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EXPLORING THE IMPACTS OF INTERACTIONS, SOCIAL PRESENCE AND EMOTIONAL ENGAGEMENT ON ACTIVE COLLABORATIVE LEARNING IN A SOCIAL WEB-BASED ENVIRONMENT

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HIGHLIGHTS

- This study explores antecedents of active social web-based collaborative learning.
- Social presence and teacher-student interaction influence active learning.
- Student-student interaction has the least impact on active learning.
- Emotional engagement plays a key role as a mediating factor.

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Keywords:
Computer-mediated communication; Cooperative/collaborative learning; Interactive learning environments; Higher Education; Teaching/learning strategies.

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ABSTRACT

This study examines the influence of social presence, interactions (student-student and teacher-student) and emotional engagement on active learning within the context of social web-based collaborative learning (SWBCL). In order to accomplish this objective, an empirical study was conducted with 416 students from two universities, organized into groups of 4 or 5 students, who were instructed to complete a collaborative project over the course of one semester. At the end of the project, the students filled out a questionnaire and the resulting data was analyzed using the partial least squares (PLS) technique. The results suggest that social presence and teacher-student interaction have a positive influence on students' active learning, both directly and indirectly, through emotional engagement. This variable also mediates the influence of student-student interactions, which have a less significant impact on active learning than the other analyzed variables. Consequently, this study offers important contributions to the study and practice of active learning in a SWBCL environment.

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1. INTRODUCTION

Active learning involves speaking, listening, writing, reading, and thinking (Yoder & Hochevar, 2005). As active learning has been demonstrated to improve learning outcomes (Baepler, Walker & Driessen, 2014), its implementation is consequently promoted in higher education (Hardy III, Day, Hughes, Wang & Schuelke, 2014; Ogawa & Shimizu, 2015). One of the most beneficial methods of active learning is collaborative learning (CL) (Prince, 2004). CL increases students' active roles in participation by requiring them to interact in a group environment, as well as to manage their relationships and the content they develop (Keyser, 2000; Lee, 2014).

CL has benefitted from the expansion of information and communications technologies (López-Yáñez, Yáñez-Márquez, Camacho-Nieto, Aldape-Pérez & Argüelles-Cruz, 2015). Specifically, in recent years, social web applications have become an important learning communication tool for students (Liao, Huang, Chen & Huang, 2015). The use of social webs is positive, making learning fun, meaningful and interactive, and can get students more involved in activities, in addition to increasing their motivation, learning among peers, feedback and active learning (Bowman & Akcaoglu, 2014; Lim & Richardson, 2016; Mao, 2014; Manca & Ranieri, 2016; Meishar-Tal, Kurtz, & Pieterse, 2012). However, at the same

time, there are disadvantages in using social webs, such as the absence of personal contact among classmates and the teacher, and the lack of interaction or more fragile relationships associated with online environments that may develop during the learning process (Nam, 2014; Witney & Smallbone, 2011). In this regard, Robinson (2013) determined that students must provide more detailed textual descriptions in online contexts to compensate for the lack of face-to-face contact. Tutors also have to take into account the importance of social aspects in learning, as they can become obstacles for group cohesiveness (Nam, 2014). This could also lead to frustration due to the perception of asymmetric collaboration caused by the online environment, leading to lower levels of engagement, identification and performance (Capdeferro & Romero, 2012). These aspects require students to spend more time working online to organize and socialize (Janssen, Erkens, Kirschner, & Kanselaar, 2012) and, therefore, some of them are reluctant to participate in collaborative online activities (ChanLin, 2012; Korkmaz, 2012; Witney & Smallbone, 2011).

Of the factors that influence active learning (see Bell & Kozlowski, 2009), the literature demonstrates that social interaction is key (Hrastinski, 2008). When students interact, they are not only more motivated to learn, but are also more attentive, participatory and prone to exchange ideas with others (Sims, 2003). Two types of social interactions have been distinguished: (1) student-student and (2) teacher-student (Blasco-Arcas, Buil, Hernández-Ortega & Sese, 2013; Thoms & Eryilmaz, 2014; Vuopala, Hyvönen, & Järvelä, 2016). Within the context of interactions, it is very important to consider the effect of social presence, defined as “the sense of awareness of an interaction partner” (Fu, Wu, & Ho, 2009, p. 553). This concept is useful for explaining how the characteristics of social web tools influence student behavior (Kreijns, Kirschner, Jochems, & Buuren, 2007). Some tools allow for asynchronous communication (e.g. forums), while others are perceived as similar to face-to-face interaction (e.g. Skype) (Fu et al. 2009). Interactions are not only directly related to active learning, but also to engagement (Blasco-Arcas et al., 2013). Student engagement is considered to be a multidimensional construction with psychological and behavioral components (Fredricks, Filsecker, & Lawson, 2016). In particular, the emotional dimension provides incentives for students to engage in participatory behaviors and to be resolute in their scholarly efforts (Finn & Zimmer, 2012). Therefore, emotional engagement is considered as playing a fundamental role in active learning (Järvelä, Veermans, & Leinonen, 2008), although its effect on student behavior has still not been adequately studied (Boekaerts, 2016).

Despite the recognition that these variables play an important role in active learning, there are few studies that analyze their overall impact within the context of SWBCL (see Akçayır & Akçayır, 2016; Manca & Ranieri, 2016). Analyzing the impact of these variables in a single

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model not only allows us to evaluate their influence on active learning, but also their relative importance. Accordingly, the objective of this study is to analyze the impact of social interactions (student-student and teacher-student), social presence and emotional engagement on active learning within the context of SWBCL. In order to analyze these relationships, a conceptual model was defined and evaluated through an empirical study of undergraduate students that undertook collaborative work, using social web tools, over the course of a semester. The data was collected through a survey and analyzed using the partial least squares (PLS) technique.

