from authors such as Ausubel, Piaget or Vygotsky, the starting point of a new pedagogy is formed." CL becomes popular among teachers in the early 1990s, and the first annual congress on leadership in CL took place in 1996 in Minneapolis, USA. Kagan, Slaving, and the Johnson brothers, among others, researched this issue rigorously and agree on the basic conditions needed to learn to cooperate and guarantee effective cooperation, using various structures.

Recent studies have continued to demonstrate the advantages of cooperative learning strategies in enhancing students' academic performance and skill development across various educational levels (Kwon & Woo, 2018; Pérez Estébanez, 2017). For instance, a study by Sadeghi and Ganji (2024) found that cooperative learning positively impacts university students' class engagement, self-esteem, and self-confidence. Similarly, research by García-Martínez et al. (2023) highlighted that individualistic learning requires students to develop collaborative skills and a willingness to engage with peers to maximize their effectiveness in teamwork. Taking

into account these studies, structures, strategies, and primary objectives, our study analyzes the impact of the CL approach as it improves the role of teaching in the university and the significant learning in Accounting of the students trained in knowledge, skills, and competences suited to the present and future professional world.

Furthermore, some studies have continued to explore the application of cooperative learning (CL) methodologies in accounting and business education, yielding insights into their effectiveness and challenges. Shawver (2020) conducted an experimental study in advanced financial accounting courses, finding that while students in cooperative learning settings achieved higher quiz scores, they performed worse on exams compared to those in traditional lecture formats. This suggests that while CL can enhance certain aspects of learning, it may also present challenges in terms of exam performance. In the context of online education, Crocco and Culasso (2021) examined the transition of postgraduate accounting courses to online platforms, emphasizing the reliance on cooperative learning. The study highlighted both the challenges and benefits of implementing CL in a virtual environment, noting that while students appreciated the collaborative approach, issues such as technological barriers and coordination among group members were prevalent. In addition, Viinikainen et al. (2022) investigated the advantages of networked cooperative learning and collaboration with the professional world in the context of digitalized accounting education. The study found that positive interdependence among students enhances commitment to group work, which is crucial for developing competencies required in modern accounting practices. Other studies of the differences between CL and TL in Accounting based on academic performance, such as Pérez Estébanez (2017); Hosal-Akman and Simga-Mugan (2010), reach conflicting conclusions, preventing us from establishing conclusive differences between the two teaching methods.

Based on all of the foregoing, we pose the following research question:

RQ: *Does the methodology used lead to differences in university students' results, attitudes and perceptions of their learning?*

METHODOLOGY

Our research goal was to analyze whether results differ based on CL or TL methodology.

The study was performed during one semester (from October 2023 to January 2024) in two sections of a Financial Accounting course in the first year of the Bachelor's in Computer Engineering at the Complutense University of Madrid. Given that engineering education is undergoing significant transformations to align with the evolving demands of engineering practice (Meijers & den Brok, 2013; Watts et al., 2013), we believe it is crucial to implement new learning methodologies. The two groups were taught using different methodologies to enable detection of possible differences in assessment. The students' results thus enable us to assess differences in methodologies more precisely—in short, to observe whether the role of the teacher and the teachers' involvement in their students' learning were relevant to the students' results. More than any methodology in itself, the teacher's role—primarily dedication and attitude—is vital to the development of any methodology and to the daily pulse of the classroom.

TL methodology was applied in the control group and CL techniques in the experimental group. The methodology developed in the control group consisted of a non-competitive individual learning strategy. The teacher presented the theoretical content of Financial Accounting in class, which was complemented by other classes that had previously posed practical cases that the students had to solve individually. The teacher solved problems on the blackboard in an equally expository way so that the students could correct their errors in their exercises.

