Comparative analysis of a university learning experience. Classroom mode versus distance mode.

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Abstract

Purpose:

The article presents a comparative analysis of learning a group of students in three different courses in the classroom mode or 'campus', and distance or 'online' using synchronous technology through web-conferencing *software*.
The findings establish a very good perception on the part of students, who qualify very well these tools, *and on the other hand, the average rating of distance learning is superior in two of the three courses to the classroom course*.

Method:

A questionnaire was designed to address issues concerning the adequacy of the tools in online courses to make learning efficient and secondly, to check the learning performance of students in both modes.

Result:

It has obtained sufficient information to analyze in depth courses and establish conclusions on the adequacy of the means used to distance and comparative results on respect to traditional teaching.

Discussion & Conclusion:

It has been found that there is a very good perception of students who qualify very well these tools and the results of student grades on-line exceed on average than those obtained in the classroom course.

1. Introduction

1.1 Background

The end of the last decade and the beginning of this saw the first versions of what later came to be known as CMS (Content Management Systems), LMS (Learning Management Systems), or VLEs (Virtual Learning Environments). In 1997 the first version of WebCT was launched, and in 2001 the first version of Moodle. Now, this open source content management system is probably the most widely-used in education for the creation of virtual learning environments. These applications have become widely used in universities, both those offering only distance learning and those which offer in-campus learning.

Other technological resources which have been widely used in the last 30 years are multimedia teaching and learning materials, which when they fulfill certain conditions are called learning objects (LOs). These LOs are digital documents which can include different media. Their most relevant features are that they can be used in different platforms or VLEs, their modular nature and description using metadata [15].

The most relevant features of distance learning based on ICT are its asynchronous nature and communication based on text. A review of the literature of research related to distance learning and the use of ICT shows that if online courses are well designed, they produce good learning results and high levels of satisfaction among students [10], although it is also true that the asynchrony and interaction based on text gives rise, among other limitations, to the inability to resolve students' questions at the time they are asked [11], with the possible negative repercussion on the effectiveness in learning.

Another potentially negative consequence of this type of interaction is the degree to which the students feel a connection with each other and with the instructor (social presence), a factor which also influences the success and satisfaction of the students of online courses [12].

Before the appearance of web-conferencing software, attempts were made to incorporate technologies such as communication via audio and video conference, in order to make interaction easier and to increase the sensation of being connected. However, these techniques were not fully adopted, probably owing to implicit technological difficulties and their high cost, among other factors [4].

Gloor *et al.* [5] describe the experience of a course carried out in the last six years, with students from different parts of the world (Germany, Finland and the USA), using various technological tools for collaborative work and communication, such as videoconferencing. The authors state that although videoconferencing systems allowed communication in sufficient conditions, there were always problems, which meant that before meetings were started, time was lost in testing connections, and even

that once the meeting had begun, it could be another half hour until both the video and audio worked correctly in both directions.

Current technologies have changed this scenario considerably. The steady rise in the capacity and speed of data transmission, of data storage, and the reduction in size of these devices are some of the most relevant features of the current situation in the use of ICT in learning and teaching. Added to these are other factors such as the appearance of mobile devices with a constant connection to internet, a steady improvement the ergonomics of devices, accessibility to content and the usability of application interfaces.

These factors generate a new and rich scenario for collaborative learning and working. Using modern web-conferencing software it is possible to carry out activities which in the past were only possible in face-to-face situations. For example, it is possible to have a virtual classroom, and real-time interaction between teachers and students, or between the students themselves. In addition, there are other tools which allow sharing of multimedia documents and digital whiteboards, real-time surveys and questionnaires with different response types, online conversations or chats, and remote access to the computer of another participant in the session. All these new possibilities for online interaction mean that both students and instructors have to possess the necessary competencies to use the technology. Kear *et al.*, [6] and also mean that there are new challenges related to the need for an appropriate instructive design and combined use of synchronous and asynchronous resources, to provide effective interactions between students, or between students and teachers [13].

Bower & Hedberg [2], in their research aimed at analyzing online collaborative learning using web-conferencing, found the critical impact of the design of activities on the collaborative behavior of teachers and students in the teaching and learning process.

There are currently on the market various web-conferencing programs, along with information from comparative studies of these programs' features (http:// en.wikipedia.org/wiki/Comparison_of_web_confe-rencing _software - Accessed 12 March 2012), and even websites which test these programs and establish commercial ranking tables (http://www.Webconferencing-test. com/en/ webconfe rence home3.html?ref=gaw-en&gclid=CNyw m4rg-6sCFUMKfAoduDd7kw - Accessed 12 March 2012).