2. CONCEPTUAL FRAMEWORK

2.1. Active learning

Bonwell and Eison (1991) define active learning as “anything that involves students in doing things and thinking about what they are doing” (p. 2). Active learning is based on theories that consider learning as a constructivist, self-regulated, collaborative process (Niemi & Nevgi, 2014). Active learning changes the way in which students learn, moving from a passive role to one that actively manages and develops their learning (Fu et al., 2009; Ituma, 2011; Peterson, 2001). Students are encouraged to think about why they are doing what they are doing and discover knowledge for themselves (Bell & Kozlowski, 2009; Hardy III et al., 2014). This refers to practices that involve students in the learning process and includes techniques where students do more than just passively listen to lectures (Blasco-Arcas et al., 2013). Active learning is a methodology that requires a high degree of student engagement in the learning process; it is not enough simply to read, listen to or view the didactic materials, but rather students must participate in discussions, give talks, make presentations, simulate real experiences, as well as undertake other activities (Gainor, Bline & Zheng, 2014; Hamouda & Tarlochan, 2015; Prince, 2004). Therefore, active learning is both an individual process and an experience of participating with other community members (Niemi & Nevgi, 2014). It improves students’ social integration, their attitude toward the subject and their engagement with their studies and the academic institution, which consequently reduces the dropout rate (Prince, 2004) and creates a competitive learning environment (Gainor et al., 2014).

The establishment of active learning requires students to be motivated and feel confident. In addition, teachers must clearly explain the methodology and know how to guide students to ensure they adopt a positive attitude (Niemi & Nevgi, 2014). The teachers are responsible for creating collaborative environments (Prince, 2004). Additionally, the evaluation system must

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assess dialogue and participation in debates, as well as problem solving, which motivates active learning (Yoder & Hochevar, 2005).

2.2. Social Web-Based Collaborative Learning (SWBCL)

Collaborative learning (CL) takes place when students work together, in small groups, toward a common goal, exploring specific topics or improving their skills (Prince, 2004). CL is based on social constructivist learning theory, which emphasizes that learning and knowledge building are affected by interaction and collaboration (Krange & Ludvigsen, 2008). Therefore, collaborative work increases active learning by forcing students to take the initiative in managing their groups and the content developed in the groups (Keyser, 2000). Collaboration is a driving force in the achievement and maintenance of one's own learning (Lee, 2014).

In recent years, the Internet has facilitated active learning by allowing for new forms of dialogue between teachers and students (Paladino, 2008). In particular, social web-based technologies have an increasingly greater presence in students' daily lives. A social web application is defined as a platform in which users can easily create, communicate and publish online content (e.g. blogs, wikis, forums, virtual communities and social networks). Social web tools have therefore become important instruments for use in education (Churchill, 2011; Top, 2012).

Collaborative learning contexts, mediated by technology, encourage interaction among students so that they can acquire knowledge, skills and attitudes through active participation in the process (Dewiyanti, Brand-Gruwel, Jochems & Broers, 2007; Gu, Shao, Guo & Lim, 2015). They therefore support knowledge exchange and facilitate collaboration as a means of improving students' learning (Witney & Smallbone, 2011).

Nevertheless, collaborative work using social tools presents a series of difficulties that must be taken into account. For example, in comparison to face-to-face collaboration, students in web learning environments have to dedicate more time and effort to self-managed activities in order to achieve their proposed objectives, while also helping the learning community (ChanLin, 2012). Additionally, teachers must clearly define the tasks at hand, the evaluation system and what their role will be (Churchill, 2011), in addition to using interaction tools that are relatively easy to manage (Suthers, Hundhausen & Girardeau, 2003).

2.3. Factors contributing to active learning in a SWBCL environment

The literature identifies many factors, both internal and external to the student, that influence active learning (e.g. Bell & Kozlowski, 2009; Bonwell & Eison, 1991; Deed & Edwards, 2011; Hamouda & Tarlochan, 2015; Thoms & Eryilmaz, 2014). As previously mentioned, this study

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considers only four factors related to online interaction using social web tools: teacher-student interaction, student-student interaction, social presence and emotional engagement.

Social interactions are an essential element for the success of online learning (Kuo, Walker, Schroder & Belland, 2014) and the achievement of active learning (Blasco-Arcas et al., 2013). An interaction is defined as a bidirectional communication between two parties. Various forms of interaction have been identified as important factors in the success of collaborative learning (Vuopala et al., 2016), with an emphasis on those that arise between teachers and students, as well as among students.

Teachers have a great responsibility to encourage students to engage in more active, collaborative learning (Chapman & Van Auken, 2001). The interaction between teachers and students is therefore fundamental (Dietrich, Dicke, Kracke & Noack, 2015), as is the design of effective tasks (Lee, 2014). Activities led by teachers regarding how to use, implement, monitor, evaluate, and communicate with students affect their learning and the success of collaborative work groups (Chapman & Van Auken, 2001). Furthermore, the relationship between teachers and students has a direct influence on student motivation (Dietrich et al., 2015; Lee, Srinivasan, Trail, Lewis & Lopez, 2011). Therefore, if students have the opportunity to ask questions, express their ideas and there is room for discussion in their interactions with their teachers, they will feel more comfortable and satisfied with the relationship and will, consequently, be able better to develop their skills (Abrantes, Seabra & Lages, 2007).