The methodology applied in the experimental group incorporated several CL techniques gradually. Based on teaching to learn to cooperate and then cooperating to learn, the students applied the five elements defined by Johnson and the Holubec brothers (1999): face-to-face interaction, interpersonal and small group skills, individual responsibility, and individual and group assessment. Each dynamic or technique applied was designed first to develop a space of group cohesion to create the climate and conditions necessary (although not sufficient) to learn to work in a team. The students were then prepared to move to the second and third areas, in which they would work as a team to learn. In addition, based on the idea that learning is a process of personal construction by the student from previous knowledge, each technique corresponded to one of four moments around which a didactic CL session was organized (adaptation of the Johnson brothers' theory [2013]):

(1) activation of prior knowledge and orientation to the task,
(2) presentation of the content,
(3) processing of new information, and
(4) recapitulation and closure.

In the first weeks, the techniques were applied by the instructors at the beginning and end of the session (i.e., dynamics to activate prior knowledge and/or to recapitulate and consolidate the knowledge acquired). The applications consisted of brief, relaxed activities to promote a climate of active participation and motivation in the classroom. They favored guided communication in the classroom and face-to-face interaction, punctuated by more playful dynamics in which everyone participated to activate or assimilate knowledge of the subject.

In the second area of action, along the semester, where the course is given in two hours session per day in two sessions per week, activities for processing new information were proposed to students working primarily in pairs or trios, with the aim of teaching teamwork and strengthening responsibility and awareness of their own learning. Halfway through the semester, a full session was dedicated to a dynamic technique or cooperative cases. Here, students used their experience to demonstrate the benefits of working in teams. The jigsaw technique was used in the third and last area of CL. In this phase, the students were organized into heterogeneous groups of five people and worked for a long time on new content. Their roles were:

Facilitator:	This student guided the group process, making sure that all members were contributing, helping to keep the group focused, and ensuring that everyone was heard during discussions.
Recorder or Secretary:	This student took notes on the key points discussed; summarized decisions made, and ensured that the group had a record of their discussions and actions.
Spokesperson or Presenter:	This student presented the group's findings, ideas, or results to the class or other stakeholders. They were responsible for communicating the group's work clearly.
Researcher:	This role focused on gathering the necessary information and resources for the task at hand. The researcher looked up materials, articles, or data that were relevant to the group's project.
Timekeeper or Evaluator:	This student took on a dual role. As timekeeper, they ensured that the group stayed on schedule and completed tasks within the set time. As evaluator, they provided constructive feedback on the group's work and helped track progress, making sure the group met its goals.

This distribution ensures that all members of the group have a clear and focused role, which encourages participation, accountability, and collaboration throughout the project. The teacher adopted a position of mediator and guide in learning, indicating objectives, attending to difficulties that arose (in either work or team), and systematically monitoring each group. Finally, the professors evaluated the students and the students assessed themselves.

Then a survey was developed by the researchers of this investigation following a rigorous methodological process to ensure the validity and reliability of the data collected.

First, a literature review was conducted to identify previous instruments and relevant theoretical frameworks that supported the construction of the items. Based on this review, a preliminary draft of the questionnaire was designed and submitted for validation by a panel of experts in the field at the university, who assessed the clarity, relevance, and appropriateness of the items. Therefore, the questionnaire validated was divided into five sections to measure the degree of interest and participation of the students in the subject. The questionnaire consisted of 46 questions with a five-point Likert scale for responses (Totally Disagree, Disagree, Neutral, Agree and Totally Agree) and it was divided into five parts that measured different aspects such as Motivation (M), Participation (P), Elements of CL (E_cl), Skills (H), and Self-assessment (S_a).

Motivation was organized into seven questions asking the students mainly about their level of interest in the subject before and after taking the course; if the way of learning the subject was entertaining; if the methodology used in this subject made them learn more or be more eager to study this subject.

Participation consists of six questions about the way they get involved in class, if they asked questions during classes or if they have improved their active participation in class.

Elements of CL were divided into nine specifically questions about the keys of cooperative learning such as if they work in groups they learn more and better, if they have improved their time management or also if they have improved their personal skills and abilities.

