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COLLABORATIVE WORK COMPETENCY IN ONLINE POSTGRADUATE STUDENTS AND ITS PREVALENCE ON ACADEMIC ACHIEVEMENT

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ABSTRACT

The purpose of this research was aimed to establish a relationship between the level of collaborative work competency and the academic performance of students in an online master's degree program. An Ex-post-facto investigation was conducted through a quantitative methodology and descriptive analysis. A collaborative competency checklist was designed to evaluate 46 teams in order to estimate their collaborative work competency level. This competency was assessed through interactions and performance, registered in discussion forums. Results confirmed a positive correlation between high level of collaborative work competency and academic achievement. Didactic recommendations of this study included collaborative learning activities as one way to promote useful academic and personal skills development. For future research, experimental approaches could be applied to get higher level of certainty about collaborative competency benefits.

Keywords: Collaborative work, team work, online course, higher education.

INTRODUCTION

Collaborative work is as old as the history of humanity concept. Even in nature itself, it is practiced, as in the flight of geese forming a V in the sky when directing the flock, looking for warmer places to spend the winter. Goose flapping their wings produces a movement in the air that helps the goose that goes behind it to increase their power of flight. Then, every time a goose decides to leave the training experience, air resists and it is difficult to fly; for that reason, when a goose flies alone they quickly return to training, understanding that teamwork is better (Daft, 2010).

Collaborative learning competency can be defined as a learning phenomenon where individual in a social constellation (e.g. group, team, or community) within a physical and/or

virtual environment interact on the same or different aspects of a share task to accomplish implicit or explicit share and individual learning goals (Strijbos, 2016). Another way of defining this competency is the following: A student who works in collaboration is able to use dialogue as knowledge construction base, as well as received and give feedback from others during interactions. Simultaneously, he/she must interact with empathy, responsibility, and on time by using ITC (Villa & Poblete, 2008).

This concept of collaboration in the teaching-learning process expects students to help each other to learn together; some authors said that it is beneficial for students to share knowledge, as the student who teaches might actually be learning twice (Ioannou, Demetriou & Mama, 2014; Yeo & Tan, 2011). Later in the eighteenth century, Joseph Lancaster, who reported about the benefits of collaborative group, coined the term computer. As seen from ancient times, the need for people to interact with each other is important in order to learn and achieve common purposes (Ferreiro & Calderon, 2007). Piaget's theory states that human beings are involved in schemes to interpret the world around them. Then, learning is acquired through knowledge building; this means that people, according to their physical and mental development, have certain mental structures that store knowledge and learning. The processes related to these interactions are mainly two: accommodation and assimilation. Assimilation involves changing the perception of an individual about their reality; it means to signify new acquired information to suit in a person's mindset. Accommodation involves changing mindsets to adapt to reality built with newly acquired information. On this note, it is natural for children as they grow to increasingly develop sophisticated and integrated schemes thanks to the two complementary processes of assimilation and accommodation (Piaget, 1972).

Vygotsky's theory expressed that sociocultural perspective proposes that their social environment directly affects an individual's learning. According to this theory, as children develop, they internalize these processes until they use them without the help of those around them. The process in which social activities are transformed into internal mental activities is called internalization, where inner speech occurs. It is also argued that in this cultural perspective through formal schooling, as well as informal, conversations between adult and children transmit schemes and patterns of behavior on their culture, which interprets and responds to the world. Under this view, human beings are the protagonists of their own existence, capable of changing the world and themselves (Vygotsky, 1978).
The research question the guided this study was: Is there a relationship between the development of the competency for collaborative work and academic achievement of students in a graduate course in a virtual learning environment?

The difference between *collaborative* and *cooperative* arises from its etymological and semantic roots. Cooperative learning arises from the American educational tradition whose teaching origins is based on peer learning, Jean Piaget being the precursor. Some of the authors who have published on cooperative learning are Deutsch (1949), Slavin (1987) and Johnson and Johnson (2001), stated that cooperative learning is an educational approach in which instructional motivating methods are applied by students to work together on academic tasks, in order to maximize their own and peers' learning. In this way, a student achieves its objective only if the other students achieve theirs.

