The influence of knowledge recipients' proactivity on knowledge construction in cooperative learning experiences

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Abstract

Cooperative learning techniques in teaching activities are becoming increasingly popular. Many studies have documented the benefits of these techniques, but fewer have analysed the factors affecting students' achievement. One of those factors could be the student's proactivity, since cooperative techniques require active involvement of students. Proactivity or proactive behavior relates to pioneering behavior, initiative taken to exploit new opportunities, and a leading attitude. This study analyses the influence of several aspects related to students' proactivity on knowledge construction in the context of cooperative learning. The aspects included in the proactivity framework are the student's creativity, locus of control, self-effectiveness, and motivation towards cooperative learning. These variables and their potential effect on knowledge construction in cooperative experiences are discussed. The resulting hypotheses are tested with data from students who participated in a jigsaw, and the results show the positive impact of the internal locus of control and self-efficacy, along with the fact that the student is attending the course for the first time.

Keywords
Cooperative learning, proactivity, creativity, locus of control, self-effectiveness, motivation

Cooperative learning environments and students' active behaviour

The paradigm shift from a teacher-centred perspective to one focused on the student has created many challenges, and a certain degree of confusion. The adoption of this new perspective entails the design of learning environments which include several elements from a pedagogical lens. These include the relationship between the teacher and the students, and the one among the students, students' learning approaches and motivations, supportive learning technologies, the development of the curriculum based on the learning outcomes, the teaching and learning climate and students' perceptions about it, and the potential link with the learning outcomes (Abualrub et al., 2013).

One approach used is group work. There is strong scientific support of the benefits of students learning and working in groups (for example, Chiriac and Granström, 2012; Karacop and Doymus, 2012). One of the main concerns felt by teachers when they design and implement this kind of learning environment is to minimise the student's surface approach to learning (Marton and Säljö, 1976). Surface approaches are the ones which are reproductive in nature (Ellis, 2016) and are oriented to pass examinations and meet course requirements, opposed to deep approaches which actively seek meaning from the experience and use strategies to further this goal (Ellis, 2016) so the most appropriate cognitive activities are sought (Biggs and Tang, 2007). Deep approaches to learning are associated with high levels of achievement (Ellis, 2016). Another concern is that real cooperation takes place among the students in the experience. Cooperative learning fosters more autonomous forms of learning (Warbuton and Volet, 2012). Through the active role that students take in those activities and the social environment where it is developed, learning results can be very positive in the cooperative activities designed under this perspective. The goal of the implementation of cooperative learning should be to promote more interdependent relationships among students, to arouse their interest and to produce better learning outcomes (Yi and LuXi, 2010).

Collaborative learning techniques provide opportunities to increase the student's self-regulated behaviour. Self-regulated learning refers to the student's control of the learning process (Stefanou et al., 2013). One of the assumptions of self-regulated learning (Pintrich, 2004) is the learners' active participation in the learning experience, who construct meaning in the interaction between the information obtained from the environment and the prior knowledge they have. The interaction between students and the instructor is also paramount (Nguyen and Ikeda, 2015). Thus, collaborative learning is consistent with current social and constructivist perspectives on learning processes and activities (Mayordomo and Onrubia, 2015; Myyry and Joutsenvirta, 2015).

Whilst there are many benefits of cooperative learning, few have examined the influence of variables on achievement. However, research has contributed to understanding the requirements for its success (for example, Cavanagh, 2011; Herrmann, 2013; Vuopala et al., 2016). As the application of cooperative learning techniques in higher education can be a challenge, especially in the context of classrooms comprising large numbers of students, the interest to identify factors that affect success and how students construct knowledge effectively in the implementation of cooperative learning is needed. There is also a need to consider proactivity, because proactive people influence the environment, since they "identify opportunities and act on them, show initiative, and persevere until they bring about meaningful change" (Crant and Bateman, 2000:65). Proactivity-related variables are predictive of important educational outcomes (Geerthuis et al., 2014). Though several proactivity-related aspects have been studied in several contexts (for example, e-learning, university preparation programmes, business graduate and undergraduate programmes), the collaborative learning field is mostly unexplored regarding proactivity-related factors (Geerthuis et al., 2014).

