ENHANCING ENTREPRENEURIAL SKILLS THROUGH CO-OPETITIVE LEARNING EXPERIENCE: A CASE STUDY IN A SPANISH UNIVERSITY

MEJORA DE LAS HABILIDADES EMPRENDEDORAS MEDIANTE LA EXPERIENCIA DE APRENDIZAJE CO-OPETITIVO: UN CASO DE ESTUDIO EN UNA UNIVERSIDAD ESPAÑOLA

Anett Erdmann*
https://orcid.org/0000-0001-6194-568X (ORCID iD)
ESIC University, Spain

Fernando García-Monleón
https://orcid.org/0000-0003-2993-6745 (ORCID iD)
ESIC University, Spain

Margarita Nuñez-Canal
https://orcid.org/0000-0002-5377-1592 (ORCID iD)
ESIC University, Spain

ABSTRACT

Global competition and digital market forces imply opportunities and threats in an increasingly fast and competitive job market. In this context, motivated learning through collaboration or cooperation have been extensively studied to develop necessary skills to be competitive. However, in undergraduate teaching little attention has been given to learning through competition and co-opetition, which is more common in entrepreneurial education. This paper proposes and tests a new classroom methodology where undergraduate students in the course Microeconomics interact in teams playing out features of the four C's of game-based learning in an entrepreneurial environment: cooperation, collaboration,

competition and co-opetition. The pedagogical pilot-project, dubbed as "Micro-Challenge", is a peer-based student challenge which has been implemented in face-to-face classes as well as in a hybrid classroom. A posterior analysis of survey data and academic results, using regression analysis, reveals that the development of collaborative skills and team-based skills depend on personal characteristics and expertise while there is no significant effect of academic performance. Moreover, women are more likely to improve team-working or collaborative skills through the proposed challenge than men and engagement in terms of induced learning effect is found to be higher for students who are already endowed with a high level of competitive or collaborative attitude.

KEYWORDS

gamification in higher education; entrepreneurship education; cooperative learning; competition-based learning; student engagement

RESUMEN

La competencia global y la digitalización de los mercados implican amenazas y oportunidades en un mercado cada vez más dinámico y competitivo. En este contexto, el aprendizaje motivado por la cooperación y la competición ha sido estudiado ampliamente para el desarrollo de las habilidades necesarias para ser competitivo. Sin embargo, dentro de los estudios de grado se ha dedicado poca atención al aprendizaje competitivo y colaborativo-competitiva (co-optitive), el cual es más común en la educación a través del emprendimiento. Este trabajo propone y testea un nuevo sistema docente donde los alumnos de la asignatura de Microeconomía interactúan organizándose en equipos para poner en práctica las 4Cs del aprendizaje en entorno de emprendimiento; cooperación, colaboración, competición y colaboración competitiva a través de un sistema de aprendizaje basado en el juego. El proyecto docente piloto con el nombre de "Micro-Challenge", ha sido implementado tanto en un entorno de clase presencial como hibrido. Un análisis posterior de los datos de la encuesta junto con los resultados académicos, a través de un modelo de regresión lineal, revelan que el desarrollo de las habilidades colaborativas y de trabajo en grupo, dependen de las características y habilidades personales sin que el desempeño académico se muestre relevante. Las mujeres son más propensas a mejorar sus habilidades colaborativas y de trabajo en equipo a través de la dinámica propuesta que los hombres. El efecto de aprendizaje es más intenso en estudiantes que previamente mostraban altos niveles en sus rasgos de competitividad y colaboración.

PALABRAS CLAVE

gamificación en educación superior; educación a través del emprendimiento, aprendizaje cooperativo, aprendizaje basado en competición, compromiso del estudiante

INTRODUCTION

Competitiveness in education usually has not the best reputation, instead emphasis is made on collaborative and cooperative learning methodologies (Oakley et al., 2004¸ Kristensen et al., 2015; Johnson & Johnson, 2017). Nevertheless, from an economic perspective, competitiveness is directly related to prosperity and economic growth (World Economic Forum & McKinsey, 2019); and in entrepreneurial education, team working activities within a competitive environment are commonly accepted as didactic option to simulate the real enterprise world and to develop entrepreneurial skills, knowledge and mind-set, necessary skills for students´ future in the labor market (Brentnall et al., 2018; Jones & Iredale, 2010). In this line, a new educational methodology for higher education seems to merge both, collaborative and competitive learning, known as "co-opetition" (Charlebois & Massow, 2015; Attle & Baker, 2007), consisting in structured competitive in-class-games in which students compete and at the same time collaborate within teams.

In a global competitive market, where natural and political boundaries disappear in favor of a unique scenario (Chan et al., 2009) a frontier-less society starts to lead changes. The growth of this new environment may present opportunities as well as threats, like job losses (Frey & Osborne, 2017) out of the automation, born from the fourth industrial revolution (Schwab & Davis, 2018) and inter-firm relationships are increasingly shaped by co-opetition (Hoffmann et al., 2018; Gnyawali & Charleton, 2018; Devece et al., 2019; Roig-Tierno et al., 2018). The ever-growing competitiveness of this new global and digital market enforces the need to rethink what kind of education and skills do we need to face the future challenges.

Some pioneering authors, such as Gibb (1993), promoted, since some decades ago, that entrepreneurial attitudes and behaviors through education met the needs for adaptation to a new competitive socio-economic environment and globalization. This field of research has been growing since the last 30 years becoming a main element to foster European future development (Bernal, 2020). Since Lisbon conference in 2000, the EU urge to foster an entrepreneurial mindset to the new generation to ensure the sustained growth of economies. The OECD (DeSeCo 2005) followed by the EU (Recommendation 2006/962/EC) has enforced the shift to a new education focus in competences rather than knowledge that has been crystalized. Other institutions as World Economic Forum (Report on innovation, 2019) insist that "Europe needs a new ambition: to compete for global innovation leadership" (p.4). On the one hand, reskilling of the workforce in terms of hard skills like digital training, new technologies and data science are required. On the other hand, entrepreneurial skills and collaborative skills to be competitive and foster competition are needed with new pedagogical perspective in all educational levels (Ladevéze & Núñez, 2016). In this regard, the future of jobs depends upon the skills developed in educational systems, often focused on the benefits of collaborative team working learning (e.g. Oakley et al., 2004).