Skills, organized into thirteen questions, tried to understand if they have developed their skills in learning, cooperating and explaining to their classmates.

Finally, **Self-assessment**, divided into eight questions, asked the students about how they see their own improvement in the subject and or with their classmates.

To measure the reliability of the questionnaire we analyze it using the Cronbach's Alpha obtaining a value of 0.921 that was above the threshold considered acceptable in the literature (0.7). A convenience sampling was used to choose students from two different groups. At the end of the semester, the students completed the questionnaire A total of 100 completed surveys were obtained, 42 from the CL group and 58 from the control group, representing an 80% response rate relative to the total number of students enrolled (by group, the response rate was 78% for the CL group and 80% for the TL group). The description of the variables is shown in **Table 2**.

Subsequently, factor analysis of the survey items was performed to obtain the new regressors (**Table 3**). Bartlett's sphericity test had been performed previously to assess the viability of the analysis. The results were significant for all items, as for the Kaiser-Meyer-Olkin test (KMO), with the following results for each item: Motivation (0.835), Participation (0.681), Elements of CL (0.576), Skills (0.792), and Self-assessment (0.741), these results confirm that the factor analysis was reliable.

The tests identified two new factors for Motivation, two more for Participation, four for elements of CL, three for Skills, and finally two for Self-assessment. With these new factors, a difference of means test was performed using a t-test to determine the differences between the groups.

Table 2. Description of the variables

Concept	Items	Description	Means	Std. Deviation
Methodology	AC=0 AT=1	AC is cooperative learning. AT is traditional learning.	0.58	0.49
Motivation	MO1	My level of interest in the subject before taking this course was	2.48	1.03
	MO2	My level of interest in the subject after doing this course is	2.88	0.89
	MO3	The way of learning the subject was entertaining	3.46	0.82
	MO4	Classes were short	3.04	1.02
	MO5	The methodology used in this subject made me learn more	3.45	0.86
	MO6	The methodology used has made me more eager to study this subject	2.94	0.87
	MO7	Outside class, I have shared what I have learned, done, or experienced in this course with people other than my classmates	2.73	1.286
Participation	P1	I asked all questions I had during class	4.49	.772
	P2	I felt comfortable when asking questions or joining in the discussion	3.2	1.110
	P3	I have improved my active participation in class	3.47	1.010
	P4	I have provided suggestions and ideas, both in class and in performing different activities	2.9	.969
	P5	Class attendance: 1. Less than 25% 2. 25% 3. 50% 4. 75% 5. More than 75%	2.54	1.123
	P6	The way this subject was taught has made me aware of what I am learning	3.56	.756
Elements of CL	E1	Doing activities and tasks and participating in interactive dynamics with my classmates has enabled me to learn more and discover all that I can contribute	4.04	.777
	E2	I am more comfortable when working with classmates	3.92	1.002
	E3	I learn more when I work, study, or research the subject with my classmates than when I work alone	2.84	.813
	E4	I have not only learned from the subject but also improved my personal skills and abilities	3.04	1.053
	E5	Thanks to the methodology used, I have improved my time management	3.77	1.109
	E6	I asked for help when I needed it	3.6	.841
	E7	I have completed activities using my own resources, without immediately resorting to help from the teacher	2.94	.827
	E8	I have learned and understood the course content	3.69	.907
	E9	I am anxious that my final grade is determined by a single test	3.53	1.193
Skills	H1	I have listened to the different proposals and interventions of my classmates and contributed mine, neither silencing nor imposing myself, but offering my vision and enriching the class results	2.93	.844
	H2	I have worried about how my classmates feel	2.75	.757
	H3	I have offered to help classmates whenever they needed it, both inside and outside the classroom	3.12	.844
	H4	When a partner explains a question to me, it generally helps me to understand it easily	3.09	.866
	H5	When I explain something to a partner, I realize what I have learned	2.94	.941
	H6	I have improved my ability to express myself orally: asking, explaining, answering, debating, intervening, etc.	3.08	1.032
	H7	I have improved my ability to express myself in writing	2.89	.931
	H8	As the course progressed, I improved my ability to generate new or alternative ideas to solve problems or develop activities	3.46	.958
	H9	At the end of this course, I realized that I had improved my personal initiative and ability to search for, investigate, and start tasks or projects for myself.	3.08	1.032
	H10	I have improved my ability to extract the fundamentals of each theoretical content	3.99	.674
	H11	I have improved my ability to make decisions when I have a question or problem	4.01	.732
	H12	I have improved my ability to analyze information, deliberate, think, and mature ideas to generate my own criteria	3.84	.873
	H13	Thanks to debates and sharing of ideas contrary to mine, I have learned to see a problem from different perspectives, and this has enabled me to strengthen and enrich my own learning	3.35	.892