Knowledge construction in cooperative learning experiences: Determinants from a proactive perspective

The concept of knowledge includes declarative and procedural knowledge. Learning theories emphasize the importance of the active construction of knowledge and that this develops over time and with experience (Koohang and Paliszkiewicz, 2013; Lee et al., 2017). In collaborative learning, knowledge is constructed socially in the interactions among people before it is internalised as individual knowing (Ioannou et al., 2014). In cooperative learning experiences students must adopt an active role and in some of their techniques they also have responsibility in others' learning. Thus, it is a process where learners are actively regulating joint activities and coordinating their tasks (Vuopala et al., 2016).

Regarding factors that favour knowledge construction, aspects that entail an active vision and performance by students should be related to successful learning. In this sense, proactivity, along with participation, can be considered a potential driver of learning, especially in this context. The student's proactive personality exerts significant influence on the overall satisfaction with the course (Kickul and Kickul, 2006) and proactive thinking contributes to explain task performance (Kirby and Kirby, 2006). Proactive personality, confidence to perform and the frequency of proactive behaviours influence academic outcomes such as self-assessed self-directed learning, the taking of a mastery approach to learning, and grades (Geerthuis et al., 2014). Thus, facets of proactivity positively influence academic grades (Tymon and Batistic, 2016).

Various proactivity concepts have been identified (Tornau and Frese, 2012). The definition of proactivity generally deals with one being relatively unconstrained by situational forces and changes the environment intentionally and directly (Akın, 2014) or the willingness and ability to take action to change a situation to one's advantage (Kirby and Kirby, 2006). A proactive behaviour is then defined as a "self-initiated and future-oriented action that aims to change and improve the situation or oneself" (Parker and Collins, 2010:635). Proactivity is linked to pioneering behaviour, initiative taking to pursue new opportunities, and attempts to lead rather than follow (De Jong et al., 2013). Less proactive people display little initiative and they tend to passively adapt to their circumstances rather than change them (Crant and Bateman, 2000). Proactivity is seen as a process that can be applied to any set of actions through anticipating, planning and striving to have an impact (Grant and Ashford, 2008). Active participation in a diversity of social interactions is crucial for increasing the quality, quantity and scope of knowledge building (Dawson et al., 2011).

Proactivity is an umbrella term for several constructs and hence it is a multidimensional concept (Tymon and Batistic, 2016). Though the literature does not provide a thorough, comprehensive model, creativity (for example, De Jong et al., 2013; Tymon and Batistic, 2016), locus of control (for example, De Jong et al., 2013), self-efficacy prior to the learning experience (for example, Fuller et al., 2012; Vanderberghe and Ok, 2013), and motivation towards cooperative learning techniques (for example, Fuller et al., 2012) can be considered dimensions of proactivity. Thus, as a basis for a proactive behaviour the presence of an internal locus of control (from a global approach), and a positive self-assessment of the performance regarding the task at-hand from a more specific perspective set the basic context for proactive behaviour. In addition, the development of a proactive behaviour is strongly associated with ability-related factors, where creativity stands out as an aspect linked to the exploitation of opportunities to solve problems and perform activities. However, the proactive behaviour is only unleashed if the individual perceives there are enough incentives (motivation) for a positive performance. All those aspects address different facets of a dynamic behaviour, which is opposed to inert and immobile ones.

Creativity

According to Hargrove and Nietfeld (2015), creativity is the ability to produce work that is novel and appropriate. Creativity has played a limited role within formal education (Hargrove and Nietfeld, 2015), and it is often inhibited by predictive outcome-based course designs as well as by assessment tasks and criteria (Jackson, 2006). However, the individualistic perspective on creativity defends the idea that, while all people are somewhat creative, there are highly creative students with certain attributes (Heinonen et al., 2011), but creativity is derived from the interplay between the individual creative act and the social context that evaluates whether or not that act is endorsed and legitimated (Tomás-Miquel et al., 2016).