Important universities explain that they have carried out pilot tests or are even using web-conferencing courses. Related links can be found for Harvard University (http://www.extension.harvard.edu/distance-education/how-distance-education-works/web-conference - courses - Acces 22 April 2012), or the Stanford School of Medicine (http://med.stanford.edu/smp/technology/web conferencing.html - Accessed 22 April 2012) Berkeley University(http://inews.berkeley. edu/articles/OctNov2010/ webconference-tools - Accessed 22 April 2012).

Formal research is also being carried out, almost always applying the methods of a case study or action research, into the use of web-conferencing systems in university undergraduate and post-graduate studies, and specifically into their effect on efficiency in learning processes. Loch & Reushle [7] and Reushle & Loch [9] describe a distance course carried out in the Australian University which used a web-conferencing program to make interaction and learning easier, as well as interaction and collaboration activities. Among their conclusions they highlight the improvement which web-conferencing provides for communication and collaboration and they raise interesting questions, such as whether new pedagogy will be necessary as a result of the use of this technology.

Tucker & Neely [14] assesses the effectiveness of applying the Socratic model in a distance course using web-conferencing. Among other results of this research, these authors highlight the fact that the technology was well-accepted by the students, and the integration with other technologies. Dawson [3] also studied its integration with other technologies.

2. Objectives

This paper tries to provide answers to the following questions:

Q1. Do students consider that the tools used in online course are appropriate in making their learning efficient?

Q2. Is the performance of students in an online course and that of students in a campus course similar, or are there significant differences?

3. Description of the experiment

The experience referred to in this paper was carried out in the Image Processing and Multimedia Technology Centre of the Image Processing and Multimedia Technology Centre of the Universidad Politécnica de Cataluña (Barcelona Tech). This centre teaches two official degree programmes: Degree in Multimedia and Degree in photography and digital creation.

3.1 Previous information

During the academic year 2007-2008 a pilot programme was carried out with an online course for 12 students, using web-conferencing technology along with a virtual learning environment. At the end of the course the students were asked to respond to a questionnaire created with the objective of obtaining information referring to the variables of the learning model applied, and to the technology used: the web-conferencing software and the virtual learning environment, as well as asking for suggestions for improvement. With the same objective, meetings were held with the teachers of the course.

Some of the lessons learnt in this pilot programme, which were applied to subsequent programmes, referred to the need for both students and teachers to be trained in the use of the web-conferencing software, the same conclusion reached by Alpanis *et al.* [1]. Since this pilot programme, all the participants in online courses, both teachers and students, receive training in the use of web-conferencing software.

In addition to this training, it was decided that during synchronous sessions the teachers should be assisted by personnel who had experience in the use of web-conferencing software, and who could deal with any technical or practical problem. This would avoid problems which could disrupt the sessions, such as a teacher forgetting which actions have to run in the interface to carry out a given activity, or a failure in the connection of the teacher which would imply having to maintaining the students connected while the connection was re-established. In all subsequent courses, this support was available to the teacher.

The result (unpublished) of this experience was in general satisfactory, and it provided a good basis to continue. It also tested scale included in questionnaire and used as a tool to collect information in this research.

3.2 Dynamic of the synchronous sessions with the teacher

Despite the importance of the general instructive design and in particular the design of the activities during the sessions with the teacher, this is not a variable under study in our research. The design of the activities which are developed and the dynamic of the synchronous sessions with the teacher are the same in the online and campus courses.

In the first part of the synchronous sessions with the teacher, the activities carried out are centered on the students. In each session the combination of activities may vary, and it is the teacher who plans what is done and when it is done. Some activities, such as asking the teacher to resolve problems, are carried out in almost all the sessions, but others are not necessarily present, depending on the objectives of the course and the specific objectives of the session.

The activities are:

a) Consult the teacher about doubts or queries. These queries are the result of study, document review, exercises, etc., which the student has done since the previous session.
b) Work in teams to do exercises or progress in the development of the project. Present the exercises done or the work carried out until that moment (figure 1).
c) Debate or discussion forums.
d) Carry out evaluation tests.