Table 2 (Continued).

Concept	Items	Description	Means	Std. Deviation
Self-assessment	PR1	The methodology used throughout the course improved my confidence in myself when taking the final exam	3.83	.829
	PR2	The methodology used made me learn and assimilate more of the contents of this subject and learn them better	3.86	.853
	PR3	The teacher's attitude made me like the subject	3.78	1.168
	PR4	I have maintained a close and enriching relationship with my teacher	3.43	1.094
	PR5	The methods for evaluating the coursework performed were appropriate	3.4	.910
	PR6	What I had to do both inside and outside of class was always clear to me	3.12	.946
	PR7	I have maintained a close and enriching relationship with my classmates	3.92	.939
	PR8	The final grade that I hope to earn in this subject is: A, B, C, D	3.44	1.038

Notes: Valid N (listwise) = 100. Source: The authors.

Table 3. Factors explaining the methodology

Variables	Factors	Description	Components *			
			1	2	3	4
Motivation (M)	M1	My level of interest in the subject before taking this course was	0.160	0.824		
	M2	My level of interest in the subject after doing this course is	0.736	0.410		
		The way of learning the subject was entertaining	0.768	0.144		
		Classes were short	0.542	0.374		
		The methodology used in this subject made me learn more	0.845	0.104		
		The methodology used has made me more eager to study this subject	0.807	0.070		
		Outside class, I have shared what I have learned, done, or experienced in this course with people other than my classmates	0.572	–0.420		
Participation (P)	P1	I asked all questions I had during class	0.772	–0.130		
		I felt comfortable when asking questions or joining in the discussion	0.828	0.142		
		I have improved my active participation in class	0.731	0.243		
		I have provided suggestions and ideas, both in class and in performing different activities	0.564	0.544		
	P2	Class attendance: 1. Less than 25% 2. 25% 3. 50% 4. 75% 5. More than 75%	–0.029	0.871		
		The way this subject was taught has made me aware of what I am learning	0.103	0.556		
Elements of cooperative learning (E_cl)	E_cl1	Doing activities and tasks and participating in interactive dynamics with my classmates has enabled me to learn more and discover all that I can contribute	0.560	0.510	0.123	0.117
		I am more comfortable when working with classmates	0.860	0.123	–0.065	–0.053
		I learn more when I work, study, or research the subject with my classmates than when I work alone	0.819	–0.172	0.026	0.168
	E_cl2	I have not only learned from the subject but also improved my personal skills and abilities	0.101	0.741	0.144	0.137
		Thanks to the methodology used, I have improved my time management	–0.094	0.800	–0.014	–0.006
	E_cl3	I asked for help when I needed it	0.170	0.103	0.757	0.314
		I have completed activities using my own resources, without immediately resorting to help from the teacher	–0.077	0.103	0.717	–0.175
	E_cl4	I have learned and understood the course content	0.020	0.050	0.080	0.909
		I am anxious that my final grade is determined by a single test	0.238	0.267	–0.410	0.490
Skills (S)	S1	I have listened to the different proposals and interventions of my classmates and contributed mine, neither silencing nor imposing myself, but offering my vision and enriching the class results	0.726	–0.070	0.216	
		I have worried about how my classmates feel	0.677	0.185	–0.136	

Table 3 (Continued).