Entrepreneurship education, which is already embedded in the educational systems across Europe as a goal of the priority policy given by the EU (European Commision, 2016), is commonly understood as a new pedagogical methodology which develops entrepreneurial skills, knowledge and mind-set, typically through a team-based learning experience with competitive learning elements (Jones &

Iredale, 2010; Brentnall et al., 2018). Concretely, it consists in a set of activities that promote more active learning processes in the classroom, or in competitions across schools, simulating the real enterprise world. Here the burden of competitiveness relies in the team - aiming to achieve the best performance -, not in the person, such that the values to be developed are focused on cooperation between team members and competition between teams. These experiences help to foster the behaviors, attitudes and knowledge that lead to a higher entrepreneurial intention (Vamvaka et al., 2020); is understood as a path to self-growth and improvement; and increase the employability of students (Man & Farquharson, 2015; Man, 2019).

In this paper, we investigate how, apparently opposed behaviors - competitiveness and collaboration – can lead to a higher engagement and a satisfactory learning experience and increases self-awareness of competitive attitude and team-working skills. Concretely, we propose and test a new classroom methodology where undergraduate students in the course Microeconomics interact in teams competing among each other's in a game-based learning process. The pedagogical pilot-project, dubbed as "Micro-Challenge", consists of 2 rounds of "battles" between different group-classes, before the partial examinations. Students challenge the other group, taught by another professor, based on self-elaborated questions on course topics in a successive concurrence and judge the responses based on previously submitted answers. The challenges have been implemented in face-to-face classes in the course year 2019-20 as well as in a hybrid classroom 2020-21.

Based on this experience and collected data, a multiple regression analysis is conducted to identify some entrepreneurial traits referred as self-efficacy in the sense of self-awareness and self-identity of determinants as own competitiveness, own social skills, and the metacognition process of consciousness of own learning process throughout the activity. The analysis is based on two different datasets: (1) a survey about these constructs realized after the challenge in the academic year 2019-20, and (2) the academic results of current and previous years, academic years 2018-19 and 2019-20. In explaining the development of the different skills, we distinguish between previous soft skills, tastes and personal characteristics on the one hand and academic performance on the other hand.

Our analysis reveals significant relations between personal characteristics as personality traits or gender and the development of collaborative skills and team-based skills.

The paper is structured as follows. Section two provides a literature review on competencies in active learning in a competitive environment, introduces the idea of the structured "4Cs learning challenge", hereinafter called simply 4C, and set up the hypothesis. Section three describes the challenge. In section four the data and methodology are provided, and section five presents the econometric results. Finally, section six provides a discussion and implications for instructors.

LITERATURE REVIEW

The global competition and a fast changing environment (e.g. digitalization, Covid19 effect) require a faster and strategic adaptation to be competitive. In the university students learn about information processing and decision making in changing environments (Biggs, 1993) and develop the corresponding

competencies as future employees (Cerkovskis & Titko, 2017), which should be aligned with the need of new work force skill formation (Di Gregorio et al., 2020; WEF, 2020).

Enterprise education, with the active mentoring of entrepreneurs and business world representatives and an environment of team working (Mann & Kashefpakdel, 2014) as well as promoting competitiveness across peers (Brentnall et al., 2018), is considered as a reference for undergraduate education in terms of an early development path of entrepreneurial skills. It is noteworthy that entrepreneurial education systems strongly depend on the cultural background of the different societies and countries, with cultural dimensions affecting the way countries and its educational systems react to the competitive environment of a global economy (Cheung, et al, 2010).

Based on the literature on developing entrepreneurial skills, we identify cooperation, collaboration, competition and coopetition as the *"Four C's of active knowledge construction"* through the interaction between peers and with the educator, each approach focusing on a particular aspect of these interactions, which is detailed in the following:

1. Cooperative learning is understood as a learning approach where students change the role from a passive knowledge transmission to an active contribution in the learning process (Johnson & Johnson, 2008). Already Johnson et al. (1994) provide instructors with concrete examples how to implement cooperative learning in the classroom, for instance, promoting student's individual responsibility, using activities based on interpersonal skills or group self-evaluations, among others. The cooperative learning strategy has been found to increase significantly the academic results of students and generate a positive perception towards peers and the content of study, and hence has been widely adopted in education (Johnson & Johnson, 2008). In the context of the digital transformation, the same authors have emphasized the importance of cooperative learning in the use and developments of digital tools (Johnson & Johnson, 2013).

2. Collaborative learning is based on learning in a community, working towards a common goal, implemented through an increasing relevance of student's interactions in group work based on responsibility and respect across peers (Laal et al., 2012). Haythornthwaite (2006) provides concrete recommendations how to implement collaboration in the classroom. She emphasizes the need to make students aware of the process of collaboration, planning for extra time needed for collaborative activities and be aware of the differences in managing offline collaboration and collaborative online skills of remote students. Moreover, it is argued that time, effort and trust among peers can be a barrier for successful implementation of collaboration within and outside the classroom. When it comes to collaborative learning, team-work in form of team assignments does not automatically generate the desired benefits but need to be guided by instructors to equip students with the necessary interpersonal skills (Oakley et al., 2004).

Collaborative and Competitive learning may be, in this context, deemed as synonyms since both terms address the same situation. Nonetheless the concept of Cooperative skills focuses on the individual dimension of learning in community

where us Collaborative skills address the collective attitude of the members of the learning community.

3. Competitive learning has largly been implemented as part of the gamification of learning, with games creating a particular learning environment (Cagiltay et al., 2015). Kristensen et al. (2015) argue that competition is an integrated part of human's daily interactions (by nature or culture), especially in sports and education, and can have ambiguous effects, but if combined with cooperation positive results have been proven in the literature. To be highlighted is the increasing motivation and the learning effect, in terms of achieving higher scores in subsequent assessments (Cagiltay et al., 2015). However, some authors such as Brentnall et al. (2018), have argued that side effects of competitive education are the possible frustration, demotivation between many others to those students who are unable to cope with the pressure of competition advice against the adoption of the competitive method. Another undesired side effect of competitive teaching methods is that they tend to surface social differences since students with a more privileged background tend to reinforce their intellectual superiority and remark the inferiority of others, an outcome that is clearly unwelcome.