Individual creativity can be linked to the concept of promotive interaction in the context of cooperative learning. Based on Johnson et al. (2007), promotive interaction exists when individuals encourage and facilitate each other's efforts to complete tasks and achieve the group's goals. Thus, creativity can be a positive determinant when facing the assistance to other members of the group adapting to specific needs or when challenging each other's conclusions and reasoning. An individual's creativity can be paramount to provide with appropriate feedback to others' contributions in order to construct knowledge. This idea is reinforced in that creativity plays a relevant role in the collection of information, not only in getting access to certain people but also in how to get it in the most accurate way (De Bono, 2009). It is also interesting to note that creative processes implemented by a group member can generate constructive controversy (Johnson et al., 2007), since creativity increases the likelihood of addressing new lines of reasoning and logic, and challenging norms and group thinking (Strom and Strom, 2011). Hence:

H1: *Creativity is positively associated with knowledge construction in cooperative learning experiences.*

Locus of control

Locus of control addresses a person's belief system about the results of outcomes or events (Rotter, 1966). Locus of control refers to the sense of control that an individual has over outcomes (Fielding and Head, 2012). The extreme points of that belief system allow for distinguishing people based on their internal or external locus of control: individuals characterised by an internal locus of control tend to believe that events or outcomes are a result of their own plans and actions; individuals with an external locus of control tend to assume that events or outcomes are a result of external factors beyond their control (for example, Rotter, 1966; Suphi and Yaratan, 2012). In the knowledge construction process and in the educational framework, an internal locus of control is addressed based on the assumption that individuals make much effort if they think that they can control outputs.

Research in education and learning on the influence of the locus of control on academic achievements presents mixed results (Cassidy, 2012; Suphi and Yaratan, 2012), though some underline the significant role of the internal locus of control on higher academic achievements (Iskender and Akin, 2010). In the context of cooperative behaviour, there is a solid base to think that this variable can exert a more determining influence. Students with external locus of control can feel a sense of powerlessness and lack of control over outcomes that could translate into passive reactions to the development of the experience. Since individuals with internal locus of control believe that their individual actions can bring about an outcome (Rotter, 1966), they are more prone to unleash a set of behaviours oriented to maximise cooperation and knowledge construction. Hence:

H2: *Internal locus of control is positively associated with knowledge construction in cooperative learning experiences.*

Self-efficacy

Self-efficacy is a concept that involves making a judgement of confidence about one's capability to successfully accomplish a task at some point in the future (Bandura, 1997). When an individual feels more confident in their ability to accomplish a task, that person is more likely to initiate effort, persist in their efforts, and perform better because self-efficacy affects an individual's efficient self-regulation, effort and persistence (Bandura 2012). Locus of control and self-efficacy are different concepts, since a person can strongly believe that the outcomes of a process are controllable but at the same time judge oneself to be incapable of executing that control (Cassidy, 2012).

Beliefs that individuals hold about their abilities and outcome of their efforts can exert significant influence on how they will behave (Hassanzadeh et al., 2012). Some (for example, Diseth, 2011) suggest that self-efficacy may be a determinant of academic achievement, but others (for example, Cassidy, 2012) do not evidence a significant contribution to explain academic success. In their meta-analytic findings, Honicke and Broadbent (2016) conclude that there is a moderate positive relationship between academic self-efficacy and academic performance. Since self-efficacy can be seen as a cognitive process that results into a generative capability (Simosi, 2012) which allows for allocating resources and employing skills to achieve a successful performance, its role in cooperative learning experiences can be very positive. That is so because students with high self-efficacy are expected to devote more effort to their planned future actions. A higher degree of self-efficacy can be also linked to adopt faster a hands-on approach to the tasks ahead, and time can be a decisive factor in cooperative learning. That is coherent with findings of a positive relationship between social self-efficacy and achievement in a collaborative context (Dunbar et al., 2016). Hence:

H3: *Self-efficacy towards knowledge contents is positively associated with knowledge construction in cooperative learning experiences.*

Motivation towards collaborative pedagogical techniques

Motivation refers to the degree to which students invest attention and effort in various pursuits (Brophy, 2010). It is rooted in the individual's subjective experiences, especially those connected to the willingness to engage in learning activities and the reasons for doing so. Though the link between motivation and learning has been extensively studied, motivation to learn still generates much research. An important aspect linked to motivation research is that most assume that motivation orientation is

context- or task dependent (Prat-Sala and Redford, 2010). Regarding cooperative learning, motivation has been a fruitful line of research. However, most focus on that relationship but taking motivation as the dependent variable, ignoring the role that prior motivation towards the technique can exert in the approach, development, and outcomes of the collaborative experience.

