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Improving Student Competencies Through Face–to-Face and Virtual Teams

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1. Introduction

In an educational context, teamwork, as a way for cooperative learning, helps achievement of educational objectives, not only in their knowledge dimension but also in their social and affective dimensions. Success for the individual in the group depends on the rest of the group members' attainments. Therefore, the achievement of the common goal implies deployment of relational competences relevant for future professional performance. Nevertheless, the effectiveness of these objectives may vary depending on the learning environment where the attainment of above objectives takes place.

In the context of higher education and university learning, new information and communication technologies have opened possibilities for students with different educational requirements. Most universities have developed and implemented new learning tools as a way to complement traditional education by facilitating discussion and knowledge sharing by means of an online environment. Additionally, these tools can be used to foster the development of course competencies in those cases in which students cannot meet on a regular basis due to geographical or temporal impediments.

These advancements run in parallel to market demands. In a global economy as the current one, firms are changing their way of organising and working. Employees must develop abilities to deal with complex processes, due to the variety and complexitiy of variables that form their labour environment, what requires group work and close cooperation with other colleagues, external consultant or even other firms. In many cases, geographical distance between units within a firm or between a firm and its partners makes it necessary, and recommended due to cost reasons, the utilization of virtual communication. De Lisser (1999) exposed that more than 50% of firms over 5000 employees used virtual teams; meanwhile Lenz and Machado (2008) indicated that it is the predominant type of work organization within multinational companies. Hence, the development of the necessary skills, not only for group working, but also for virtual team working, by using information and communication technologies is also a response to demands in our society.

The main aim of this work is to compare in the context of an undergraduate operations management course the development of a set of managerial competences associated to teamwork in two different learning environments, as represented by traditional face-to- face teams and virtual teams. Face-to-face groups execute the required assignments in the course by meeting physically under the guidance of the teacher and in collaboration with their partners. Virtual teams do not attend the classroom and do the assigned course group activities and communicate each other through a specific forum created for this purpose in the university online learning platform. We put forward that competences to be developed in the course should be accomplished in both types of teams, what would imply that both alternatives are equally effective and meet their purpose.
Bearing in mind the above objective, the work is structured as follows. The following section examines the importance of fostering competences, specifically by means of teamwork, in higher education courses. We distinguish between face-to-face- and virtual groups and analyze the main differences between them, given the particularities shown by virtual teams. Next, we describe the methodology we have followed. In doing so, we present the sample and the data gathering methods. The fourth section shows the main findings and finally, we conclude with the discussion of results and a few final reflections on the experience.

2.Theory and Teaching Methods Adopted in the Course

Nowadays, communication, coaching, team-based facilitation and team working skills have reached an increasingly importance in the business environment which have been also recognized by management educators (Mosca and Howard, 1997). By its own, there are professional competences of the operations manager, which Morgan (1989) identified, besides the knowledge of the specific operations contents, as the ability for taking decisions, communication, management, staff assessment, calculation, creation of reports and resolution of problems. These competencies that exceed the traditional content or knowledge transfer in higher education are more important since the concept of competence was pointed in Tuning project[1]. In this context, competences represent a dynamic combination of knowledge, understanding, skills and abilities (González and Wagenaar, 2003) and are obtained or developed during the process of learning by the student/learner. In European universities, the Bologna process of construction of the European Higher Education Space has become an incentive to consider competencies as a relevant component for preparing students well for their future role in society in terms of employability and citizenship. Therefore, educators increasingly give importance to the development of skills as part of the teaching process in higher education (Bilimoria, 1999, Wankel and DeFillippi, 2003).

[1] TUNING Educational Structures in Europe started in 2000 as a project to link the political objectives of the Bologna Process and at a later stage the Lisbon Strategy to the higher educational sector. Over time Tuning has developed into a Process, an approach to re-design, develop, implement, evaluate and enhance quality in first, second and third cycle degree programs. The Tuning approach has been developed by and is meant for higher education institutions.