Given these different approaches to knowledge acquisition, some authors have argued that neither colaboration and cooperation (which are often not differentiated in the literature; Kozar, 2010) nor competition in its own have an inherently good or bad effect on the learning process, but it is the combination of both that creates a learning environment (Attle & Baker, 2007)

4. Co-opetitive learning combines elements of cooperative and competitive learning, which can be defines as "Cooperation-competition is an instructional strategy combining components of cooperative learning with the positive aspects of motivational competition through inter-group competition between collaborative teams" (Attle & Baker, 2007, p. 79). A co-opetition allows to create a business-like environment which can enhance the learning outcome. For the implementation, a problem-based focus and the clear defined team award in order to commit to team effort are crucial (Attle & Baker, 2007).

Charlebois & Massow (2015) implement the concept of co-opetition as teaching activity (applied to MBA students, where competition between student groups in develeoping project is the main framework but there exists the possibility to strategically coloborate between groups, for instance to gather additional information from third parties, which improves the outcome for all parties involved. A co-opetitive setting in education can also be found at the level of educational organizations, where succesful collaboration between competing colleges in some aspects can create aditional value (networking; sharing risks, costs, etc.) but at the same time university business schools compete strongly for students (Mujis & Rumyantseva, 2014). In the context of online leaning, co-opetition in terms of partnerships with online providers is an interesting option, given the different cost-structure of E-learning (Sjogren & Fay, 2002), and different needs for teaching methodologies, which has become especially relevant since Covid19.

With the aim to develop student's ability to participate and interact actively in a social context, and in this environment to interpret, paraphrase and apply key concepts of the corresponding subjects, under competitive pressure and collaboration, we propose a learning activity, based on a structured combination of collaboration and competition. The activity consists in 2 battles between different classes within the same university based on self-elaborated questions within groups, using elements of individual reflection, collaboration and cooperation as well as competition among peers, and in this way building a co-opetitive learning environment, within and across groups. The activity follows the challenge based learning used frequenty in entrepreneurship education (Castreo & Gomez Zemeño, 2020).

In Table 1, we provide a summary of the reviewed literature supporting the definitions we have used as base for our investigation, namely cooperative, collaborative, and competitive skills as well as of the impact of digitalization in the learning environment.

Table 1. Research's positioning in the literature.

Papers	COOPERATIVE	COLLABORATIVE	COMPETITIVE	Digital
Johnson et al. (1994)	✓			
Johnson & Johnson (2008)	✓			
Laal et al. (2012)		✓		
Oakley et al. (2004)		✓		
Cagiltay et al., 2015			✓	
Kristensen et al. (2015)			✓	
Attle & Baker (2007)	✓	✓	✓	
Brentnall et al. (2018)		✓	✓	
Charlebois & Massow (2015)		✓	✓	
Mujis & Rumyantseva (2014)		✓	✓	
Ladevéze & Núñez, 2016		✓	✓	
Johnson & Johnson (2013)	✓			D
Haythornthwaite (2006)		✓		D
Sjogren & Fay (2002)		✓	✓	D

In this context, we set up the following two main hypothesis on C-skill improvement through the proposed activity:

H1: The proposed challenge improves students' collaborative skills.
H2: The proposed challenge improves student's competitive attitude.

Moreover, we study the overall effect on learning focused on the following hypothesis:

H3: The overall learning effect through the proposed challenge is determined by the general perception and improvement of collaborative and competitive skills.

DATA AND METHODOLOGY

The Challenge, dubbed as "Micro-Challenge", was implemented in two groups of a Microeconomics course for second year students of the Bachelor's Degree in Business Administration and Management at a private university in Spain. Peer competition between the two groups were realized in a conference room during the course year 2019-20 and in a hybrid format during the course year 2020-21.

Challenge setup

The challenge is set up selecting at least two different groups of university students which are taught in different classes the same subject, not necessarily by the same professor. Students taking part in the challenge are informed at the beginning of the term and again two weeks in advance of the activity. Concretely, students are provided with the following information:

a) **Type of the activity:** A student competition is realized between different classes, where you have the chance to challenge the acquired knowledge of the other class and strategically collaborate within your class in knowledge acquisition before the individual partial examinations.

b) **Teams:** Each of the two classes taking part in the challenge (A and B) is going to be divided in 4 teams. To avoid self-selection bias, we assign consecutive numbers to students based on the position they normally take in class which tends to be based on personal affinities, and these numbers are allocated randomly to the four groups.

c) **Pre-work:** Before the challenge, students should work out together with their classmates (regardless of the team) short questions, exam type, and submit individually at least one of these questions two days before the challenge. We shall receive at least as many questions as the students we have in the class to construct a "question bank". Questions are supervised by each class professor to eliminate duplicated or non-suitable questions.

d) **Timing:** The recommended time for the scheduling of this challenge is one week before the partial exam, such that, based on the outcomes, students have still time to improve before the individual examination.

e) **Location:** The day of the challenge, both groups (A and B) gather together in a classroom selected for the purpose with sufficient capacity (optimally any event room or aula magna). Each group is placed on one side of the class organized in four rows based on the teams previously selected. The designed questions by the students have been printed and cut in small pieces of papers which are introduced in a box, one for each group.

f) **The contest:**
  (1) The delegate of each class, tosses a coin to decide which group starts asking.
  (2) The class starting with the questioning draws, though its delegate, a random question from the corresponding box and reads the question out loud to Team 1 from the other class.
  (3) Team 1 has one minute to answer, and the answer is evaluated by the questioning group. A correct answer shall give the Team 2 points, a wrong one means that the question jumps to Team 2 from the same class, receiving 1.5 points for a correct answer and sending the question to Team 3 in case the answer is wrong. Team 3 will receive 1 point for a

correct answer and will send the question to Team 4 in case the answer is wrong which may obtain 0.5 points for a right answer and will send the question to the other class if the answer is wrong. To select the team from the questioning class to answer the question, we follow a random procedure using a four faces dice. The team selected answers the question, receiving 0 points for a correct answer and -1 for a wrong one. This is the maximum extent for each question round.
   (4) In the second round the questioning class will be the other one and the process starts all over again.
   (5) The students play as many rounds as time allows, keeping track of the achieved records of each group on the whiteboard.
   g) **Rewards and assessment:** The winner is awarded with some symbolic present sponsored by the university, usually a baseball cab with the university anagram. Moreover, the activity is graded as part of the class participation for the continuous evaluation of the course. Nonetheless what has been said, the physical reward is just a symbol of the most important and valued reward by the students, the sensation of achievement, as manifested afterwards by the students.