In order to analyse motivation towards processes, interest is a relevant concept. Interest has the potential to alter individuals' engagement in learning (Linnenbrick-Garcia et al., 2012). Another aspect in the analysis of motivation towards collaborative learning is peer orientation, since research has recognised the relevance of social aspects in emerging and sustained motivation in cooperative learning activities (Järvella et al., 2010). The relevance of the presence of this social orientation derives from the fact that research works find that students perform best when they are allowed to learn in their preferred way, since student motivations are significantly linked to their use of cognitive strategies (Stolk and Harari, 2014). Though student motivation to learn decreased during a cooperative learning session (Vreven and McFadden, 2007), an interest for collaborative pedagogical techniques could translate into an increase of attention and willingness to make an effort to learn, which would result in a higher degree of knowledge construction. Hence:

H4: *Motivation towards collaborative pedagogical techniques is positively associated with knowledge construction in cooperative learning experiences.*

Methodology

Study context and participants

A cooperative learning experience was designed at the University of Las Palmas de Gran Canaria (Spain) to teach the contents of a selected unit in two courses of basic management concepts and principles for undergraduate students. The University is a public institution. The two courses were compulsory and part of the Bachelor programmes of the School of Physical Activity and Sport Sciences, and the School of Economics, Management and Tourism, respectively. There were 286 students enrolled in these two courses. Both courses in both Schools were divided in two groups of students, ranging from 50 to 80 students per classroom. Most students' age ranged between 18 and 21 years old. Regarding ethical issues, the research project was accepted and financed by the Committee of Educational Innovation and Quality of the university.

Participation in the study was completely voluntary. The final sample (165) comprised 112 male and 53 female students. This asymmetry was largely due to the composition of the Sport Science subsample, since only 13 students out of 81 were female in this category. 57% of the students were younger than 20 years old and 13.3% were working during the period of the data collection. Most students (94.4%) were taking the course for the first time. Regarding the level of prior knowledge about management, the mean of the answer to a Likert-scale self-assessment question ranging from 1 (very low) to 7 (very high) was 3.7.

Design and procedure

The cooperative learning intervention was based on the jigsaw method (Aronson et al., 1978) to teach topics related to organisational design. The jigsaw method provides a cooperative learning environment which fosters learner activity, joint acquisition of content and mutual explanations (for example, Karacop and Doymus, 2012). At the end of the experience the students had to take an individual test which consisted of an analysis of a case study where knowledge of the contents was required to solve the questions.

The jigsaw was implemented as follows. Firstly, students studied some basic information about the topic: the concept of organisational design and structure, and design parameters. The material for that and all the documents related to the intervention were uploaded to the course websites, based in the Moodle software. Students were told to take a very short online test about that introductory content and they got immediate feedback about their results and the incorrect answers. The lecturers prepared a document with the guidelines of the process, and it was explained to the students in the first session of the unit in order to minimise uncertainty and anxiety about the experience.

Next, the lecturers turned to stable 4-member groups (the so called *base group*) which had been used from the beginning of the course in the previous two months, and each group member was given a

document with their part. Those four documents were assigned randomly to the students in every group, and each document comprised a theoretical discussion of several design parameters. Each student read their document and tried to understand the concepts and identified the main problems and the pedagogical approach to explain the concepts to their fellow students in the group. After it, the students were summoned to the so called *expert group* formed by students with the same document. The lecturers created those expert groups to discuss the problems to understand and the learning strategy to explain the content. They also posted on the course website the main conclusions and conceptual maps of those expert group meetings and some of them even informal slides/presentation they were going to use in the next step of the experience.

In the next session, every student presented/taught their part to the remaining three members of the base group. After that, the students took a test prepared by the lecturer in order to assess the preliminary understanding and knowledge of the taught topics, and they self-evaluated their performance with the solution to the questions provided by the lecturer. In the final session of the jigsaw, the students analysed the case study described above. In addition, in that final session the students provided the lecturer with formal, anonymous feedback on the overall experience, despite informal feedback was obtained in every milestone.