On another note, interactions among students in a computer-supported collaborative learning environment relate both to the coordination of the group (e.g. planning and organizing activities), as well as the tasks themselves (e.g. comments, responses to previous messages, etc.) (Vuopala et al., 2016). The number of interactions, perceived social interaction, sense of community, and student satisfaction is greater when using social web tools than in traditional learning management systems (Thoms & Eryilmaz, 2014). Interaction with peers can improve students' interest and motivation, which will lead them to pursue different ideas in more depth and improve their learning outcomes (Moore, 1989; Kuo et al, 2014).

Social presence is also a key factor for SWBCL. Social presence is defined as the "degree to which participants feel affectively connected to one another" (Kozan & Richardson, 2014, p. 69). It is the degree to which individuals represent themselves and perceive others in mediated environments (Oztok, Zingaro, Makos, Brett & Hewitt, 2015). There is evidence in the literature suggesting that social presence is crucial to students' satisfaction in online

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studies (Grieve, Padgett & Moffitt, 2016). Furthermore, various studies have demonstrated that it has a positive influence on learning outcomes (Hostetter & Busch, 2013; Lee, 2014).

Finally, engagement is another key element of learning and academic success. Although engagement has been defined in various different ways, there is a certain degree of consensus in that it is generally considered a multidimensional concept (Fredricks et al., 2016). One of the most frequent conceptualizations in the literature is that engagement consists of three dimensions: behavioral, emotional/affective and cognitive (Fredricks, Blumenfeld & Paris, 2004). Nevertheless, some authors have identified other dimensions (e.g., social-behavioral, agentic, volitional), although with the risk that a very broad conceptualization of engagement would essentially explain practically everything related to the learning process and, consequently, end up not explaining anything at all (Fredricks et al., 2016). In order to avoid this effect, this study focuses on emotional engagement, which refers to the affective state (e.g. interest, happiness, pleasure) experienced in SWBCL (Fredricks et al., 2004). Emotional engagement provides motivation for students to invest energy as well as an incentive to participate behaviorally (Finn & Zimmer, 2012).

3. HYPOTHESES DEVELOPMENT AND RESEARCH MODEL

3.1. Social interactions

Social interactions are a critical element in learning environments (Lee et al., 2011). Dialogue and the discussion of ideas encourage students' thinking and learning (Faranda & Clarke, 2004). Therefore, conducting collaborative activities has a positive effect on students' attitudes and study habits (Prince, 2004). In collaborative learning, the possibility of discussing ideas and interacting with teachers and peers (Robinson, 2013), thereby generating a feeling of belonging to the group or community (Kwon, Liu & Johnson, 2014; Lee et al., 2011), encourages students to be more active in their learning (Hamalainen & Vahasantanen, 2011). CL stimulates discussion and motivates students to express themselves, which facilitates their engagement (Finn & Zimmer, 2012). Consequently, students' engagement is reflected in their work and activities through exchanges and interaction with other students (Cho & Kim, 2013; Martin & Rimm-Kaufman, 2015).

Similarly, students' success in learning is affected by their interactions with their teachers (Fu et al., 2009; Moskvicheva, Bordovskaia & Darinskaya, 2015). Teachers participate in the creation of learning experiences through their interaction with students. The interactions between teachers and students, which offer emotional, organizational and educational support, are a significant predictor of student satisfaction (Kuo et al., 2014) and contribute to an increase in engagement (Blasco-Arcas et al., 2013; Dietrich et al., 2015; Ma, Han, Yang &

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Cheng, 2015; Marks, 2000; Martin & Rimm-Kaufman, 2015; Reyes, Brackett, Rivers, White & Salovey, 2012). In collaborative work, teachers must provide assistance and guidance in order to ensure the continuity of the learning process (McGill, Klobas & Renzi, 2014). Teachers thereby influence students' productive behavior in their work groups (Bangert, 2008; Chapman, Meuter, Toy & Wright, 2010; Fu et al., 2009). Students that value their relationship with their teachers have a stronger disposition to learn more actively (Blasco-Arcas et al., 2013; Díaz-Méndez & Gummesson, 2012),

The use of social web tools improves interactions in CL as they encourage communication among students, as well as between teachers and students, by fomenting a more continuous, asynchronous interaction (Robinson, 2013) and counteracting feelings of isolation that some students may experience (Lee et al., 2011). Social webs offer students the opportunity to actively create and share content, interact, collaborate and generate knowledge (Bennett, Bishop, Dalgarno, Waycott & Kennedy, 2012; Deed & Edwards, 2011; Hamid, Waycott, Kurnia & Chang, 2015). Learning mediated by social web tools may achieve a greater degree of student satisfaction with the learning experience (Hamid et al., 2015).

On the basis of the preceding discussion, emotional engagement and active learning are considered to be two important results of social interactions. Accordingly, the following hypotheses are proposed:

H1. Student-student interaction has a positive impact on emotional engagement.

H2. Student-student interaction has a positive impact on active learning.

H3. Teacher-student interaction has a positive impact on emotional engagement.

H4. Teacher-student interaction has a positive impact on active learning.

3.2. Social presence

As previously mentioned, social presence is another factor to be taken into account within the context of SWBCL. In the study of social relationships in online educational environments, social presence has recently been conceptualized as the way in which the sense of oneself is perceived, as well as the perspectives of others (Oztok et al., 2015). Social presence "reflects a supportive context for emotional expression, open communication and group cohesion for building understanding" (Garrison, Anderson & Archer, 2000, p. 101). Students with higher levels of perceived social presence in an online environment experience a greater degree of learning satisfaction and engagement (Grieve et al., 2016).