We expect that elaborating questions based on the course content to have a review effect, which may help to structure for preparing the partial exam or directly result in better scores in the exam for all students. Moreover, challenging peers from other groups may increase learning incentives for competitive students. Within the structured environment between and within groups, we expect students to develop both, competitive skills as well as cooperative skills.

In order to evaluate the academic outcome, a summative assessment (generated points) is combined with a formative assessment through feedback by peers in each round which has been found to increase the learning effect (Wiliam, 2011; Sainsbury & Walker, 2008). In terms of the evaluation of the activity, at the end of the course a survey among students is conducted about the satisfaction with the activity and a self-evaluation of personal competencies and skills and the perceived influence of the challenge on these competencies.

Data collection
At the end of the term, we conduct an anonymous survey among all students taking part in the challenge asking them about their overall satisfaction, increased learning incentives, learning effects and their competitive and collaborative attitude and the influence of the challenge respectively.

Regression analysis
We run a multiple linear regression analysis to estimate the determinants of self-reported outcome as follows:

$$\Delta Cskill = \beta_0 + \beta_1 masculine + \beta_2 Cskill + \beta_3 AvGrade + \beta_4 AvAttendance + \beta_5 GroupB + \varepsilon \quad (1)$$

where $\Delta Cskill$ measures the reported improvement of cooperative skills in terms of team-working attitude or the effect on the student's competitive attitude and $Cskill$ measures the general self-evaluation of the corresponding skill. Gender is accounted for by the dummy variable $men,$ which takes the value one

for male students and cero for female students. The dummy variable $Group$ controls for the two different classes participating in the challenge. The academic profile of students is accounted for through the average grade (AvGrade) and the average attendance (AvAttendance). Moreover we control for students being enrolled in a complementary degree, which is here omitted for simplicity.

Furthermore, we analyze whether the overall learning effect depends on the reported impact on cooperative and competitive attitude.

$$LearninEffect = \alpha_0 + \alpha_1 masculine + \alpha_2 collaborative + \alpha_3 competitive \qquad (2)$$
$$+\alpha_4 \Delta collaborative + \alpha_5 \Delta competitive + v$$

RESULTS

Descriptive statistical results

The detailed questions and the class average of the self-evaluated outcomes are indicated in Table 2.

The survey results have been merged with the individual academic information from each student (mark obtained in Microeconomics, overall attendance to Microeconomics class, average mark obtained in their first year). Table 3 presents summary statistics on the academic results of the sample. For the analysis student data were anonymized.

Table 2. Survey results by group

Question evaluated on a scale 1-10	Average	Std.dev	Min	Max
Group A (N=23)				
Q1: The Micro Challege has increased my learning incentives for the Microeconomics course	**6,8**	1,8	2	9
Q2: I find it interesting as a new teaching method	**7,6**	2	2	10
Q3: Do you consider yourself collaborative	**6,5**	2,1	1	10
Q4: Did the Micro-challenge help you to develop **team-working skills**	**6,8**	2,3	2	10
Q5: Do you consider yourself competitive	**7,5**	1,8	3	10
Q6: Did the Micro-Challenge help you to develop a more **competitive attitude**	**6,7**	2,1	2	10
Q7: It has increased my **learning effect**	**6,1**	1,9	2	9
Q8: It has increased my interest for the area of Microeconomics	**6,2**	2,1	2	10
Q9: I would recommend exporting this model to other areas	**7,3**	2,2	2	10
Q10: Indicate your overall level of satisfaction with the Micro-Challenge	**7**	1,8	3	9
Group B (N=16)				
Q1: The Micro Challege has increased my learning incentives for the Microeconomics course	**8,3**	1,4	5	10
Q2: I find it interesting as a new teaching method	**9,1**	1	7	10
Q3: Do you consider yourself collaborative	**7,6**	1,8	4	10
Q4: Did the Micro-challenge help you to develop **team-working skills**	**7,7**	1,6	5	10
Q5: Do you consider yourself competitive	**8,6**	1,7	4	10
Q6: Did the Micro-Challenge help you to develop a more **competitive attitude**	**7,6**	2,1	2	10
Q7: It has increased my **learning effect**	**7,8**	1,8	4	10
Q8: It has increased my interest for the area of Microeconomics	**8,1**	1,7	4	10
Q9: I would recommend to export this model to other areas	**8,9**	2	2	10
Q10: Indicate your overall level of satisfaction with the Micro-Challenge	**8,8**	1,2	7	10

As we can see from Table 2, the challenge obtained higher results in the survey in group B, who found this methodology more interesting and felt more motivated by it, nonetheless, this difference didn't show up in the results obtained in the contest, since, after two contests in different dates, each group won one of the contests with a very close result to the other (differences below 10%).

Table 3. Academic performance

Performance	Average	Std.dev	Min	Max
Group A (N=23)				
Score Microeconomics, 2nd year (over 10)	**6,2**	1,5	3,2	8,5
Attendance Microeconomics	**90%**	4%	80%	100%
Average total score 1st year	**6,8**	1,1	4,8	8,4
Sex (1=masculine)	**43%**			
Group B (N=16)				
Score Microeconomics, 2nd year (over 10)	**5,7**	3,36	1,25	9,5
Attendance Microeconomics	**89%**	16%	73%	98%
Average total score 1st year	**6,64**	0,87	4,38	8,81
Sex (1=masculine)	**78%**			

Note that the marks and class attendance of both classes were very close, being group A, a little bit ahead, with a clear difference in gender distribution (43% of mean in group A and 78% in group B), something that again contrasts with the apparent higher motivation and interest in the experiment by group B reflected in the survey results.