Measures and analysis

The research design was developed as to have two data sources to test the hypotheses. One, the grade of the case study test was obtained from the lecturers of the course as a proxy of the student's knowledge construction. The case study is a widespread technique due to its benefits to foster learning (Christensen and Carlile, 2009) and this teaching technique can promote a deep approach to learning (Ellis, 2016). Grades earned in the course can be used as an indicator of student performance (Xu and Jaggars, 2014) and the underlying logic can be applied to a specific activity as grades attempt to measure the attainment of its goals. Since the questions of the case study required the understanding and processing of the content of the collaborative experience, the grade can be seen as a proxy for knowledge construction in this context too. This is also reinforced in the works where proactivity is analysed in light of its effect on academic outcomes, since grades tend to be used as a measure of academic success (for example, Geerthuis et al., 2014; Kirby and Kirby, 2006). Two, a survey was conducted to obtain the data of independent and control variables at the beginning of the intervention.

The survey was based on a questionnaire which contained scales to measure the variables of interest. All items were formulated with a 7-point Likert scale ranging from 1 (totally disagree) to 7 (totally agree). The scale of creativity comprised 6 items and followed the basic ideas from the scales used by Lavelle and O'Ryan (2001) and Zhou and George (2001), but it was significantly adapted to the study. The scale of locus of control was an adapted and very simplified version of the one proposed by Craig et al. (1984) and included three items. Measures of self-efficacy must be customised to the field of psychological functioning being explored (Bandura, 2012); consequently, a scale of three items was developed considering that and the scale used by Saks (1995). For the motivation towards collaborative pedagogical techniques, and due to the scant use of the measurement of this variable in the literature, a scale with 5 items was developed. Sample items from these four scales are: "I am a creative person" [creativity]; "I believe that our actions and decisions definitely influence what happens to us in life" [locus of control]; "I have confidence that my skills or abilities match or exceed those of my fellow students" [self-efficacy]; "Collaboration with my fellow students would help me to better understand the concepts and processes of a topic" [motivation towards collaborative pedagogical techniques].

The questionnaire was self-administered under the supervision of a research assistant. Though students did not write their names in the questionnaire, they had to provide their ID number to link the questionnaire to the obtained grade in a later phase of the study. This process was exclusively carried out by the research assistant and communicated to the students to avoid concerns about the lack of anonymity of their answers.

Exploratory factor analyses were conducted in order to reduce the dimensionality of the scales measuring the independent variables. Table 1 shows the main data about the factor analyses. One single factor was extracted for each of the scales regarding creativity, self-efficacy and motivation towards non-traditional pedagogical techniques. The scale of the variable locus of control provided two factors with eigenvalues higher than 1, and they were extracted with Varimax rotation. One of those factors was linked to the internal locus of control, while the other one was associated to the belief in luck and external forces to achieve things.

<<Insert Table 1 here>>

A standard regression analysis on the grade was conducted. The five factors obtained in the exploratory factor analyses were included as independent variables. The regression model also included control variables: gender, whether the student was participating in the course for the first time or had failed the course in the previous academic years, and the School where they were studying.

Results

Creativity
The first hypothesis was that creativity is positively associated with knowledge construction in cooperative experiences. The results (Table 2) do not support this hypothesis, since the factor regarding creativity is not significant under the standard level of significance.

<<Insert Table 2 here>>

Internal locus of control
The second research hypothesis addresses the role of the student's internal locus of control on knowledge construction. There were two independent variables regarding the locus of control: one about the internal locus of control, and another one about the locus of control associated with luck and external factors. The internal locus of control significantly influences knowledge assimilation and learning, and the external locus of control linked to luck and other external factors does not seem to exert a negative influence on the student's grade.

Self-efficacy
The influence of self-efficacy on knowledge construction is the core of the third hypothesis. The data show that self-efficacy is a determinant of academic achievement in the context of learning in collaborative experiences. Thus, the beliefs that students hold about their skills and about the results of their efforts and activities influence the behaviours they adopt, though the impact of self-efficacy on learning seems not to be as strong as the internal locus of control in the context of cooperative experiences.