According to Fu et al. (2009), a student's social presence within an online collaborative work group affects the degree to which the student is inclined to learn and put forth a greater individual effort. Therefore, social presence enables the development of a sense of

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community that motivates students to develop their own learning in collaboration with their peers (Smith & Flaherty, 2013). Social presence has an influence on defining a problem or task; exploring relevant information/knowledge; making sense of and integrating ideas; and, finally, testing plausible solutions (Bangert, 2008; Garrison, Cleveland-Innes & Fung, 2010). The greater is the social presence in the group, the greater the active learning (Cho, Yim & Paik, 2015).

Based on this discussion, social presence is considered to be a key driver of emotional engagement and active learning. Consequently, we propose the following research hypotheses:

H5. Social presence in collaborative work has a positive impact on emotional engagement.

H6. Social presence in collaborative work has a positive impact on active learning.

3.3. Emotional Engagement

Emotional engagement is an internal state that provides the impetus to participate in certain academic behaviors (Finn & Zimmer, 2012). Students who are engaged to their work are more motivated and willing to interact with the subject content, which is reinforced through collaborative work mediated by computers (Sims, 2003). In online collaborative work, the commitment may be even greater as it allows for more flexible communication and eliminates the fear of face-to-face interaction, in addition to establishing clearer planning and operating rules (Ituma, 2011; Robinson, 2013). Due to the interpersonal relationships and trust established among the members of a collaborative work group, it is possible to develop a feeling of belonging to the group, which helps improve student involvement and learning outcomes (Kwon et al., 2014). Various studies have demonstrated that engagement has a positive impact on active learning (Hamalainen & Vahasantanen, 2011; Ituma, 2011; Prince, 2004). Consequently, increased emotional engagement encourages more active learning. We therefore propose the following research hypothesis:

H7. Emotional engagement in collaborative work has a positive impact on active learning.

3.4. Research model

In accordance with the literature, we developed our research model as depicted in Figure 1. The model is intended to improve knowledge regarding the influence of student-student and teacher-student interactions, social presence and emotional engagement on active learning in SWBCL.

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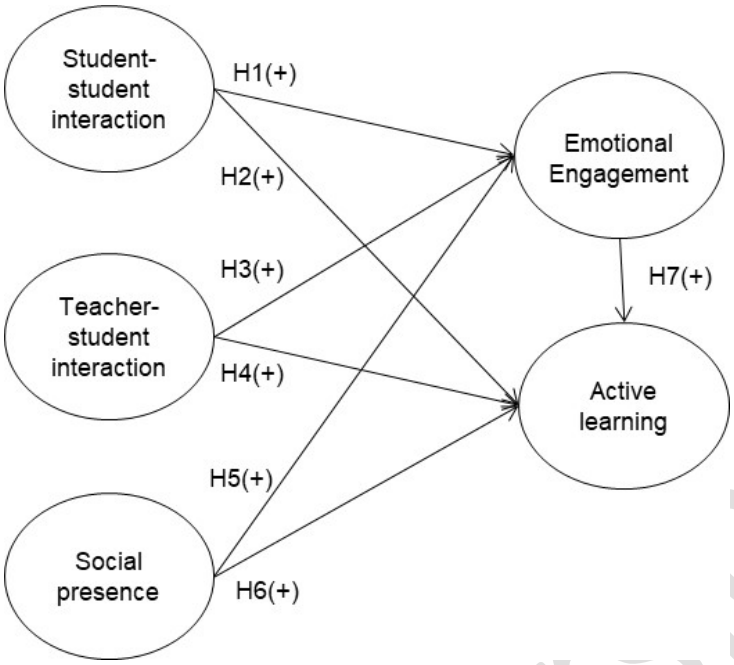

Figure 1. Research model

4. METHODOLOGY

4.1 Procedure and participants

This study presents empirical research undertaken in blended learning business courses. Random groups of four or five students were formed and tasked with completing a mandatory collaborative project over the course of a semester. The goal of the collaborative project was to conduct a case study (an activity frequently undertaken in business studies courses) through the use of social-web based tools. In a face-to-face session at the beginning of the semester, each group was randomly assigned a marketing case study prepared by the teachers. The teachers were responsible for establishing the objectives of the study, providing guidance instructions and for motivating the students. The case study was about a real, local company. A problem was described which the group had to address by answering a series of questions (e.g. regaining market share, improving reputation, increasing market coverage, improving customer loyalty). It was made clear to the students that the case study did not have one single correct answer, and that several alternative courses of action were possible, but that the rationale for the actions had to be set out in a reasoned and justifiable manner.

To accomplish this, throughout the semester the group had to analyze the company´s situation in accordance with the theoretical framework of the course, to seek out additional information that could help in their decision making, propose alternatives to address the company´s problems and make decisions as if they were part of the company´s commercial

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management team. In carrying out the task they had to use social tools to communicate, organize, interact, share information, co-produce knowledge and work collectively to address the relevant case issues. Specifically, through the Moodle 2.5 platform, the teachers instructed the students in the use of blogs (WordPress and Blogger), social networks (Facebook and Twitter), hosting and file sharing tools (Google Drive and Dropbox), conversation systems (Skype), forums and wikis (Moodle 2.5).

During the semester the teachers interacted with the students through social web tools and the Moodle 2.5 platform, providing them with guidance and help in the resolution of the case study, resolving unexpected circumstances and asking questions to help clarify any confusing aspects and to move the discussion to another level. The teachers continuously monitored student activity on the different platforms to ensure that the learning process went smoothly and that the right decisions were being made. Simply by reading the contributions of the students over time, and noting their development, the teacher could get a general idea of the evolution of the work and ensure that all the group members were involved, detect possible problems and intervene to correct the learning process if necessary. In addition, through the monitoring process the teachers could accurately evaluate the students´ individual and group learning, noting the activities carried out by each student (i.e. contributions, peer feedback, communication skills, etc.) and evaluate them in fair way.