Collaborative learning has its origins in European educational tradition. Its predecessor was the renowned psychologist Vygotsky who adopted the term collaboration. Some researchers of collaborative learning are Bruffee (1993), Driscoll and Vergara (1997), and Gros and Adrian (2004). As they explained, collaborative learning refers to the process in which students maintain a constant interaction between them, for the construction of solutions to a

problem, and where the participation of all stakeholders is necessary to achieve a goal that could not be done individually.

The main difference between cooperative learning and collaborative learning in a face-to-face classroom, is that in cooperative learning the teacher is the designer of the activity and maintains complete control over interactions and the results to be obtained; while in the collaborative learning, students design the activity to be performed and are responsible for interactions and the results. According to Johnson and Johnson (2001), there are five elements that help promoting cooperation in collaborative teams: (a) positive interdependence; (b) individual and group responsibility; (c) face-to-face interaction; (d) interpersonal; and team skills; and (e) group evaluation.

The main element of collaborative learning is positive interdependence. The mere fact of belonging to a team of collaborative work is not sufficient to ensure improved achievement of the group. There must be a commitment or need for each of the members, a positive interdependence between them. This implies that all team members are aware of the importance of their participation in the team, since each depends on the contributions of the other. Thus, it is known that none of them alone can achieve success without the others.

The second essential element of team collaboration is individual and group responsibility. As noted by Johnson and Johnson (2001), individual responsibility occurs when students are evaluated on their achievement, and the results are communicated to each student to determine who needs more support, motivation, and encouragement to achieve the learning goals, both individually and as part of a team. For this purpose, an atmosphere of respect and cordiality must predominate in the team and avoid peer ridicule, which would be negative since the aim of the evaluation is to improve the areas of opportunity of the weakest members.

The third element of face-to-face learning is interaction. Students interact together among the group or in pairs; in this context, all experiences and conversations are oriented to the activities and to achieve common goals.

The fourth element of collaborative learning is to teach students interpersonal and team skills. Collaborative learning, in comparison to individualistic, is more complex because students must not only learn to correctly execute a task, but also they must learn to interact with each other, to create a climate of trust and open communication channels to handle conflicts arising between them to function well as a team. For this reason, the professor should teach group techniques with the same intensity in which he teaches learning materials.

The fifth element of collaborative learning is the group evaluation. This assessment occurs when team members analyze to what extent they are achieving goals and how close they are to obtain a favorable working climate for collaboration. Collaborative work in a virtual environment involves that all actions must be taken by a group of people to achieve specific goals, supported by technological tools that facilitate the integration of ideas, experiences and contributions to the team project. Collaborative work in a virtual environment is not to simply gather a group of people from different states and define them as a team, and neither is a synonym of assigning a task among team members. Collaborative work in a virtual environment requires positive interdependence and interest to learn and teach each other (Salinas, 2000).

In a Learning Management System (LMS) as Blackboard, students in distance education interact in virtual rooms, focused on certain learning objectives. These spaces allow an

asynchronous participation on discussions; it provides storage of files during the development of learning activities, and spaces for evaluation and feedback.

Academic achievement in collaborative work competency is based on an external manifestation that shows the level of learning, knowledge, and the development of students' skills and values. In any educational context, the importance lies not only the fact of acquiring knowledge and skills, but also the individual's ability to correctly apply them (Argudín, 2006).

To assess competencies, it is necessary to consider the following aspects: define what achievement criteria are needed, define the expected results, gather the evidence of individual achievement, and compare it with the expected results. Then, it is necessary to make judgments about the results and assess its competitiveness to establish a development plan to improve areas that are not considered competent, and finally to evaluate the final product (Argudín, 2006).
The evaluation with a focus on virtual learning skills has advantages. According to Colvin and Mayer (2008), it promotes the creation of scenarios for peer assessment and self-assessment, so it is easier for the professor to motivate and encourage participation of students in this type of innovative assessment (Topping, Smith, Swanson & Elliot, 2000).

To assess the participation of students within the online discussion forums is essential to study the interactions occurring in forums, which is understood as the interaction among students' publications of the ideas that will help knowledge construction. For this, the participation frequency must be considered as an indicator and the quality of contributions. The participation frequency counts the number of contributions of each participant in a discussion forum, a time set by the course calendar. The indicator of quality of contributions involves revision by the teacher, who must read each of the contributions and assign a score, depending on how valuable it is for the achievement of the team activity (Valenzuela, 2003).
Another common evaluation practice in collaborative work is peer assessment, which is the process where students evaluate the achievement of teammates depending on their participation, quality of inputs, and cordial communication with each member. Moreover, peer assessment and self-assessment can be either quantitative or qualitative; obligatory or optional; a supplement or replace the grade the teacher assigns to teamwork, and it may be anonymous or public.