Table 4 provides complementary to the descriptive analysis of Table 2 and 3, a detailed description of the variables used in the econometric analysis.

Table 4. Description of variables

Variable	Description
masculine	Dummy variable taking the value 1 for men and 0 for woman.
Cskill	2x2 vector measuring the self-evaluated C-skills
collaborative	10-point ordinal scale for self-assessment of collaborative skills
competitive	10-point ordinal scale for self-assessment of competitive skills
ΔCskill	2x2 vector measuring the self-evaluated change in C-skills
Δcollaborative	10-point ordinal scale for self-assessment of the change in collaborative skills induced by the co-opetitive environment
Δcompetitive	10-point ordinal scale for self-assessment of the change in the competitive attitude induced by the co-opetitive environment
AvGrade	Average grade in the first year, with the highest score being a 10 and the lowest score 0.
AvAttendance	Average class attendance during the respective term, measured in %.
GroupB	Dummy variable taking the value one if the student belongs to group B and 0 if the student belongs to group A.
LearningEffect	10-point ordinal scale for self-assessment of the learning effect in the co-opetitive environment.

Previous to the regression analysis, we check for normality of our main variables of interest using the Kolmogorov-Smirnov Test of Normality (K-S test) using the Stata Software Package. The value of the K-S test statistic for the self-assessment of being collaborative is .20233 (p-value 0.26535) which implies that

the data are not significantly different from a normal distribution. Similar, for the selfassessment of the competitive attitude, the K-S test statistic is 0.19683 (p-vale 0.29449) which does not allow to reject the hypothesis of a normal distribution of the data. For the measurement of the learning-effect the test statistic is 0.21421 (p-value 0.20936) which again does not allow to reject the hypothesis of a normal distribution of the data. Hence, we assume a normal distribution of the data and representativeness of the sample out of the total population of all students of the considered degree, who at a given time pass throgh this course 2nd year course where the experiment was carried out.

Inference results

Table 5 reports the regression results. In the evaluation of the change in C-skills, the corresponding general self-evaluation by students is found to have a significantly positive effect on the induced changes through the activity (H1, H2).

In the table, we conduct different regressions using a stepwise analysis to assess the influence of pre-existing soft skills, namely: gender, collaborative or competitive personality or academic performance, hard skills, in the improvement of collaborative or competitive character as well as the learning effect. The roman numbers in the table refer to the questions presented to extract the required information from the sample.

We cannot confirm the hypothesis that the general academic performance of students matters for perceived C-skill enhancement. Likewise, the fact of being enrolled in a complementary degree has neither a significant effect on the development of team-working skills nor on the competitive attitude.

Respective the overall learning effect, the general self-evaluation of team-working abilities as well as the perceived improvement of competitive skills are identified as significant positive determinants of the learning effect. However, the general self-evaluation of competitive attitude and the improvement of collaborative skills have no significant effect on the perceived learning effect, such that H3 is only partially confirmed, which will be discussed in the next section.

Table 5. Regression Results

Explicative Variables	Depending variable									
	C-skills								Engagement	
	Improving **Collaborative skills (team-working)**				Improving **Competitive attitude**				**learning effect**	
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(IIX)	(IX)	(X)
previous skills and tasts										
men	-1.03 (0.64)	-0.91 (0.65)	-1.27* (0.66)	-1.02 (0.65)	-1.23** (0.50)	-1.20** (0.52)	-1.32** (0.51)	-1.21** (.50)	-0.94* (0.57)	-0.01 (0.49)
collaborative	0.38** (0.16)	0.36** (0.16)	0.36* (0.19)	0.37** (0.16)					0.45*** (0.14)	0.37*** (0.12)
competitive					0.89*** (0.13)	0.88*** (0.14)	0.86*** (0.14)	0.88*** (0.13)	0.35** (0.15)	-0.22 (0.19)
DGMM		0.81 (0.75)				0.17 (0.57)				
academic performance										
average grade			-0.24 (0.31)				0.15 (0.21)			
attendance				2.18 (6.36)				4.39 (4.65)		
Improving **team-working skills**										0.12 (0.14)
Improving **competitive attitude**										0.63*** (0.18)
constant	4.97*** (1.18)	4.41*** (1.28)	6.65*** (1.93)	3.04 (5.75)	0.82 (1.01)	0.71 (1.09)	0.03 (1.87)	-3.08 (4.25)	1.43 (1.38)	0.67 (1.18)
R-squared	0.1868	0.2153	0.1946	0.1898	0.5684	0.5696	0.5554	0.5801	0.3717	0.6328

Standard errors in brackets.
Significance at ***1%, **5%, *10% level.

DISCUSSION AND IMPLICATION FOR INSTRUCTORS

Main findings

Team-working skills are demanded in most job positions and the development of these skills takes place in the university education. We find that the personal characteristics, different from academic performance, are important determinants for the formation of this type of skills. Concretely, collaborative types reinforce team-working skills more through this activity than others.

The development of a competitive attitude, as entrepreneurial skill required for successful business performance, has also be found to depend on personal characteristics rather than academic performance. In particular, competitive types reinforce their competitive attitude significantly over others through the educational challenge.

Moreover, it turns out that the perceived change in C-skill development doesn't depend on student's being enrolled in additional degrees, which leads us to the conjecture that the proposed activity implemented in different careers result in similar results.

Likewise, gender determines the perceived change in skill formation through the structured challenge. We find that men are less likely to improve team-working skills as well as their competitive attitude, compared to woman. This may be due to a general higher endowment or perception (possible upward bias) of men respective these competencies before the activity, such that, given the usual assumption on the learning curve with decreasing marginal returns, the generated effect of the competition is smaller for men. Alternatively, this may be just one more example of gender differences in education, which has often found female students to outperform male students (Logan & Medford, 2010). The same hold for the overall learning effect through the challenge, which is found to be lower for men than for woman.