Motivation towards collaborative pedagogical techniques
The last hypothesis looked at the potential influence of the motivation towards collaborative pedagogical tools on knowledge construction. The analysis shows that this kind of motivation does not exert a significant impact on learning in collaborative experiences.

After having presented the results, it is interesting to comment that a control variable is also significant to explain academic achievement. Thus, the third significant variable is the fact that the student is taking the course for the first time.

Discussion and conclusion

The study has addressed proactivity factors affecting knowledge construction and consequently on academic achievement in cooperative learning experiences. The proactivity aspects were the student's creativity, internal locus of control, self-efficacy, and motivation towards collaborative pedagogical techniques. This research has contributed to scant empirical research on the influence that these factors have in successful collaborative learning techniques.

The findings of this study show there are significant proactivity concepts that influence knowledge assimilation by students in cooperative learning, though not all the student's proactive characteristics seem to be directly related to successful knowledge construction. As recent work in different contexts have shown, there seems to be a positive relationship between proactivity and academic outcomes also

in the context of cooperative learning techniques. In line with Geerthuis et al. (2014) and Tymon and Batistic (2016), this study has identified that some proactivity factors positively affect academic grades, which is a relevant measure of knowledge construction. In general, the student's willingness and ability when adopting an active role with other students seem to play a role in the outcome of the experience. This work has shed light on the specific elements of proactivity that can affect knowledge reconstruction and academic achievement in cooperative experiences. Specifically, the internal locus of control and self-efficacy are dimensions of the student's proactivity directly linked to knowledge development. On the other hand, the student's creativity and their motivation towards collaborative learning techniques are not relevant.

The findings contribute to support the importance of the student's internal locus of control in the debate of its influence on academic achievements (Cassidy, 2012; Suphi and Yaratan, 2012), at least in the context of cooperative learning. The sense of control about the outcomes of processes and task seems to be a success factor in the implementation of a cooperative learning technique, and this is coherent with some research on the educational field (Iskender and Akin, 2010). Since it is not about luck or external factors, concentration and commitment can make a difference in a situation where social interactions could easily derail the group's efforts.

The relevance of students' self-efficacy to influence academic achievements linked to knowledge in the collective experience has also been found. Thus, the beliefs that students hold about their skills and about the results of their efforts and activities influence the behaviours they adopt (Hassanzadeh et al., 2012). In line with Dunbar et al. (2016), the confidence about the personal capability to accomplish a task seems to be an important factor facing knowledge construction in academic jigsaws. The development of confidence in the ability to succeed in the future is greatly affected by experiences from the past (Smith and Woodworth, 2012).

Creativity, and motivation towards learning techniques do not exert a relevant influence on knowledge construction. A plausible explanation for the lack of importance regarding creativity in this context could lie in the relevance of sticking to the classical view of presenting the contents in a pedagogical, easy-to-explain way since the design of the experience considered the inclusion of support materials pedagogically interesting based on their clarity. In addition, collaborative learning teams "can also engage in negative interactions that interfere with the processes resulting in collaborative creativity" (Pluut and Cuseu, 2013: 17). In addition, the constraints imposed by the group (Tomás-Miquel et al., 2016) can also affect the implementation of creative approaches.

Motivation is a relevant feature to increase the student's satisfaction and achievement in most educational experiences. However, the element of proactive behaviour considered here is a specific one: the motivation towards collaboration. The irrelevant influence found could be explained by the distraction that this collaborative eagerness can entail and result in longer social interactions that go beyond the academic goal of the experience. Furthermore, many kinds of social challenges and problems can appear in collaborative learning activities which interfere (Järvella et al. 2010), such as leadership conflicts or social loafing. This can be a reason to reduce or change the initial motivation to engage in the cooperative technique as Vreven and McFadden (2007) also suggested.

An additional finding in the empirical approach is that students who take the course for the first time are in a better position to construct knowledge. This can reveal that this variable is a proxy for intellectual capabilities or even for the general motivation and interest towards the discipline. However, it could also be linked to the lack of frustration associated with the fact of failing the course in previous opportunities.