To assess the level of mastery of collaborative competency, four indicators were chosen: work participation, organization, cohesion and social assessment. The working participation indicator assesses whether the student achieved the assignment within the time required by the team, and the quality of delivery. This indicator also assesses whether the student is actively involved in the team meeting spaces to share experiences and knowledge. The organization indicator assesses whether the student contributes to the definition, distribution and organization of team activities. Cohesion indicator assesses whether the student promotes goal setting and team integration. The social assessment indicator assesses whether the student integrates the opinions of others and constructive feedback. For each of these indicators there are five levels: 5 excellent, 4 good achievement, 3 regular, 2 deficient, and 1 poor achievement (Villa & Poblete, 2008).

In recent studies, a paper reports the results of a case study where mechanical engineering students studying at a newly established branch campus in Dubai of a British university were exposed to vertical and horizontal integration. Different activities were included to ensure that students worked together with their peers and colleagues at different levels. The implemented processes and practices led to improved academic achievements, which were better than those of a similar cohort of students were no effort had been made for

collaboration. The analysis revealed that cooperative learning and the degree of academic support provided by teachers are positively and directly correlated to academic as well as the students' own sense of personal achievement. The results are discussed in light of previous research and with reference to the cultural context of the study (Al-Zubaidy, Abdulaziz & Dashtpour, 2012).

Another exploratory study examines the impact of a collaborative research-based afterschool program in an urban high school with students using information technology (IT) for science, technology, engineering, and mathematics (STEM). The study used a mixed method, involving 77 participants within two cohort groups, each participating in an eighteen-month intervention period. Data were collected from the pre- and post-surveys, analysis of the participants' IT/STEM projects, external evaluation reports, and follow-up interviews. Findings indicate that the program had a significant impact on students' technology and IT/STEM skills, frequency of technology use, and understanding of the field. There was some of attitude changes toward IT/STEM and career aspirations in these fields. The study demonstrates that IT/STEM experiences supported through technology have significant impact (Duran et al., 2014).

Another research examined the influence of Jigsaw, which is a collaborative learning (CL) method, on students' views and decision-making processes concerning the use of nuclear energy. The research included 60 fourth-year undergraduate students attending the science teacher-training program of a university in Turkey in the 2013–2014 academic year. In the research, firstly an attempt was made to provide students with scientific literacy on the subject through the Jigsaw method. Then the groups created argumentative texts to express their views. In the end, the students developed positive attitudes and supported the establishment of nuclear power plants in Turkey. They had negative views about the use of nuclear energy before teaching (Tekbiyik, 2015).

Another reviewed research project focused on documenting statistical learning among 16-17-year-old Finnish upper secondary school students (N = 78) in a computer supported collaborative learning (CSCL) environment. The value of this study was in reporting the shift from teacher-led mathematical teaching to autonomous small-group learning in statistics. The aim was to examine how student collaboration occurs in learning statistics in a CSCL environment. The data included material from videotaped classroom observations and the researcher's notes. The intersubjective phenomena of students' interactions in a CSCL environment were analyzed by using a contact summary sheet (CSS). The results show that collaborative learning can facilitate cohesion and responsibility, and reduce students' feelings of detachment in a class-less school system. The interactive material and collaboration in small groups enabled the statistical learning (Oikarinen, Jarvela & Kaasila, 2014).

METHODOLOGY

The research used a quantitative, ex-post facto and descriptive design. The study was conducted in an online course of a university's master program located in Northeastern Mexico. The participants were students enrolled in the online course *Psychology of Learning*, which was offered from January to May 2014. This course included individual and collaborative activities. From 13 individual learning activities, three were collaborative. Two of the collaborative learning activities were designed in the Problem Based Learning (PBL) technique. The evaluation criteria of this course included peer assessment in certain group activities.