The students, for their part, during the semester used the social media tools to develop an extensive range of learning activities, including: speaking, listening, reading, writing and thinking about the course content through the case study, self-expression, social interaction, searching for and applying information for the resolution of real world situations, reaching agreements, document exchanges, working at a distance, team management, time management, work planning, organization, synthesis and co-production of knowledge and contributing creatively and collectively (Table 1). At the end of the semester, the students gave a remote presentation of their solutions/reasoning through Skype and responded to the teacher's and peers' questions.

Following the presentation, the students responded to a questionnaire in order to measure the model's variables. The sample consisted of 416 students from four blended learning courses from two degree programs in two Spanish universities. These public universities are among the largest in the country in terms of student numbers. Among the participants, 55.30% were between the ages of 19-21, 54.60% were women and 57.50% had one or more years of experience in the use of collaborative tools.

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Table 1. Social-Web based tools and conducted learning activities

Tool	Learning activities
Blog	Each group managed a blog used as a type of diary, in which the activities carried out and problems encountered were described informatively, reflecting on the learning experience, their findings and possible solutions. The blog allowed the students to monitor and track progress in their learning, simply by comparing their reflections throughout the semester. The students also used it for critical and constructive interaction with students from other groups and even with other users of the blogosphere. In addition, they included news about the company in the case study and its sector of activity.
Social network	Social networks were particularly useful for interaction with other students and users as these platforms have a high level of use in the daily life of young people. They allowed synchronous and asynchronous communication, both through text and through voice and video calls, in public or private conversations between two or more interlocutors. The public exposure to their thinking forced students to work hard on their analytical skills because their comments were being shared with a potentially wide audience. In addition, students were encouraged to comment on the work of other groups, which encouraged critical thinking. The familiarity of students with social networks, and the characteristics of the type of communication they facilitate, led to collaboration, the exchange of ideas and information, feedback, discussion in a comfortable and even entertaining environment and enhanced the role of the students in the learning process and their engagement with the case study.
File storage and sharing	Each group created an account on a free platform to share folders and files. Group members could upload, download, create and delete files. This was used as a shared repository of useful documents for the resolution of the case study and was accessible from any computer with an Internet connection. This facilitated the organization of the available information, so that the members of the group could know what information was readily available. In addition, it was used to store backup copies of work documents, which helped avoid data loss; previous versions of documents could be recovered if necessary.
Forum	First, the groups used this tool as an asynchronous written communication channel. On this platform the group members organized, coordinated and shared their knowledge to carry out tasks. They debated possible answers and reached the consensus that they would later write up in the wiki text, thus promoting deeper understanding of the material. In addition, it allowed capture and review of the history of the interactions. Furthermore, a second forum was created as a means to disseminate news, make course announcements and allow the teacher to transmit his instructions to the groups; and the students could, in turn, raise questions.
Communication system	For synchronous communication through voice and video calls among group members, Skype was preferred. This platform allowed debate, the exchange of ideas, coordination, reaching agreements and almost immediate online decision-making. This immediacy meant less time for analysis and reflection so, for effective use, group members had to prepare for the "meetings" in advance by using asynchronous tools. The students used Skype several times a week throughout the semester. In addition, at the end of the semester, the tool was used to make the presentation and for remote discussion of the case study through videoconferencing.
Wiki	Using this tool, the members of each group collaborated to write up their case analysis and give their answers to the posed questions. For this, through collaborative writing the students gathered and organized their knowledge and resources, documented each step and explained their reasoning. Throughout the semester the wiki was built collaboratively, so that at any time students could access the text to continue the task or simply to review what had been done and improve its content. As a result, logical conclusions were presented in response to the company's problems, based on the knowledge that had been acquired in the course.

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4.2. Research instrument

Data collection was conducted through personal surveys. The questionnaire consisted of 24 items designed to measure the model's five constructs, six questions to measure the use of collaborative tools and two demographic questions (i.e. age and gender). The model's constructs were measured using scales validated and used in prior studies. The *student-student interaction* and *teacher-student interaction* variables were each measured with 4 items adapted from research by Blasco-Arcas et al. (2013); *social presence* and *active learning* were measured with 7 and 5 items, respectively, adapted from Fu et al. (2009); and *emotional engagement* was measured through 4 items adapted from Martin and Rimm-Kaufman (2015). 7-point Likert scales were used in all cases (see Appendix). For example, in the "Student-student interaction" and "Teacher-student interaction" scales (Blasco-Arcas et al., 2013), the expression "Using the clickers in class" was replaced by "Using the social web tools"; and, in "Emotional engagement" (Martin & Rimm-Kaufman, 2015), "Math class" was replaced by "The collaborative work". As the original measurement scales were in English, a qualified interpreter translated the scale items into Spanish. Before the data was collected, a pre-test was conducted with a random sample of 20 students from the business courses selected for the study, using the class lists. Based on feedback from the pre-test, minor modifications were made to the language and wording of the measurement instrument in order to make the questions easier to understand, while keeping faithful always to the meaning of the original phraseology.