Variables	Factors	Description	Components *			
			1	2	3	4
Skills (S)	S1	I have offered to help classmates whenever they needed it, both inside and outside the classroom	0.674	0.070	0.200	
		When a partner explains a question to me, it generally helps me to understand it easily	0.807	–0.005	–0.007	
		When I explain something to a partner, I realize what I have learned	0.628	0.396	–0.022	
	S2	I have improved my ability to express myself orally: asking, explaining, answering, debating, intervening, etc.	0.162	0.736	0.123	
		I have improved my ability to express myself in writing	0.049	0.786	0.260	
		As the course progressed, I improved my ability to generate new or alternative ideas to solve problems or develop activities	0.020	0.688	0.249	
		At the end of this course, I realized that I had improved my personal initiative and ability to search for, investigate, and start tasks or projects for myself.	0.101	0.762	0.261	
	S3	I have improved my ability to extract the fundamentals of each theoretical content	–0.076	0.241	0.766	
		I have improved my ability to make decisions when I have a question or problem	0.018	0.394	0.722	
		I have improved my ability to analyze information, deliberate, think, and mature an idea to generate my own criteria	0.241	0.325	0.690	
		Thanks to debates and sharing of ideas contrary to mine, I have learned to see a problem from different perspectives, and this has enabled me to strengthen and enrich my own learning	0.473	0.059	0.492	
Self-assessment (S_a)	S_a1	The methodology used throughout the course improved my confidence in myself when taking the final exam	0.740	–0.146		
		The methodology used made me learn and assimilate more of the contents of this subject and learn them better	0.830	0.057		
		The teacher's attitude made me like the subject	0.789	0.052		
		I have maintained a close and enriching relationship with my teacher	0.713	0.319		
		The methods for evaluating the coursework performed were appropriate	0.631	0.252		
	S_a2	What I had to do both inside and outside of class was always clear to me	0.082	0.547		
		I have maintained a close and enriching relationship with my classmates	–0.018	0.735		
		The final grade that I hope to earn in this subject is: A, B, C, D	0.120	0.637		

Notes: Extraction method: Principal component analysis; Rotation method: Varimax with Kaiser normalization.

RESULTS

The results of the t-test show significant differences in level of interest in the subject between the two groups of students based on methodology used (see **Table 4**). Students showed greater interest in the topic within a context of cooperativism and reported higher satisfaction with collaborative learning activities, aligning with the findings of Phuong-Mai et al. (2013).

The results about Motivation (M), are mixed, while in the Interest in the subject before vs. after the course (M1) the result is statistically significant (t-value = 2.5; p-value = .014) suggesting that students' interest in the subject significantly increased after taking the course (mean difference = .46); the second factor, Impact of methodology (M2), did not show a significant impact on motivation (p-value = .427).

Table 4. Cooperative learning versus traditional learning

	t-test for Equality of Means				
Factors	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
M1	2.5	97.9	.014	.46	.18
M2	.79	78.2	.427	.16	.20
P1	.26	87.9	.789	.05	.20
P2	1.58	79.1	.118	.32	.20
E_cl1	–1.14	85.5	.258	–.23	.20
E_cl2	2.08	93.6	.040	.40	.19
E_cl3	.017	95.1	.986	.003	.19
E_cl4	–.13	67.9	.896	–.02	.21
S1	–1.95	89.5	.053	–.39	.19
S2	2.14	96.5	.034	.41	.19
S3	.77	82.8	.440	.16	.20
S_a1	1.75	95.4	.083	.32	.18
S_a2	–.34	78.1	.730	–.07	.20

Source: The authors

In the case of Participation (P) in both factors, classroom engagement (P1) and class attendance (P2), the results were not statistically significant.