A total of 380 students were enrolled in this course. Their age ranged between 25 to 50 years old. They belonged to various professional backgrounds and worked as teachers or professors. Their countries of residence was Mexico, Colombia and Costa Rica. For academic activities, groups of 3, 4 and 5 members were formed. A sample was selected only with the groups that were formed by 4 students. In the frame of these criteria, the research was conducted with 46 teams (184 students). This amount of students represented 48% of the population (Hernández, Fernandez & Baptista, 2012).

Instrument

A checklist of the criteria of collaborative competency domain was elaborated through an Excel worksheet. According to the learning modality, the fourth criteria was modified from its original version. Thus, the five criteria included in the instrument were: (a) positive interdependence; (b) individual and group responsibility; (c) stimulating asynchronous interaction; (d) interpersonal and team skills; and (e) group evaluation (Johnson & Johnson, 2001; Villa & Poblete, 2008). In addition, a scale of three levels of proficiency was included. The levels were poor, medium and high.

Procedures

On one hand, all three-discussion forums content developed on the collaborative learning activities were store for further analysis. On the other, a excel checklist was designed to classify and evaluate interaction within the five criteria explained above. Then, two groups were defined: one with high and other with low collaborative competency level. Simultaneously, assignment and coevolution grades were added to the database. These data were correlated. SPSS was used for statistical analysis.

RESULTS

All students' interactions within their groups were registered in Blackboard forums. A score was assigned for each interaction using the scale mentioned above. This procedure ended in a classification of groups in two possible categories: collaboratively poor or high. Based on this classification, a list of grades and peer-assessment scores were obtained by the end of the collaborative activities.

It was found that from the 46 teams that were assessed with the instrument to define the collaborative competency, 14 teams (30 %) were found with a high degree of collaborative work competency development, while 32 teams (69 %) obtained poor development.

Analysis of the five key elements was done according to the existence of elements that permit to infer the high or low level of collaborative competency features (Johnson and Johnson, 2001). These elements were found in electronic interaction forums. Table 1 contains the results expressed in percentage.

Table 1. Scores of the five elements of the collaborative work in the teams of high degree and poor of competency

Competency elements	Teams of high degree of competency punctuation	Teams of poor degree of competency punctuation
	N=14	N=32
Positive interdependence	98%	72%
Individual and group responsibility	62%	12%
Stimulating asynchronous interaction	98%	62%
Interpersonal and team skills	46%	34%
Group evaluation	85%	62%

From the results, the three main characteristics of high collaborative teams can be identified: positive interdependence, stimulating asynchronous interaction and group evaluation. In the case of poor collaborative teams, even if the results are lower, the three characteristics already mentioned of high collaborative groups are also well considered. We can infer that both, responsibility and interpersonal interactions are not developed enough to consolidate students as a team. It was found that in, the most poorly collaborative teams missing features were positive interdependence, individual responsibility and group evaluation; which translates into a lack of commitment to the team to deliver on time their contributions and poor communication between team members. It was also considered important to test correlation (Sperman's rho non-parametric) between final grades and collaborative work competency results. Table 2 shows the analysis.

Table 2. Spearman's rho correlation

			Work collaborative competency	Academic Achievement
Spearman Rho	Work collaborative competency	Correlation coefficient	1.000	.351**
		Sig. (bilateral)	.	.000
		N	100	100
	Academic Achievement	Correlation coefficient	.351**	1.000
		Sig. (bilateral)	.000	.
		N	100	100

****The correlation is significant at the 0.01 level (bilateral).**

We calculated the Spearman's rho coefficient (0. 351), which means that there is a moderate positive correlation between the variables of academic achievement and collaborative work competency. Besides, an analysis of the academic achievement was made for the entire group and for each kind of team according to their collaborative competency level. The average score for the entire group reached 88.02 out of 100. The standard deviation was 6.37. Table 3 contains these results.

Table 3. Academic achievement of the high/poor collaborative degree of competency

	Teams of high degree of competency	Teams of poor degree of competency
	N=14	N=36
Mean	91	86
Standard deviation	5.25	6.52

Note: In a Chi Square Analysis, even if the difference between groups was not significant, positive likelihood was found (0.013).

Peer assessment was another tool that allowed students to participate in the evaluation of the performance of their mates (Topping et al., 2000). Through peer assessment, the perception of other's work was collected. Table 4 contains peer assessment results.