5. RESULTS

The structural equation modeling (SEM) analysis was used to evaluate the quality of the measurement tool and compare the research hypotheses, through the partial least squares (PLS) technique, using SmartPLS 3.0 software (Ringle, Wende, & Will, 2007). The PLS-SEM technique is appropriate when the normality of the data cannot be guaranteed, allowing one to work with formative constructs and small samples (Hair, Hult, Ringle, & Sarstedt, 2013). We used the PLS analysis in our study for two reasons: first, because, after conducting the Kolmogorov-Smirnov test for normality with SPSS, we could not guarantee that most of the data followed a normal distribution; and, second, because the theoretical knowledge justifying the proposed model is still in a developmental phase (Fornell & Bookstein, 1982).

The results are displayed in two stages: first, in the reliability and validity of the measurement model and, second, in the evaluation of the research hypotheses and the structural model.

5.1. Measurement model

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The results of the constructs' reliability and convergent validity are shown in Table 2. All factor loadings are greater than 0.70, except for one item of *social presence*. After verifying that this item did not adversely affect the internal consistency and the convergent validity of the scale, we decided to retain it in the study because of its contribution to the validity of the content. Cronbach's alpha (CA) and composite reliability (CR) exceed the 0.8 minimum value suggested by Nunnally (1978) in all cases. In terms of convergent validity, the average variance extracted (AVE) exceeds the minimum value of 0.5 proposed by Fornell and Larcker (1981).

Table 2. Reliability and convergent validity

Construct	Loadings	CA	CR	AVE
Student-student interaction	0.9108-0.938	0.9439	0.9596	0.8559
Teacher-student interaction	0.9319-0.9529	0.9576	0.9692	0.8871
Social presence	0.5468-0.8841	0.8949	0.9193	0.6239
Emotional engagement	0.8196-0.8822	0.8704	0.9115	0.7205
Active learning	0.7382-0.8943	0.8946	0.9228	0.7059
Perceived learning	0.9089-0.9388	0.8302	0.9211	0.8537

Note. CA = Cronbach´s alpha; CR = Composite reliability; AVE = Average variance extracted.

To verify discriminant validity we employed three methods valid for PLS: i) the loadings of each indicator in its respective construct must be greater than the cross-loadings in other constructs (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014) (Table 3); ii) the correlations between the dimensions must be less than the square root of the AVE (Fornell & Larcker, 1981) (Table 4); iii) the heterotrait-monotrait (HTMT) relationship of the correlations between two constructs must be less than 0.9 (Henseler, Ringle & Sarstedt, 2015) (Table 4). In this study, all values were below the maximum recommended thresholds.

As a result of these analyses, we confirmed that the measurements are reliable and valid and, consequently, we proceeded to analyze the structural model.

5.2. Structural model

To evaluate the structural model, we studied the significance of the relationships between the constructs and predictive quality. To test the significance of the path coefficients, the bootstrapping procedure was run with 5,000 subsamples (Hair, Ringle, & Sarstedt, 2011). Table 5 shows the results of the structural model assessment. All of the hypotheses in the model were supported, except for H2.

Table 6 shows the values of the model's predictive capacity. The model explains a great deal of the variance of the endogenous constructs: emotional engagement (54.12%) and active learning (53.45%). Additionally, the degree of influence of the predictive variables over the endogenous variables was evaluated. Emotional engagement is fundamentally explained by social presence (22.82%), student-student interaction (17.17%) and, to a lesser degree, by

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teacher-student interaction (14.12%). Active learning is 23.54% explained by social presence, 21.70% by emotional engagement and 13.70% by teacher-student interaction. Lastly, the predictive relevance is evaluated through the Stone-Geisser or Q^2 Test. The greater is the value of Q^2, the greater the predictive capacity of the model. The results show that the proposed model has a good predictive capacity, as these parameters are moderate (0.38 and 0.37). Lastly, the SRMR (Standardized Root Mean Square Residual) (Henseler et al., 2014) allows us to compare the difference between the observed and predicted correlations and adjust the model accordingly. A value of less than 0.08 is considered to be acceptable. The value in our model was 0.055, meaning the proposed model adjustment is correct.

Table 3. Discriminant validity and cross-loadings.

	Active learning	Emotional engagement	Student-Student interaction	Teacher-student interaction	Social presence
AL1	**0.8545**	0.5671	0.4067	0.4791	0.5448
AL2	**0.8767**	0.4973	0.4142	0.4532	0.4852
AL3	**0.8281**	0.5400	0.3764	0.4593	0.4657
AL4	**0.7382**	0.5070	0.3436	0.2984	0.5208
AL5	**0.8943**	0.5913	0.4159	0.4367	0.5140
EE1	0.5296	**0.8176**	0.4396	0.4440	0.5023
EE2	0.5830	**0.8822**	0.5824	0.3950	0.5993
EE3	0.4853	**0.8526**	0.6248	0.3614	0.6011
EE4	0.5884	**0.8416**	0.4780	0.4457	0.4757
SSI1	0.4078	0.5602	**0.9108**	0.2996	0.6689
SSI2	0.4546	0.5949	**0.9223**	0.3203	0.6689
SSI3	0.4148	0.5774	**0.9380**	0.2650	0.7016
SSI4	0.4478	0.5881	**0.9293**	0.2884	0.6823
TSI1	0.5111	0.4941	0.3255	**0.9319**	0.2821
TSI2	0.4807	0.4507	0.3051	**0.9398**	0.3023
TSI3	0.4603	0.4287	0.2717	**0.9529**	0.2480
TSI4	0.4649	0.4438	0.2893	**0.9427**	0.2792
SP1	0.4208	0.5269	0.7083	0.1922	**0.8440**
SP2	0.4767	0.5656	0.6627	0.2156	**0.8674**
SP3	0.4401	0.5085	0.6330	0.2644	**0.7646**
SP4	0.5032	0.4619	0.4635	0.2662	**0.7161**
SP5	0.5203	0.5278	0.5996	0.2191	**0.8841**
SP6	0.5810	0.5760	0.6067	0.3012	**0.8513**
SP7	0.3407	0.3478	0.3432	0.1546	**0.5468**

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Table 4. Discriminant validity: Fornell-Larcker criterion (below the main diagonal) and Heterotrait-Monotrait ratio (HTMT) (above the main diagonal).