Competences can be distinguished in subject specific and generic ones. Generic competences are those common to almost all the professions and that can be classified in instrumental (analysis and synthesis capacity, oral communication, languages, computers, problem solving, decisions, etc.), personal (team working) and systemic (autonomous learning, adaptation to new situations, creativity, leadership, etc.). Specific competences are those pertaining a specific degree and relate to particular concepts in its area (González and Wagenaar, 2003).

Team working is considered a generic competency but a central one for work in business. Nowadays few works are carried out in an autonomous way. A group work, defined as a sociological phenomenon, include a number of individuals (between 3 and 25) with a common objective, and there must be a continuous process of communication and interaction, a sense of group belonging and a set of common norms and values as a base of the interaction process and a network comprised of different roles, what allows for achieving the group objective (Schäfers, 1999). A virtual team is defined as a team whose members use technology to varying degrees in working across location, temporal, and relational boundaries to accomplish an interdependent task (Martins, Gilson and Maynard, 2004; Clark and Gibb, 2006). In the case of virtual groups, due to spatial and temporal separation, the continuous process of communication and interaction within the group takes place predominantly through the use of modern communication technologies (Lenz and Machado, 2008).

Therefore, communication in virtual groups is based on an intensive use of new technologies. From the business perspective the advantages of the virtual team are seen in the opportunity to hire a group of experts regardless of location. In this sense, virtual team work facilitates a more efficient use of internal and external expert knowledge; savings on travel costs and on conference room rent; and being flexible in solving problems such as a surge of complex tasks to be tackled within a limited time frame (Lenz and Machado, 2008). Therefore, firms should benefit from a richness of information transfer and from an extended reach between people (Evans and Wurster, 1999). There are also disadvantages and problems which result directly from the virtual element of the teamwork, such as the differences in the team members' cultural origins and influences.

In spite of these drawbacks, the business environment is increasingly demanding work carried out in virtual goups, hence the need for students of developing not only face-to-face group work competences but also by means of virtual teams.

In this paper we analyze the development of certain competences, generic and specific, in an operations management course, which is taught in the last year of the business administration. In the course, we focus on the development of competencies by means of teamwork. Specifically, we try to develop some competences by solving some exercises or business situations by means of individuals working in groups. The particular situation of some students (i.e., part time jobs with overlapping timetables, staying abroad within mobility programs, etc.) difficults their participation in face-to-face teams. Given these circumstances, we decided to enable group work tasks also by creating virtual teams. The use of the computer platform of the University as a teaching tool supports all the process enabling virtual learning. The combination of different didactic models has been expressed by some authors as a practical solution. Each pattern has its own advantages and limitations and for that reason it is important to diversify the methodology with the aim to be able to take advantage of the most appropriate methodology in each moment (Ferrer, 1994).

In the case of the course we analyze, theoretical sessions are carried out in the first part of the semester, so that the students have the information as soon as possible to be able to solve successfully the problems proposed in the practical module about operations strategies. When these sessions finish, several exercises and cases about specific operations management situations are proposed to students, with some indications on how to start the assignment and suggestions on where or how to search for the information.
The analysis of these problems and situations is carried out by the groups of students, and their proposals are exposed to the teachers in tutorials during the last weeks of the term. It is in this practical part of the course, which must be carried out by means of teamwork, when we differentiate between virtual teams and face-to-face teams, as although they must develop the similar kind of competences, the way of working is different.
The work done by the groups is guided by the teacher, who acts as an observer and learning guide. When each team concludes its assignments, in the case of face-to-face teams, the team members expose their proposal to the teacher in an oral presentation and present a written report. In the case of virtual teams, there is no oral presentation and the written report is sent electronically by way of the virtual platform. The teacher evaluates and then marks them. The cases and practical situations that students have to analyze are the same for both types of groups but the report is presented to the teacher in a different format depending on the type of group.
Face-to-face teams are composed by 4 or 5 members and virtual teams by 3 or 4 members, and they use cooperative research and group discussion. Virtual teams do their assignments through the virtual platform, which allows the work of some students that are in different places and that have different timetables. They have a forum for each exercise or business case or situation. This could be seen as an asynchronous discussion board, since students send messages or include attachments to react to each others contributions (Rienties, Van Wesel and Gijselaers, 2008). With this tool, teachers can visualize which component has contributed, their frequency of contribution and the relevance and adequacy of their contribution.