Finally, respective the overall learning effect, students equipped with collaborative skills (before the challenge) and those experiencing an increased competitive attitude (after the challenge) show a higher learning effect than others. Note that here it is the induced competitive attitude which determines the learning outcome, while previous literature found that the competitive nature of students has a positive effect on the learning outcome (Kristensen et al., 2015). The co-opetitive effect is the most subtle of the 4C´s to identify, which is present from the moment that both classes through the challenge are improving their skills to face a "common enemy" or goal, which is the exam, and this is not zero-sum game, but all the participants may succeed, and here is where competition coexist with cooperation giving birth to co-opetition. Second,

Implications for instructors

Exposing students to a "4C Challenge" with peers creates excitement respective the event and through the motivation "I challenge you" students are motivated to review class material and make sure that their peers from the same class will be able to answer each of the designed questions, integrating all members of the group, in case the question bounces back. This implies an integrative learning effect of all students and promotes collaboration within the class before the individual exams. This Challenged-Based-Learning model relies heavily on confidence in the professional role of educators (McCabe & O'Connor, 2014). This perspective is based on the constructivist model of human learning,

where the student is autonomous and responsible. In a new role, the educator is now responsible for designing and monitoring student learning rather than merely conveying concepts and knowledge (Rodríguez, 2010), promoting the skills of both autonomy and responsibility, other essentials skills for life, and their professional development as well (Perez and Afonso, 2008).

An increase in more relevant pedagogical innovation and flexibility is needed in higher education. We have considered Mishra's studies about the changing role of teaching, in which the author sees it becoming a design profession in which educators select the activities, resources, and elements to create the best learning process for the student in which ICT plays a main role (Warr & Mishra, 2021).

Counterindications and limitations

As discussed by Brentnall et al. (2018), there may be negative effects from competitive learning on those who lose the challenge in terms of losing confidence or motivation.

A potential limitation of the proposed learning activity is the restriction to short questions instead of complex problem development. As argued by Kristensen et al. (2015), learning through a structured competition may come at the cost of promoting surface-learning over deep-learning.

Immediate versus long-term effect

In this paper we analyze the immediate effect of the activity on engagement. However, it is desirable to study the long-term impact on other variables, like choice of specialization in the university career, participation in entrepreneurship activities and the impact at the aggregated level of these kind of teaching activities on the competitiveness at the country level. However, as discussed by Brentnall et al. (2018), if the outcome is not triggered the effect may break down. Hence, our conjecture at this moment is that this type of activity may require a well defined, continuous integration into the study program, which we aim to implement and draw evidence-based inferences on the long-run effect and in particular the job market integration.

The digital challenge

Digitalization and digital transformation

When we speak of the challenges presented by the digitalization process we should reflect on the difference between digitalization and digital transformation, being the first, like the previous step to digital transformation in which we substitute traditional tools by the new ones provided by the new technological framework. The second step, digital transformation, implies a dipped assumption of the technological framework in which we are now immersed and requires the redesign of the tasks we develop and the way we undertake them (Margiono, 2020).

In the present technological scenario, the resources for digitalization are plenty (cloud documents, participation tools, videoconference among many others) but unless adopted under a strategy of digital transformation, several issues arise, especially when applied in a hybrid format.

Implementation in a hybrid framework

In a hybrid environment, like the one experienced in the academic year 2020-21 at the considered university, half of the class is at home and connected through video conference (Zoom in the case of the challenge), and the other half is gathered in a class as described in the general procedure.

The main issue we found in our first challenge under a hybrid structure was, low quality communication between the participants, and this was due to, poor voice transmission since, many homes are still not equipped with wide band internet and quality microphones. The students participating from the university also hade communication problems since, only the student at the micro could clearly transmit their voices, and the rest of the class voices and its messages were lost and perceived by those at home as environmental noise (Adytia et al., 2021).

A secondary but relevant issue presented by the hybrid model comes from a decrease in the student's motivation for the activity (Zia, 2020), this decrease being measured by a decrease in the number of participants, being close to 90% in the non-hybrid model and around 75% in the hybrid framework.

Our reflection on these potential problems is that we simply adopted some digital tools like Zoom, trying to digitalize the process, but we didn´t take into account environmental limitations, instead of trying to transform the whole process.

In our second challenge 2020-21, we started our fist attempts into digital transformation. Questions were posted in the chat through Zoom, nonetheless, the process of typing them, and the limitations with non-text contents, like graphic, constrained the dynamic of the process.

We have learned from our experience along these two years that we must immerse on the process of digital transformation, and not only to solve the issues presented by the hybrid environment.

Further research

For the coming terms, we are analyzing how we should undertake a process of full digital transformation which allow us to cope with the issues presented by a hybrid structure to implement collaborative-competitive activities as the suggested "4C-challenge". We consider this process as essential since, even if the present COVID-19 scenario is expected to be transitory, the hybrid framework shall be essential for scaling the project so that we can have several campuses or even universities taking part in this type of educational challenge (Segundo et al., 2020). The measures we consider for undertaking a full digital transformation process are:

First, maintaining the videoconference system, as we consider essential the face-to-face contact to generate a participation and belonging experience.

Second, the questions, instead of being read loud by the delegate, a practice that can be maintained nonetheless, must be pre-designed and prepared to be presented through a participation tool which allows different answer types, multiple choice, numeric or graphic, with the aid of tools like tactile screens.

Thirds, interventions from the students must be channeled through chat rooms. Through this multichannel structure we can eliminate the environmental noise and increase participation (Fischer et al., 2020). We expect that this resource shall help us with our secondary issue, the decrease in participation. When education is channeled through digital means and no personal contact, students start to lose sensation of belonging, they feel less attached to other students and the university, so, in order to cope with this setback derived from digitalization, we need to enable more participation channels to achieve a full and successful digital transformation process (Alawamleh et al., 2020)

Last but not least, we are also considering scaling the experience transversely to other study areas since the challenge methodology with small adaptation for non-mathematical areas can be applied to nearly every area of the university.