Constructs	1	2	3	4	5
1. Active learning	**0.84**	0.73	0.50	0.54	0.67
2. Emotional engagement	0.64	**0.85**	0.69	0.53	0.72
3. Student-student interaction	0.47	0.63	**0.93**	0.33	0.79
4. Teacher-student interaction	0.51	0.48	0.32	**0.94**	0.31
5. Social presence	0.60	0.64	0.74	0.30	**0.79**

Note. Square root of the AVE in bold in the main diagonal.

Table 5. Results of hypotheses testing

Hypothesis	Path coefficient	t-value	p-value	Supported
H1. Stud. - stud. interaction -> e. engagement	0.2737	5.0679	***	Yes
H2. Stud. - stud. interaction -> active learning	0.1179	1.9459	---	No
H3. Teac. - stud. interaction -> e. engagement	0.2919	6.8545	***	Yes
H4. Teac. - stud. interaction -> active learning	0.2687	5.9873	***	Yes
H5. Social presence -> e. engagement	0.3552	6.5352	***	Yes
H6. Social presence -> active learning	0.3918	5.9450	***	Yes
H7. E. engagement -> active learning	0.3367	6.1979	***	Yes

Note. n = 5,000 subsamples: *p < 0.05; **p < 0.01; ***p < 0.001 (based on one-tailed t-test (4999))

Table 6. Assessment of the structural model.

Constructs	R^2	β	Correlation	Explained variance	Q^2
Emotional engagement	0.5412				0.3848
Student-student interaction		0.2737	0.6275	0.1717	
Teacher-student interaction		0.2919	0.4838	0.1412	
Social presence		0.3552	0.6427	0.2282	
Active learning	0.5345				0.3704
Student-student interaction		0.1170	0.4668	0.0546	
Teacher-student interaction		0.2687	0.5100	0.1370	
Social presence		0.3918	0.6009	0.2354	
Emotional engagement		0.3367	0.6445	0.2170	

6. DISCUSSION

6.1. Theoretical and practical implications

The objective of this empirical study was to explore the impacts of social interactions (student-student and teacher-student), social presence and emotional engagement on active learning within the context of SWBCL. The study supports all the relationships in the model except for one. This research therefore makes important contributions to the study and practice of active learning in an SWBCL environment based on a parsimonious model with explanatory power.

First, three variables that serve as key antecedents of active learning were identified: in order of importance, social presence, emotional engagement and teacher-student interaction. Social presence and teacher-student interaction have both a direct and indirect influence

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through emotional engagement. Social presence has been identified as an essential variable for students to achieve active learning, which is consistent with the literature (Bangert, 2008; Garrison et al., 2010; Cho et al., 2015; Smith & Flaherty, 2013). Consequently, the greater that the students perceive the degree of social presence among the participants in an online collaborative work group, the greater will be their predisposition to develop their own learning. Similarly, this study demonstrates that students' emotional engagement has a positive influence on active learning, which builds upon the results of previous studies that make general reference to the effect of engagement without explicitly measuring the emotional dimension (e.g., Blasco-Arcas et al., 2013; Hamouda & Tarlochan, 2015; Prince, 2004). Consequently, one can assume that the more positive the emotional engagement (e.g. fun, enjoyment, interest), the greater will be the possibility of generating active learning. Additionally, the interaction between teachers and students has been demonstrated to have a positive influence on active learning in CL, although to a lesser degree than social presence and emotional engagement. These results are consistent with previous studies that highlight the teacher's responsibility for the student's active and collaborative learning (Chapman & Van Auken, 2001). Active learning requires teachers to offer students support and to know how to work with them (Niemi, 2012). Teachers must contribute to creating a collaborative environment and cooperation (Prince, 2004), clearly explaining the methodology, supporting students and encouraging them to adopt positive attitudes (Niemi & Nevgi, 2014).

Second, despite the fact that the literature makes reference to the existence of a positive relationship between the student-student interaction and active learning (e.g., Blasco-Arcas et al., 2013), the results of this study do not support this relationship. This may be due to the possible existence of conflicts between students related to the online environment in which their interactions take place (e.g. their opinions are public within the group) (Nam, 2014). Also the role of social-comparison concern in the group may make some students feel intimidated, due to the fact that they feel less capable to perform the tasks at hand, which might affect their performance within the group (Micari & Drane, 2011). It is also possible that none of the team members might take on the leadership role, which is occasionally necessary to bring the team together or suggest behavioral changes among team members (Hansen, 2006; Lancellotti y Boyd, 2008). Furthermore, it is possible that the members of a group may have different motivations (e.g. passing the course, getting good grades, learning) that may affect their performance (Serrano-Cámara, Paredes-Velasco, Alcover & Velazquez-Itúrbide, 2014) and even lead to conflicts within the group (Kates, 2002). Consequently, perhaps students feel that greater interaction within the group may lead to a greater probability of conflict, which may discourage active learning. Despite this possibility, this

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study has demonstrated that there is an indirect impact between student-student interaction and active learning through emotional engagement, which seems logical since, as we have corroborated, the greater the exchange and interaction with other students, the greater will be the degree of student engagement (Cho & Kim, 2013; Martin & Rimm-Kaufman, 2015), which will, in turn, lead to more active learning.