Another finding is the apparent lack of validity for the continuum of external and internal locus of control in the learning context. Analysis has revealed that even when several students can believe that outcomes are mainly a result of their plans and actions, they can also concede the relevance of external factors beyond their control.

Some limitations of this work must be outlined. The utilization of a questionnaire limits the approach to information gathering, and the research design of the experience dealt with the implementation of just one jigsaw, and the measurement of the dependent variable was only addressed with the use of the grades of one exercise. Hence, the effects of proactivity and the dynamic evolution of proactive behaviours in time have not been considered. Furthermore, the data have been collected in just one university in Spain, so the geographical and institutional extrapolation of the results should be taken

cautiously. Moreover, the study has focused on just one discipline in the management context, so the findings cannot be directly applied to different scientific fields, particularly outside the social sciences. As a suggestion for further research, the use of qualitative approaches in the study of proactivity could provide a richer understanding of the dynamics that appear in the development of cooperative experiences. Moreover, the study of student satisfaction and their subjective perception of learning is another promising line of inquiry too. The replication of the study in other disciplines and in the context of universities in other countries could also shed light on cultural and institutional aspects not analysed.

If some aspects of proactivity are malleable (Geerthuis et al., 2014), then attention in the higher education context should be paid on how learner proactivity can be better enhanced. Consequently, the discussion of the results set the basis to indicate some recommendations on how teaching practices or educational approaches in the context of collaborative techniques can be improved. Starting with the internal locus of control, its importance prompts us to state several guidelines to design and implement cooperative experiences in classes with large or very large student numbers. Lecturers should emphasize that students are required to take the cooperative exercise very seriously, because their involvement will determine the outcome of the experience. It is also interesting to state the needed individual responsibility in mastering the contents assigned to the student and the need for paying attention to the rest of members in the group. This insistence during every step of the implementation of the learning technique should generate the student's self-regulation of behaviour and poise that would lead to the perception that their actions are a key element to construct knowledge. An organisational implication extrapolated of the relevance of this variable is the interest of avoiding forming groups where all or most students lack an internal locus of control. In large classes the lecturer could just measure the level of internal locus of control at the beginning of the course with a simple scale and specifically support the groups with a higher concentration of students with low levels of internal locus of control.

The significance of self-efficacy as a determining factor of knowledge construction also leads to relevant practical aspects for improving cooperative learning experiences. Thus, the lecturers should design the tasks of the experience with an appropriate level of difficulty related to students' prior knowledge. Furthermore, they should present the method addressing its advantages, and emphasize the social support that it provides. Another recommendation is the development of pedagogical materials, since this can reinforce self-efficacy in the first phases of experiences such as the jigsaw.

The fact that taking the course for the first time exerts a significant influence on academic achievement poses challenges to the lecturers, since they must support and pay special attention to students who are repeating the course. Attempting to organise the core groups in a way that all the students in those groups are not repeating the course is also an interesting strategy in the design of the cooperative experience.

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Table 1

Exploratory factor analysis for the scales of the independent variables

SCALES	Items on the scale	Number of factors extracted	Eigenvalue of first factor	Eigenvalue of second factor	Total extracted variance	KMO	Bartlett's test of sphericity
Creativity	6	1	4.093	-	68.219%	0.874	651.756**
Locus of control	3	2	1.426	1.007	81.105%	0.481	33.163**
Self-efficacy	3	1	1.772	-	59.074%	0.632	68.873**
Motivation	5	1	2.713	-	54.255%	0.690	299.711**

** $p<0.01$

Table 2

Multiple regression results with standardized estimates

VARIABLES	KNOWLEDGE ASSIMILATION
	*Beta*coefficient
Creativity	-0.140 (0.153)
Internal locus of control	0.237 (0.008)**
Locus of control linked to luck & ext. factors	0.021 (0.788)
Self-efficacy	0.225 (0.019)*
Motivation t. non-traditional techniques	-0.133 (0.111)
Gender	-0.017 (0.844)
Repeating student	-0.204 (0.013)*
Student in the Sport program	-0.090 (0.289)
R^2	0.153
Adjusted R^2	0.105
F	3.178 (0.002)**

* $p<0.05$** $p<0.01$