3. Analysis and Results

The population is formed by the students enrolled in the undergraduate course Operation Management taught at the Business Administration degree of the Universitat Jaume I de Castellón (Spain) in the fall semester during the academic years 2006-2007 to 2008-2009. Of the 477 registered students, 376 students carried out the activities in 84 face-to-face groups, 31 students carried out them in 9 virtual teams, and 70 students did not follow this part of the course and worked on an individual basis. In percentage terms, it means that 79% of registered students followed the course by working in face-to-face groups, 6% of students participated through virtual teams and 15% followed the course on an individual basis ().

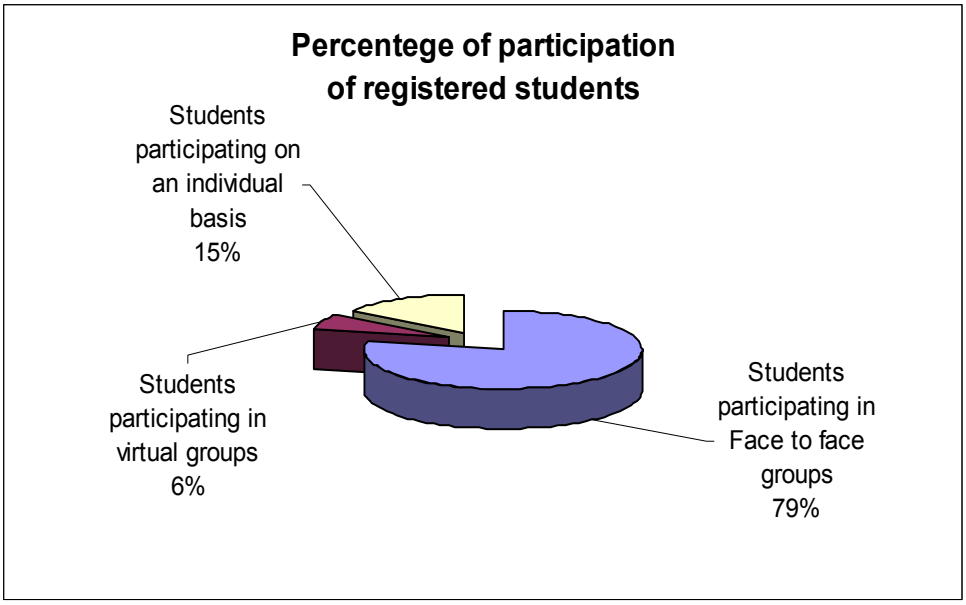

Fig. 1. Percentage of participation

Data on competence development was gathered by means of different surveys aimed at getting students' perceptions of different aspects of the learning process and their global satisfaction with the course. The questionnaires were filled in by the students at the end of the lectures period and before knowing their final marks. The number of face-to-face students who answered the surveys was 243, which represented 64.63% of face-to-face students. 18 virtual students answered the questionnaire, what represents the 58.06% of the virtual students ().

Level of Response	Number of groups	Number of registered students	Number of questionnaires	Response rate %
Number of face to face groups	84	376	243	64,63
Number of virtual groups	9	31	18	58,06

Table 1. Level of Response

The competences included in the survey were those considered as objectives in the course design and concerned both generic and specific ones. Students were asked to assess the degree of improvement in competences in a 5-points scale, where 1 represented the lowest value and 5 the highest value. The next paragraphs present the main findings regarding the degree of competences development. In doing so, we analyze competencies grouped by their typology: specific and generic competences.