Third, the results show that students' emotional engagement is positively affected, in order of importance, by social presence, student-student interaction and teacher-student interaction. These results are consistent with previous studies (Grieve et al., 2016; Martin & Rimm-Kaufman, 2015; Ma et al. 2015). It is therefore logical to conclude that the feeling of connection produced within the group (Kwon et al., 2014; Lee et al., 2011), in conjunction with the possibility of discussing ideas and interacting with teachers and peers afforded by online collaborative learning environments (Robinson, 2013), may contribute to increasing students' emotional engagement in learning activities.

Accordingly, this study contributes to improving knowledge about active learning within the context of SWBCL. Therefore, this document builds upon the current literature about active learning methodologies, with emphasis on the role of three key antecedents (i.e. social presence, emotional engagement and teacher-student interaction).

This study also offers practical implications for the use of SWBCL strategies in higher education. Firstly, it is worth noting the importance of promoting active collaborative learning using tools that allow for an appropriate social presence. The results demonstrate that the most influential aspect of active learning is the comfort and ease of communication among members of a group, which offers a sense of community thanks to the ease of interaction and opinion sharing. The combined use of tools enabling a wide range of activities, from the collaborative creation of an online document (e.g. wiki) to simultaneous conversations (e.g. forums, Skype), positively contributes to social presence. The figure of the teacher is also key in this process, since the mere use of online tools does not guarantee the significant interactions that are conducive to active learning (Lee, 2014). The results show that the use of social web tools facilitates the teacher's interaction with students, which is fundamental for providing assistance, technical support and pedagogical guidance (Lee et al., 2011), which in turn determines students' behavior and productivity in the work group (Chapman et al., 2010; Fu et al., 2009). Additionally, teachers should help group members work in harmony, to enjoy the activities and have fun as they learn, while at the same time avoiding internal tensions. It is consequently important not only to clearly establish the rules of operation and evaluation, but also to develop fun, attractive study situations, to encourage creativity and the exchange of experiences. All of this will have a positive influence on active learning, both directly and indirectly, through emotional engagement.

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6.2. Limitations and future research

This study has some limitations. Since the data comes from a cross-sectional survey, the causal relationships should be interpreted with caution. Additionally, the model has significant explanatory power, but only considers four antecedents of active learning. Lastly, although the students have used a wide variety of social web tools, some very recent technologies were not included.

Future research could further validate the model with data from longitudinal studies obtained through surveys as well as other procedures (e.g. observation). Furthermore, the model could be expanded to include other variables to increase its explanatory power, such as teacher social presence or other dimensions of engagement, as well as using learning outcomes as the dependent variable. Finally, future studies could explore the use of other technologies such as mobile devices and instant messaging apps.

7. CONCLUSION

Collaborative methodologies in which students interact with their peers through the use of different social web tools are being increasingly used in universities. These collaborative methodologies allow students to actively participate in their own learning, which they can then extrapolate to their professional lives. Nevertheless, there is very little knowledge about the antecedents of active learning in SWBCL environments. Therefore, this study contributes to the literature by evaluating a model that includes four antecedents. The results support the model and underline the roles of social presence, emotional engagement, teacher-student interactions and, to a lesser degree, student-student interactions (in that order) as antecedents of active learning.

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Appendix. Measurement scales

Constructs	Items	Mean	S.D.
Student-student interaction (Blasco-Arcas et al., 2013)	Using the social web tools...		
	SSI1. Facilitates interaction with peers	5.39	1.514
	SSI2. Gives me the opportunity to discuss with peers	5.53	1.469
	SSI3. Facilitates dialog with peers	5.47	1.550
	SSI4. Allows the exchange of information with peers	5.51	1.484
Teacher-student interaction (Blasco-Arcas et al., 2013)	Using the social web tools...		
	TSI1. Facilitates interaction with the teacher	4.38	1.594
	TSI2. Gives me the opportunity to discuss with the teacher	4.23	1.672
	TSI3. Facilitates dialog with the teacher	4.26	1.624
	TSI4. Allows the exchange of information with the teacher	4.27	1.660
Social presence (Fu, Wu, & Ho, 2009)	Using the social web tools...		
	SP1. I could comfortably interact with my groupmate(s)	5.77	1.518
	SP2. The platforms provided equipment that enabled me to express my opinions adequately for my groupmate(s) to hear/read	5.89	1.319
	SP3. The learning activity enabled my groupmate(s) and me to form an online community	5.32	1.665
	SP4. The social web based tools used in this collaborative work were good interactive media	5.24	1.517
	SP5. I could comfortably participate in the collaborative work	5.83	1.303
	SP6. I could comfortably communicate using the media provided during the collaborative work	5.54	1.379
	SP7. I clearly remember a couple of my group mates who participated in this collaborative work	6.43	1.165
Emotional engagement (Martin & Rimm-Kaufman, 2015)	In this course…		
	EE1. The collaborative work was fun	5.10	1.322
	EE2. I enjoyed thinking about the collaborative work	5.10	1.333
	EE3. Learning was interesting to me	4.90	1.469
	EE4. I liked the feeling of the collaborative work	4.82	1.518
Active learning (Fu, Wu, & Ho, 2009)	In this course…		
	AL1. I learned many factual materials	5.40	1.240
	AL2. I identified central issues in the field	5.44	1.280
	AL3. I became more interested in the subject	5.28	1.391
	AL4. I participated actively	5.92	1.158
	AL5. Written assignments aided my learning	5.64	1.257

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