CONCLUSIONS

Competencies and skills demanded by firms and hence guaranteeing employability is one of the key areas of research in business education (Díez-Martin et al., 2018). In this paper we have discussed the need of the formation of entrepreneurial skills in university undergraduate education and proposed, implemented, analyzes and discussed a concrete class-room activity.

The main findings of the study are as follows: First, the development of collaborative skills and team-based skills depend on personal characteristics and expertise while there is no significant effect of academic performance. Concretely, improvement in competitive skills is mainly explained by a preexisting competitive personality and likewise self-indicated improvements in team-working skills are especially reinforced for students with preexisting collaborative personality. Second, men are less likely to improve team-working or collaborative skills through the proposed challenge than woman. Third, engagement in terms of induced learning effect is found to be higher for students who already bring a high level of collaborative attitude and students experiencing an increased competitive attitude (after the challenge) show a significantly higher learning effect than others, which suggests engagement through improved competitive attitude based on collaborative personalities.

Based on a literature review, we identified "4C's of knowledge acquisition" - Collaboration, Cooperation, Competition and Coopetition – and designed a structured competition between classes, which puts in practice all of these elements in a co-opetition environment. The implementation as pilot-project has confirmed the positive effects on developing team-working skills and competition attitude, and suggests a positive effect on the overall learning outcome.

REFERENCES

Aditya, B. R., Ferdiana, R., & Kusumawardani, S. S. (2021). Identifying and prioritizing barriers to digital transformation in higher education: A case study in Indonesia. International Journal of Innovation Science, forthcoming. https://doi.org/10.1108/IJIS-11-2020-0262

Alawamleh, M., Al-Twait, L. M. and Al-Saht, G. R. (2020). The effect of online learning on communication between instructors and students during Covid-19 pandemic. Asian Education and Development Studies, forthcoming. https://doi.org/10.1108/AEDS-06-2020-0131

Attle, S., & Baker, B. (2007). Cooperative Learning in a Competitive Environment: Classroom Applications. International Journal of Teaching and Learning in Higher Education, 19(1), 77-83.

Bernal Cárdenas, A. (2021) Educación Emprendedora. Ed Síntesis (2021). Madrid

Biggs, J. B. (1993). What Do Inventories of Students' Learning Processes Really Measure? A Theoretical Review and Clarification. British Journal of Educational Psychology, 63(1), 3-19.

Brentnall, C., Rodríguez, I., & Culkin, N. (2018). Enterprise Education Competitions: A Theoretically Flawed Intervention? In: Higgins, D., Jones, P., & McGowan, P. (Ed.) Creating Entrepreneurial Space: Talking Through Multi-Voices, Reflections on Emerging Debates, Emerald Publishing Limited, 25-48. https://doi.org/10.1108/S2040-72462018000009A002

Cagiltay, N. E., Ozcelik, E., Ozcelik, N. S. (2015). The effect of competition on learning in games. Computers & Education, 87, 35-42.

Cerkovskis, E., & Titko, J. (2017). Matching competencies and modern labour market needs; student's self-perception study. In: 25th International Scientific Conference on Economic and Social Development – XVII International Social Congress. Moscow.

Chan, T. C. (2009). Do portable classrooms impact teaching and learning? Journal of Educational Administration, 47(3), 290-304. https://doi.org/10.1108/09578230910955746

Charlebois, S., & von Massow, M. (2015). The effectiveness of co-opetition in a live case study approach: Increasing knowledge of an industry while helping others in a competitive MBA classroom environment. Journal of Applied Research in Higher Education, 7(2), 164-179. https://doi.org/10.1108/JARHE-07-2013-0034

Devece, C., Ribeiro-Soriano, E. D., Palacios-Marques, D. (2019). Coopetition as the new trend in inter-firm alliances: literature review and research patterns. Review of Managerial Science, 13(2), 207-226. https://doi.org/10.1007/s11846-017-0245-0

Diez-Martín, F. (2018). Dónde Estamos: Una Introducción a la Educación en los Negocios. Journal of Management and Business Education, 1(1), 1- 0. https://doi.org/10.35564/jmbe.2018.0001

Di Gregorio, A., Maggioni, I., Mauri, C., Mazzucchelli, A. (2020). Employability skills forfuture marketing professionals. European Management Journal, 37, 251-258.

European Commission/EACEA/Eurydice. (2016). Entrepreneurship Education at School in Europe. In: Entrepreneurship Education at School in Europe. Eurydice Report. Retrieved from https://eacea.ec.europa.eu/national-policies/eurydice/content/entrepreneurship-education-school-europe_en

Fischer, G., Lundin, J. & Lindberg, J. O. (2020). Rethinking and reinventing learning, education and collaboration in the digital age—from creating technologies to transforming cultures. International Journal of Information and Learning Technology, 37(5), 241-252. https://doi.org/10.1108/IJILT-04-2020-0051

Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? Technological Forecasting and Social Change, 114, 254-280. https://doi.org/10.1016/j.techfore.2016.08.019

Gibb, A. A. (1993). Enterprise culture and education: Understanding enterprise education and its links with small business, entrepreneurship and wider educational goals. International Small Business Journal, 11-35. https://doi.org/10.1177/026624269301100301

Gnyawali, D. R., & Charleton, T. R. (2018). Nuances in the Interplay of Competition and Cooperation: Towards a Theory of Coopetition. Journal of Managemenmt, 44(7), 2511-2534. https://doi.org/10.1177/0149206318788945

Haythornthwaite, C. (2006). Facilitating collaboration in online learning. Journal of Asynchronous Learning Networks, 10(1), 7-24.

Hoffmann, W., Lavie, D., Reuer, J. J., & Shipilov, A. (2018). The interplay of competition and cooperation. Strategic Management Journal, 39(12), 3033-3052. https://doi.org/10.1002/smj.2965

Johnson, D. W., Johnson, R. T., Johnson, H., & Holubec, E. J. (1994). The new circle of learning: Cooperation in the classroom and school. Association for upervision and Curriculum Development. Virginia. USA. Johnson, R. T., & Johnson, D. W. (2008). Acitive learning: Cooperation in the classroom. The annual report of educational psychology in Japan, 47, 29-30. https://doi.org/10.5926/arepj1962.47.0_29

Johnson, D. W., & Johnson, R. T. (2013). Cooperation and the use of technology. Handbook of research on educational communications and technology, 777-803.