3.1 Specific Competences

The first group of results to analyze is composed by those competences related to the specific content of the subject. Figure 2 shows the perception by students of the development of the five competences included in this group,

In the case of students that belong to face-to-face teams, the highest level is observed in *Knowledge about the business reality and their environment*, and the lowest level in the case of *Knowledge of the English terms of operations management.* In virtual teams, the best evaluated competences are *Capability to analyze different dimensions of operations field* and *Adequacy in the use of concepts of operations management*, and the lowest values are given tor *Knowledge of the English terms of operations management*, as in the former case. But not statistical differences have been showed in these competencies when we compare both types of students.

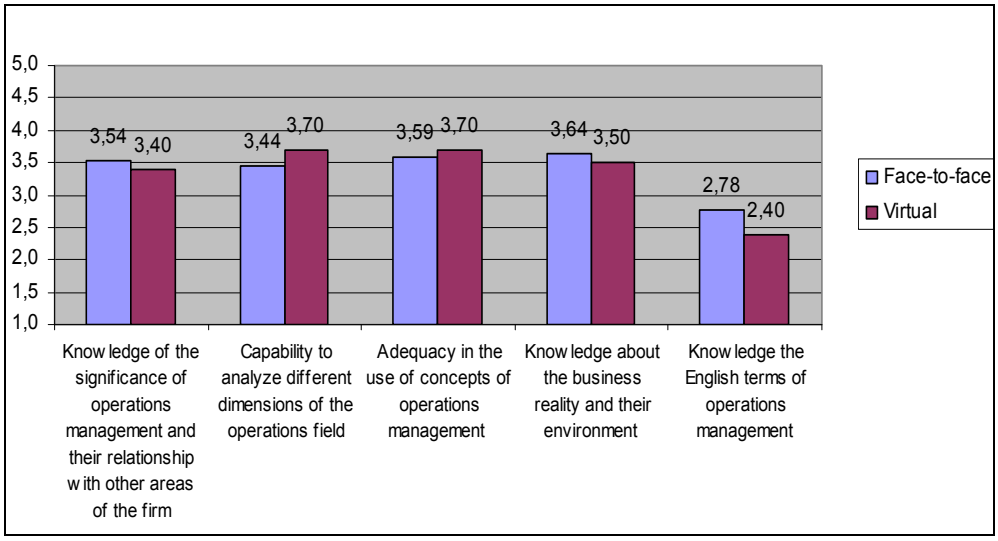

Fig. 2. Specific Competencies Results

3.2 Generic Competences

We are now to show the results in the case of generic competences, which are composed by instrumental, interpersonal and systemic competences.

In the case of instrumental competences, all reach a high evaluation (Figure 3). The competence with a highest level in face-to-face teams is *oral communication*. These teams make an oral presentation for each of their assignments in 10 minutes, and the average number of presentations they must make is close to 8. Therefore, the value achieved in this case is consistent with the importance of the effort in the development of this competence in the course. On the contrary, in virtual groups this competence has not been developed, and in congruence it reaches the lowest level.

In the case of virtual groups, *Writing communication* reaches the highest level, since those students maintain the contact with teachers and with other members of their team by instant messages and e-mails. Their tasks must be developed by sending their work in progress through the virtual platform and, when they consider their task is completed, they send the

finished assignment to the teachers. Consequently, they strongly develop through the course this competence.

Comparing both types of methodologies, those competencies which are significantly developed in different grade are *Ability to take decisions, Oral communication and Writing communication.* The two firsts are higher in Face-to-face groups and the last one is higher in Virtual teams.