Table 4. Peer assessment by of the high/poor collaborative degree of competency

Punctuation of peer assessment	Teams of high degree of collaborative work competency	Teams of poor degree of collaborative work competency
	N=14	N=32
Good + excellent	100%	65%
Approved + sufficient	0%	34%

High level of coherence was shown through the results of peer assessment in high degree of collaborative work teams (100% good and excellent work). On the opposite, lack of coherence was appreciated within poor degree of collaborative work teams. More than 50% assessed their peers with qualifications of excellent or a good performance, although collaborative competencies were not well developed.

DISCUSSION

Results let researchers infer that collaborative work competency requires more than instructional design strategies. It is not sufficient to include work collaborative activities to engage students' commitment. One possible explanation for these low results would be the fact that these students were novice on virtual education matters (Arbaugh, 2004).

Another finding that would support the idea above is the fact that the lowest feature in both, high and poor collaborative work level teams was Interpersonal and team skills. One possible reason for this is the inexperience of students communicating each other in asynchronous electronic rooms. This could affect the recognition of individual strengths in favor of collaborative work (Johnson & Johnson, 2001).

When analyzing grades as a way to infer students' performance quality related to collaborative work competency, it was found a moderate positive relation between these variables. Even if the Chi-square analysis determined a negative result about differences in grades between high and poor collaborative work competency, likelihood measure was positive. This can be taken as a second proof of the existence of a relationship between high academic achievement and high collaborative work competency (Argudín, 2006; Al-Zubaidy et al., 2012; Duran et al., 2014; Oikarinen et al., 2014 Tekbiyik, 2015).

Peer assessment was not a helpful measure to corroborate high and poor collaborative work competency differences. This assessment could have been interfering with students' interests as peer assessment results were considered part of the final grade.

The reasons mentioned in these studies of why collaborative work competency favorably affect the academic achievement of students are:

- **It is believed that teamwork favorably improves student intrinsic motivation to learn and, therefore, obtain a better result; this is evident on the results of the scores obtained in collaborative activities.**
- **The perception of students toward peers is favorably improved through collaborative participation.**

This is supported on Johnson and Johnson´s statement (1989): members of highly collaborative teams have important characteristics: (a) empathy; (b) responsibility and develop tasks according to a schedule; (c) timely communicating individual contributions to encourage the active participation of the team; (d) emit and receive feedback during interaction using argumentation which motivates them to have a committed and, (e) outstanding participation that is reflected in academic the achievement of the team.

The three most outstanding features of the highly collaborative teams in this research, which is supported in literature (Johnson & Johnson, 2001) confirms that members of highly collaborative teams: act empathetic, they are responsible and develop in timely manner the task, and notify individual contributions on time. It is important to encourage the active participation of the teams. All members emit and receive feedback during interaction using argumentation, which motivates them to be committed and demonstrate outstanding participation reflected in academic performance of the team.

CONCLUSION

The results of the study provide evidence of a positive association between the collaborative work competency and academic achievement of teams of an online course, that allow direct interactions in discussion forums, and a high participation when the members collaborate in learning activities.

The instructional design of the studied course provided the conditions to develop a positive interdependence, individual responsibility, and group assessment, which resulted in highly collaborative teams to act empathetically, responsibly and develop activities on schedule.

Regarding the perception that students had on their computers, there is consistency in the results found on the peer assessment of equipment and its relationship to academic achievement. Online learning environments and the appropriate instructional design for collaborative learnings activities are an outstanding space to develop the collaborative work competency for postgraduate students.

PRACTICAL AND FUTURE RESEARCH

Most of the revised research, including the study shown in this article, correlate positively both, collaborative learning competency and academic achievement. Besides, it is known that students develop additional competencies in parallel: negotiation and mediation, interaction problem solving, collaborative use of ICT, among others. These variables around learning process should be studied within different methodology designs as quasi-experimental studies for shaping and get more precise data about its benefits.

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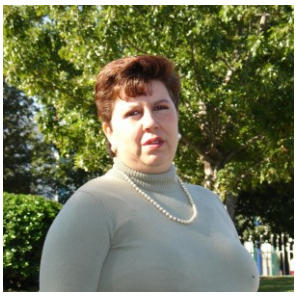

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