Johnson, D. W., & Johnson, R. T. (2017, September 22-23). Cooperative Learning [Plenary session]. Congreso Internacional de Innovación Educativa, Zaragoza, Aragón, Spain. https://tinyurl.com/khw3jw34

Jones, B., & Iredale, N. (2010). Enterprise education as pedagogy. Education and Training, 52(1). https://doi.org/10.1108/00400911011017654

Kozar, O. (2010). Towards Better Group Work: Seeing the Difference between Cooperation and Collaboration. English Teaching Forum, 48(2), 16-23.

Kristensen, F., Troeng, O., Safavi, M., & Narayanan, P. (2015). Competition in higher education – good or bad? Lund University.

Ladevéze, L. N., & Núñez-Canal, M. (2016). Noción de emprendimiento para una formación escolar en competencia emprendedora. Revista Latina de Comunicación Social, 71, 1069-1089 https://doi.org/10.4185/RLCS-2016-1135

Laal, M., Laal, M., Kermanshahi, Z. K. (2012). 21st century learning; learning in collaboration. Procedia-Social and Behavioral Sciences, 47, 1696-1701.

Logan, S., & Medford, E. (2010). Gender differences in the strength of association between motivation, competency, beliefs and reading skills. Educational Research, 53(1). https://doi.org/10.1080/00131881.2011.552242

Man, T. W. Y. (2019). Nurturing Entrepreneurial Competencies Through University-Based Entrepreneurship Centers: A Social Constructivist Perspective. In: Katz, J. A., & Corbet, A. C. (Ed.) Seminal Ideas for the Next Twenty-Five Years of Advances (Advances in Entrepreneurship, Firm Emergence and Growth, Vol. 21), Emerald Publishing Limited, Bingley, 141-161. https://doi.org/10.1108/S1074-754020190000021006

McCabe, A., & O'Connor, U. (2014). Student-centred learning: The role and responsibility of the lecturer. In Teaching in Higher Education (Vol. 19, pp. 350–359). https://doi.org/10.1080/13562517.2013.860111

Man, T. W. Y., & Farquharson, M. (2015). Psychological ownership in team-based entrepreneurship education activities. International Journal of Entrepreneurial Behavior & Research, 21(4), 600-621. https://doi.org/10.1108/IJEBR-11-2012-0126

Muijs, D., & Rumyantseva, N. (2014). Coopetition in education: Collaborating in a competitive environment. Journal of Educational Change, 15(1), 1-18. https://doi.org/10.1007/s10833-013-9223-8

Oaklay, B., Felder, R. M., Brent, R., & Elhajj, I. (2004). Turning student groups into effective teams. Journal of Student Centered Learning, 2(1), 9-34.

OECD. (2005). The definition and selection of key Competencies. Paris.

Rodríguez-García, A.-M., Raso Sánchez, F., & Ruiz-Palmero, J. (2019). Competencia digital, educación superior y formación del profesorado: un estudio de meta-análisis en la web of science. Pixel-Bit, Revista de Medios y Educación, 54, 65–82. https://doi.org/10.12795/pixelbit.2019.i54.04

Roig-Tierno, N., Kraus, S., & Cruz, S. (2018). The relation between coopetition and innovation/entrepreneurship. Review of Managerial Science, 12(2), 379-383. https://doi.org/10.1007/s11846-017-0266-8

Secundo, G., Rippa, P. and Meoli, M. (2020). Digital transformation in entrepreneurship education centres: preliminary evidence from the Italian Contamination Labs network, International Journal of Entrepreneurial Behavior & Research, 26(7), 1589-1605. https://doi.org/10.1108/IJEBR-11-2019-0618

Schwab, K, & Davis, N. (2018). Shaping the Future of the Fourth Industrial. Penguin Books.

Sainsbury, E. J., & Walker, R. A. (2008). Assessment as a vehicle for learning: Extending collaboration into testing. Assessment & Evaluation in Higher Education, 33(2).

Sjogren, J., & Fay, J. (2002). Cost Issues in Online Learning: Using "Co-opetition" to Advantage. Change: The Magazine of Higher Learning, 34(3), 52-57. https://doi.org/10.1080/00091380209601856

Vamvaka, V., Stoforos, C., Palaskas, T., & Botsaris, C. (2020). Attitude toward entrepreneurship, perceived behavioral control, and entrepreneurial intention: dimensionality, structural relationships, and gender differences. Journal of Innovation and Entrepreneurship, 9(5). https://doi.org/10.1186/s13731-020-0112-0

Warr, M., & Mishra, P. (2021). Integrating the discourse on teachers and design: An analysis of ten years of scholarship. Teaching and Teacher Education, 99, 103274. https://doi.org/10.1016/j.tate.2020.103274

Wiliam, D. (2011). What is assessment for learning? Studies in Educational Evolution, 37(1), 3-14.

World Economic Forum & McKinsey (2019). Innovate Europe Competing for Global Innovation Leadership. Insight report. Retrieved from https://www.weforum.org/reports/innovate-europe-competing-for-global-innovation-leadership

World Economic Forum (2020). The Future of Jobs Report 2020. Retrieved from https://www.weforum.org/reports/the-future-of-jobs-report-2020

Zia, A. (2020). Exploring factors influencing online classes due to social distancing in COVID-19 pandemic: a business students' perspective. International Journal of Information and Learning Technology, 37(4), 197-211. https://doi.org/10.1108/IJILT-05-2020-0089

DECLARATION OF CONFLICTING INTERESTS
The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Cite
Erdmann, A.; García-Monleón, F.; & Nuñez-Canal, M. (2022). Enhancing Entrepreneurial Skills through Co-opetitive learning experience: A Case Study in a Spanish University. Journal of Management and Business Education, 5(2), 76-96. https://doi.org/10.35564/jmbe.2022.0006