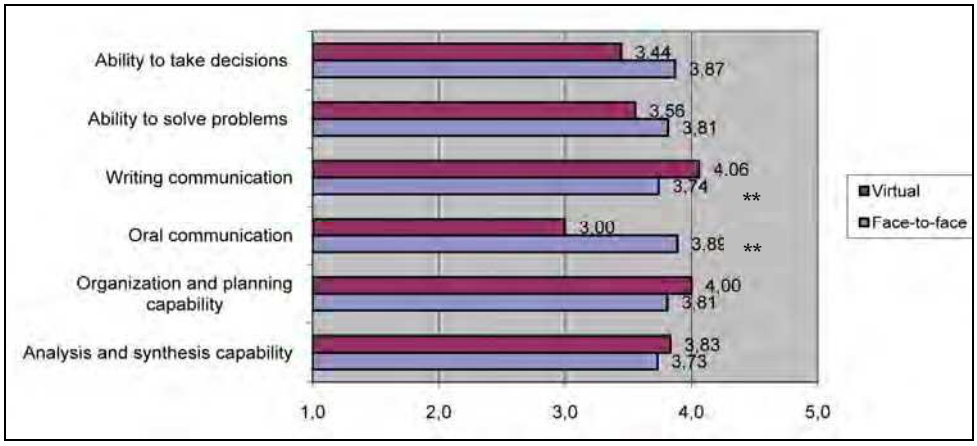

Fig. 3. Instrumental Competences Results

The second group of generic competencies analyzed are interpersonal competences (Figure 4). *Work in group* has been the competence that achieves the highest level in face-to-face teams. In virtual teams, this is the competence with the lowest degree of attainment. Teachers have noticed that in face-to-face teams, relationships between members and between the team and the teacher are better than in the case of virtual teams, where the atmosphere of tension and conflict arises in more situations, as reflected in their messages to the forums.

Evaluating individuals ability through the evaluation of the own partners in the group, is higher in the case of virtual teams. Development of tasks assigned to the students in the case of virtual teams is reflected in forums, where teachers, but also the students of the team, can control time of appearance and contribution by each member. Virtual students are more critical with the distribution and contributions of each one of the members of the team. In the case of face-to-face teams, contributions of each member are not reflected in any place, since teachers only evaluate the final result of the tasks and their presentation.

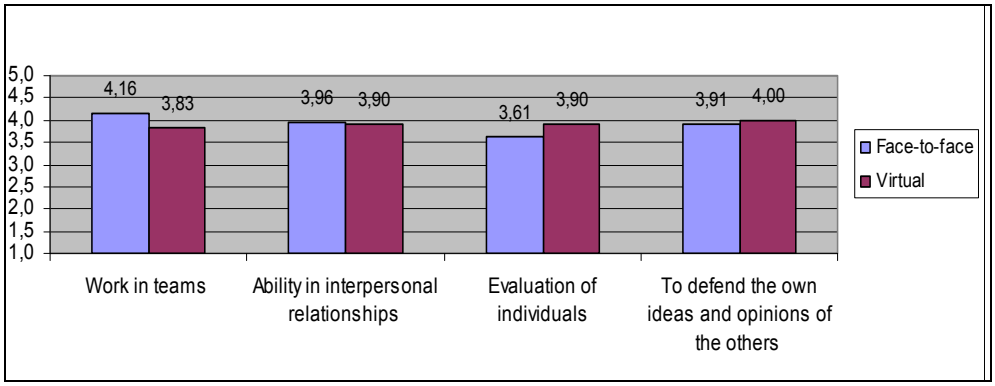

Fig. 4. Interpersonal Competences Results

With regard to interpersonal competences, we also asked about the contribution of students to the work of the team and their evaluation of the contribution of the rest of the members in their team, in different aspects, such as the level of enthusiasm; contribution with ideas; level of comprehension of the task; the contribution to the good working order of the group; the organization of the group and commitment in task development; and efficient implementation of tasks. Table 2 shows students' assessment of these aspects for both types of groups.