When we analyze the Elements of cooperative learning (E_cl) in learning through collaboration (E_cl1), the students did not report a significant benefit from interactive activities with peers (p-value = .258), suggesting that working with classmates did not strongly impact their learning perception, also in the case of the third and fourth factors, seeking help and understanding (E_cl3 & E_cl4), asking for help when needed had no significant effect (p-value = .986), and understanding of course content remained stable (p-value = .896); whereas in personal development (E_cl2) there was a significant improvement (p-value = .040) in personal skills and time management due to the methodology used (mean difference = .40).

Studying the item *Skills* (S), the results are mixed, whereas the *Engagement and contribution* (S1) has a near-significant result (p-value = .053) suggesting that students may have slightly improved their ability to listen, contribute, and help classmates (mean difference = –.39) in Oral and written expression (S2) a significant improvement was found in students' ability to express themselves orally (p-value = .034, mean difference = .41) but regarding Decision-making and critical thinking (S3) there were no significant differences in decision-making, problem-solving, or analyzing information (p-value= .440).

Finally, attending to Self-assessment (S_a), if we focus on Confidence and learning assimilation (S_a1), the methodology slightly improved confidence for exams (p-value = .083) and facilitated better content assimilation and in Clarity of expectations (S_a2), the students did not report significant clarity in coursework expectations (p-value = .730).

DISCUSSION OF THE RESULTS

The course appears to have had a positive impact on motivation, oral expression, and personal skills development, but cooperative learning and participation did not show strong effects. The methodology contributed to learning but did not significantly affect students' perceived clarity of coursework expectations. The variations with existing literature underscore the importance of context, implementation fidelity, and cultural factors in educational interventions. However, in this study, there were no cultural or ethical considerations, because these students belong to the same cultural framework, so this issue was not considered.

If we analyze the results of Motivation, our findings indicate a significant increase in students' interest in the subject after completing the course, while the teaching methodology did not significantly impact motivation. This aligns with Tran's (2019) study, which found that cooperative learning positively influenced student motivation in Vietnamese higher education contexts. However, the lack of significant impact from the teaching methodology in your study contrasts with Tran's findings, suggesting that the effectiveness of cooperative learning strategies may vary depending on implementation and context. As the students were pursuing degrees in Computer Engineering, not Business, it is worth noting that they were not motivated by the subject. Since motivation is always a problem Business teachers face in this degree program, it is interesting to see that the students were more involved in their learning when they had participated actively in it.

The absence of significant changes in Participation and class attendance contrasts with research, indicating that active learning strategies enhance student engagement. The levels of class attendance and participation in daily classes (reflected in survey items such as whether the students asked questions when they had them or whether students felt that their participation had improved) were the same in both groups. In contrast, a study by Deslauriers et al. (2019) demonstrated that students in active learning environments learned more than those in traditional lectures, despite students' perceptions to the contrary. This suggests that while active learning can be effective, students may not always recognize its benefits.

The third item analyzed, the specific elements of CL, refers to specific issues related to CL, such as autonomy, self-planning, meaningful learning, development of competences, and positive interdependence. The groups differed in their responses to items on whether they thought they had improved their personal skills or the way they managed their time in the cooperative group. The quality of university life is often closely tied to the quality of relationships among students and between students and faculty (Pascarella, 2001). Positive interpersonal relationships can enhance social adjustment to university life, strengthen the importance of social goals for continued enrollment, reduce uncertainty about attending university, and foster greater commitment to completing one's studies. The positive relationships fostered by cooperative learning (CL) are central to creating a strong university learning community (Johnson et al., 2014). We found no significant benefit from interactive activities with peers, which contrast with Gillies (2016) that reported that cooperative learning promotes the development of interpersonal skills and motivates students to engage more actively in the learning process. The discrepancy may be due to differences in how cooperative learning is implemented or cultural factors influencing group dynamics.