Contribution to the work in the team	**Face-to-face**		**Virtual**	
	Myself	**My partners**	**Myself**	**My partners**
a. Level of enthusiasm	4,01	3,96	4,22	3,89
b. Contribution with ideas	4,00	4,05	4,06	4,11
c. Comprehension of the task	4,01	4,02	4,11	3,83
d. Contribution to the good working order of the group	4,40	4,32	4,39	4,17
e. Organization of the group and commitment in task development	4,37	4,28	4,39	4,00
f. Efficient implementation of tasks	4,23	4,21	4,33	4,39
MEAN	**4,17**	**4,14**	**4,25**	**4,06**

1-1,5: Very Low// 1,51-2,5: Low// 2,51-3,00: Half Low// 3,01-3,5 Half High// 3,51-4,5: High// 4,51-5,00: Very High

Table 2. Contribution to the work in the team

In both cases, face-to-face and virtual teams, students consider their contribution to the team is high, and they also consider the level of contribution of the rest of the partners in the team is high. Nevertheless, in the case of virtual teams, students have been more critical with the participation of their partners in the group.

Regarding systemic competences, as represented by autonomous learning, entrepreneurship and initiative, quality and leadership, we can observe that, in general terms, they are better assessed by virtual students (figure 5).

The competence that achieves the highest level in virtual teams is *Autonomous learning*, which is higher than in face-to-face teams. *Leadership* is the competence with the lowest level in both cases, although is higher in the case of virtual teams, where the leader appears more easily to accomplish the task and where it is seen as more necessary to organize and plan the work.

In this case, the difference in the assessment between the two kinds of students is very high. Another question in the survey corroborates these results. We asked students to assess whether a leader had appeared in a spontaneous way to coordinate the group. Students in face-to- face teams gave an average punctuation of 3.12, whereas virtual teams' students' average assessment was of 3.83. This fact confirms that the emergence of a leader is higher in the case of virtual teams.

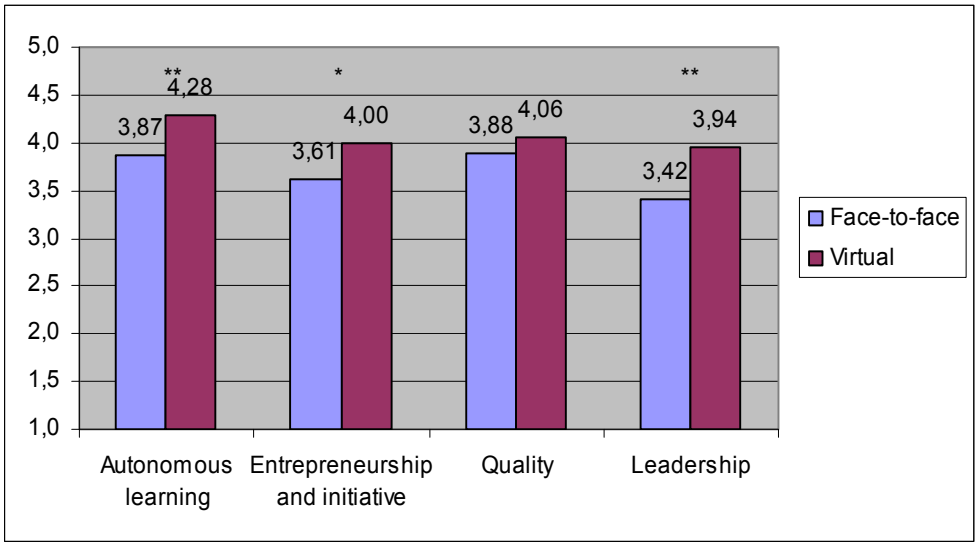

Fig. 5. Systemic Competences Results

Evaluation of the work made by virtual teams is also based in the writing report, and therefore the competence *Quality and continuous improvement* is better perceived in this case than in face-to-face teams, since they also have the opportunity of present their task in a presential way with interaction with the teacher.

4. Conclusion

In this work we have described the results achieved in the development of competencies in an Operations management course with students using different methodologies. A particular feature of this course is the strong emphasis on several of the professional abilities

that the practice of operations management entails, specially the work in teams and the knowledge of the surrounding companies operations. Specifically, for the case of competences that can be met by means of team work, we focused on whether the same competences can be developed in different learning environments, as illustrated for the possibility of working either in face-to-face- or in virtual teams. In general terms, our findings show that students' perception about their improvement in the competences in our course confirm the coherence of the methodology used in the course and its success when adapting it to a virtual learning environment. In both, results show that teams develop competencies through the successive activities and the recommendations of the teachers in the tutorship of the groups. Additionally, we have verified for the first time in our course that, with this experience, students can develop professional competences in a similar way that when students that physically meet in groups.

For example in the case of specific competencies face-to-face and virtual teams agree to give the poorest evaluation to the competence *Knowledge of the English terms of operations management*. It indicates that we must do a greater effort in next years to develop their knowledge of the subject also in English. This low evaluation can be explained because just in the last academic course, teachers introduce some activities to develop this competence.

Additionally, in spite of the similar level of attainment in most competences, we found some differences in the development of some competencies. In the case of instrumental competencies, whereas *speaking communication* reaches higher level in the case of students that participate in face-to-face teams, *writing communication* competence is higher in the case of virtual groups. This should be a logical consequence of both types of approaches, since members of virtual teams basically need to write in order to communicate between them, and face-to-face teams discuss their points of view between them and with the teacher in a presential way through oral communication. *Taking decisions* competence is also higher in the case of face-to-face groups. This fact reveals that maybe there are more problems to arrive to a consensus in the case of virtual teams in comparison with the alternative approach. This competence should therefore be improved, because one of the advantages of virtual teams is the flexibility in solving problems due to their easiness and rapid communication, and this advantage could be minimized if the group delays in taking decisions.

In the interpersonal competencies group, *work in groups* is the best evaluated competence by face-to-face students, whereas it is the one with the lowest evaluation by virtual teams. Moreover, although in both cases students evaluated their contribution to the work in their team and the contribution of the rest of their partners in a similar way, this last indicator is lower in students that belong to virtual teams, according also with the poorer evaluation of the competence *work in groups*.

According to arguments of previous literature (Cappel and Windsor, 2000; Wiesband, 1992), educators have observed that virtual teams have more time delays in completing their activities and there are also some problems of communication and coordination between team members, which is consistent with our results. Through the observation of interventions in the virtual platform, teachers have observed that the main troubles are the lack of a commitment with the work, differences in the effort of the different individuals that form the virtual teams, and a lack of time control. In order to avoid possible deterioration and communication breakdown between individuals in virtual teams, teachers must control the process deeply, by analyzing interventions of teams in forums,

encouraging members to participate, and also controlling dates of accomplishment of the proposed tasks.

In the group of systemic competencies, *autonomous learning, entrepreneurship and initiative,* and *leadership,* reach a higher level in the case of virtual teams. Components of virtual teams must make a greater effort to improve their knowledge through autonomous learning, and also it could give them greater capabilities in develop new initiatives, so it is an advantage of this virtual groups.

In spite of the differences founded between the two kinds of teams, students have evaluated the development of competences in the subject in a very positive way, since in most cases the level of competence attainment is high. More over, those differences identified between both types of ways of work can be explained and are coherent. All that confirms also the adequacy of the assessment methodology employed.

As a whole, the assessment of the teachers on the analyzed results is very positive for the process of education - learning and it can be said that the course objectives have been reached. The experience showed the compatibility of the methodologies, but also the need of the most detailed follow-up of the virtual students, in comparison with face-to-face groups**.**

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