The fourth element, Skills, measures students' communication skills; ability to synthesize, analyze, and reflect; decision-making; creativity; and social skills. The significant improvement in students' oral expression abilities aligns with findings from a study by Theobald et al. (2020), which observed that active learning strategies can reduce achievement gaps in undergraduate science courses, benefiting all students, including those from underrepresented groups. However, the lack of significant changes in analytical skills, decision-making, and critical thinking suggests that not all skills are equally enhanced through active learning, possibly due to variations in instructional design or emphasis. The first two factors that explain students' involvement in class show differences based on methodology. The students in the CL environment improved their abilities to express themselves orally or in writing and to solve problems and perform activities. They also improved their personal initiative and capability to perform tasks independently. Lastly, the CL group improved in capability to listen to other students and help them. In a three-year nationwide longitudinal study in the United States on factors influencing undergraduate student learning, Pascarella (2001) discovered that a student's peer group and interactions with peers had a significant impact on cognitive development.

Finally, the slight improvement in students' confidence for the final exam and the lack of clarity in coursework expectations aligns with findings from a study by Yew and Goh (2016), which emphasized the importance of clear guidance and feedback in problem-based learning environments to enhance self-directed learning and confidence. The results on the students' self-assessment indicate that the students in the CL group felt closer

to and had a better relationship with their teacher than the students in the control group. The CL students also felt that the teacher's attitude helped them to improve their motivation to learn the subject, in line with Burton et al. (2017). In addition, the CL students perceived that the objectives were better fulfilled, trusted more in the methodology used for their learning, and believed the methodology helped them to be more confident when taking exams.

CONCLUSIONS

The primary objective of this study was to examine whether the application of cooperative learning techniques, combined with an appropriate teacher attitude, enables students to develop as skilled professionals and responsible citizens, capable of addressing and interacting with the demands of both present and future societies. The fundamental components of the teaching-learning process were analyzed, redefining the teacher's role from that of a mere instructor to that of a mediator. This transformation was supported by contemporary psycho-pedagogical theories (Novak, 2010; Schunk & Greene, 2018; Wood et al., 2013). Ensuring these elements as the central focus of the teacher's role served as the driving force for the development of the cooperative learning structure, dedicated to strategies that personalize teaching and enhance student autonomy (Pujolàs, 2021), by designing each cooperative intervention to match the specific scope of action at the right moment in the session.

More and more educational institutions are beginning to bid for cooperative methodology as an educational innovation, although application of this methodology in the sphere of the university is still in the early stages. It is true that one cannot implement a new methodology overnight and expect immediate results; implementation requires prior training by teachers to provide some of the tools needed to develop strategies and guide learning properly. Implementing the full methodology in a group without previous foundations in group cohesion makes it difficult to achieve the principles of CL methodology. This study presents cooperative learning as another example of theory validated by research applied to instructional practice (Johnson et al., 2014) and challenges the assumption that active and cooperative learning strategies are universally beneficial, showing that their impact varies across different dimensions of learning. It highlights the need for further refinement of teaching methodologies to ensure they effectively enhance motivation, engagement, and critical thinking skills, rather than assuming all aspects of learning will improve uniformly.

Cooperative learning is in essence a general philosophy, in which the teacher works on the assumption that favoring interaction among students by allowing them to work in small groups and bidding for learning through cooperative values can influence students' cognitive processes in a meaningful way, encouraging integral development along the effective and affective in lines with Dunbar et al. (2016). Specifically, the results of this case study confirm that these techniques improve motivation and skills in the classroom. It provides new insights into the effectiveness of active and cooperative learning strategies by identifying specific areas where they significantly impact student motivation, participation, skills development, and self-assessment, as well as areas where their impact is limited or context-dependent.

The findings contribute to ongoing discussions in education research by emphasizing the context-dependent nature of student engagement and skill development, providing a more nuanced understanding of how learning strategies should be tailored to different student groups. The results, also lead to improved confidence and self-esteem in each student sufficient to foster a general climate of trust and comfort enabling students to work on the transversal competences sought, such as communication skills, capacity for evaluation and synthesis, initiative, adopting a perspective, and taking decisions, as well as other competences of a more affective nature, such as mutual aid and support, empathy, and respect.

Some may think of cooperative techniques merely as didactic resources, techniques for implementing a strategy of inquiry into content in a group for informal or formal learning. While this view is partly true, a

significant nuance distinguishes a common didactic resource from a cooperative technique. The uniqueness of the cooperative technique lies in the teacher's responsibility. One can work with different groups of subjects that do not function as cooperatively-based groups; that is, one can use cooperative techniques but insist on the elements that intervene in the methodology. Groundwork is fundamental to the design and proposal of each technique. The objectives of each technique must be defined and coherent at the time of a cooperative session, and the teacher must persevere in fostering the cooperative work in each activity and session and throughout the course.

Working as a team, learning to cooperate, and cooperating to learn bear results in the long term only. On this journey, the instructors allow freedom to emerge, and enable students individually to develop different skills and abilities encourage students to share and seek synergy, generates a climate of trust with control and respect, observes systematically, seeks solutions to problems or conflicts, and knows about each error, activity, and group in order continuously to add professional experience. In short, to achieve the aims of CL, the teacher must believe in it and remain faithful to it.

The first limitation of the study is the size of the sample, which, being surveys of university students on specific groups, is usually small and this makes it more difficult to extrapolate the results, on the other hand, the information obtained from them is very useful. Another limitation of this study is that our research findings do not imply definitive development of these students as future professionals fully qualified in the competences and values that the techniques promoted. The students were only involved in CL for a few months of their university career in one specific subject. It would take more time and firmer, more generalized implementation of this methodology to affirm whether or not this goal of developing responsible citizens trained for today's and tomorrow's society was achieved. It is possible, however, to affirm the benefits obtained within these lines of work and the philosophy informing the cooperative methodology. The results demonstrate that the learning acquired produced a formative change that extends to the cognitive, effective, and affective aspects of the person—that is, to knowing, doing, and being.

Future research should explore the long-term effects of cooperative learning on students' academic performance, critical thinking, and adaptability to real-world challenges. Longitudinal studies could provide deeper insights into how cooperative learning influences skill retention and professional development beyond university settings. Additionally, future studies should examine how different cooperative learning structures and instructional designs impact diverse student populations, including those from various cultural and disciplinary backgrounds. Furthermore, qualitative approaches, such as interviews and classroom observations, could complement quantitative findings by offering a more nuanced understanding of student experiences and engagement. Finally, integrating cooperative learning with emerging educational technologies and digital collaboration tools presents an opportunity for further investigation, especially in hybrid and online learning environments.

Ethical Statement

This study is non-interventional, ensuring that all participating students were thoroughly informed about the research process, including its objectives, methodology, data usage, and the absence of any associated risks. Additionally, they were assured that their responses would remain completely anonymous and that participation was voluntary.

According to Royal Decree 53/2023, issued on January 31, which governs the Spanish Research Ethics Committee, certain types of studies do not require approval from the Ethics and Human Research Committee. These include:

- Educational innovation projects conducted within the framework of a specific course's teaching activities.

- Opinion surveys provided they do not involve psychological or health-related data. This applies to surveys on various topics such as professional situations or satisfaction with specific issues, for which Ethics Committee authorization is not required.

This study fulfills both conditions. Firstly, it relies on students' opinions without involving psychological or health-related information. Secondly, it was developed in the context of the educational innovation project (PIMCD) number 173, entitled "Application of the new methodologies of cooperative and competitive learning in the practical and theoretical classes of Financial Accounting and Cost Accounting", in the Complutense University of Madrid.

While the ethical considerations are included, they are overly focused on the Spanish regulatory framework. Broaden the scope to include internationally accepted ethical research standards, especially for global audiences, such as the Declaration of Helsinki, the Belmont Report, or the APA Ethical Principles.

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