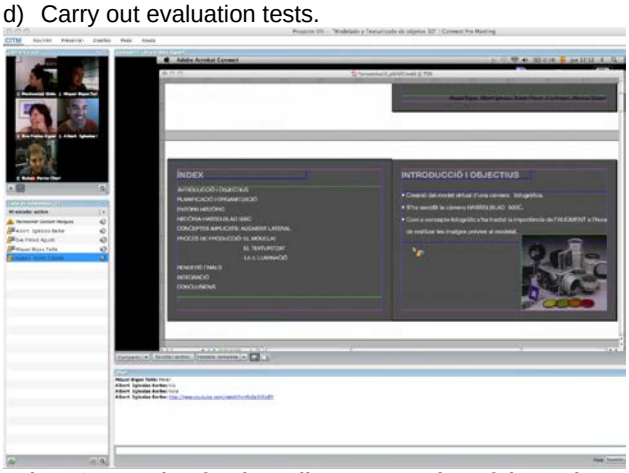


Fig. 1 Screenshot for the online presentation of the project of a working group.

In the second part of the sessions, the teacher presents the new learning content and the study materials, the complementary materials and the questions and problems, among others. These documents and materials are provided to the students so that they can study and work during the week until the following synchronous session. In all the courses collaborative work is promoted, and so most of the exercises are carried out by the students working in teams.

3.3 Technological resources

In order to develop the courses, both on campus and online, teachers and students have access to a virtual learning environment called 'Virtual Campus', based on Moodle. This allows them to share documents, send and receive messages, see marks and carry out multiple choice tests with automatic correction, as well as other services such as sending text messages and organizing administrative tasks.

Teachers and students online also have access to web-conferencing technology. For these courses, the software used was Adobe Connect Pro, which allows face-to-face interaction via video conference between multiple participants. This interaction is frequently between the teacher and the complete group of students, but may also be between the students in a work group. In addition, documents can be shared (text, audiovisual and multimedia), the desktop can be shared, chat features can be used in parallel with the video conference communication, and questionnaires can be used with real-time responses. Finally, a participant's computer can be controlled remotely, with their consent.

The students can work in teams, as the program allows the teacher to create instantly simultaneous virtual rooms in which the students from the same work group are given a user profile which allows them to use video conference, share documents, plant tasks, prepare presentations or chat, among others.

The classrooms where the campus courses take place are equipped with desktop computers which are connected to the internet via cable, so each student has access to a connected computer with the necessary software and hardware to follow the learning activities of each course. All the classrooms are also equipped with a projector connected to the teacher's computer, and an audio system.

The students on the online courses use their personal computer, but the University provides them with the necessary software to perform the learning activities of each course, with the corresponding student licenses.

4. Methods and materials

4.1 Procedure

In order to respond to the first question of the research (Q1), the students of the online courses were asked at the end of the course to complete a scale with 29 items and one open question, to assess the system of online courses, the platforms used, and the usefulness and operation of the resources offered by these platforms.

For the second question (Q2), the final marks of the students on the campus courses and online courses were compared in the three courses in each format. The teachers, the content, and the instructive design and activities of the courses were the same in both formats.

The final marks are the result of a process of continuous evaluation which requires the students to present a project or activities during the format synchronous sessions with the teacher, as well as answering multiple-choice questions and written exams. The teachers assess the participation of each of the students in the learning activities, which is also recorded in the computer system and can be reviewed on the virtual learning environment.

The three courses were chosen because of their characteristics, so a brief description is given here.

One of the courses (course "a") has the objective of acquiring competencies to carry out an integrated project in groups of four students, with practical content in subjects such as mathematics, physics, spatial geometry, projection systems, representation systems, advanced visualization, flexible and rigid geometry modeling,

methodology for assigning texture, lighting systems and the creation of realistic objects and scenes in 3D, and integration of virtual objects in real 3D scenes. The course had a value of 6 ECTS credits.

The course also worked with elements such as group work, oral and written communication to present the task, the structure of data storage, their preservation and consistency, planning work and the reliability of data sources, among others.

The students have to relate during the course the necessary knowledge to work in three-dimensional representation, and carry out a project which involves the creation, modeling, texturing and lighting of 3D scenes with multiple objects. Finally, each work group has to present the project in front of their classmates and a board of experts in the most significant areas. All this influences the instructive design of the course and of the learning-teaching activities, in which practical activities are given priority.

This course was chosen for this research for the following reasons:

- It is multidisciplinary, and so conclusions can be drawn which are valid in different areas related to these scientific techniques.
- It requires group and collaborative work, and so can give conclusions which are valid in relation to the communication and interaction between the members of the group, to the planning, coordination and distribution of the work and the reliability of the data storage systems and results.

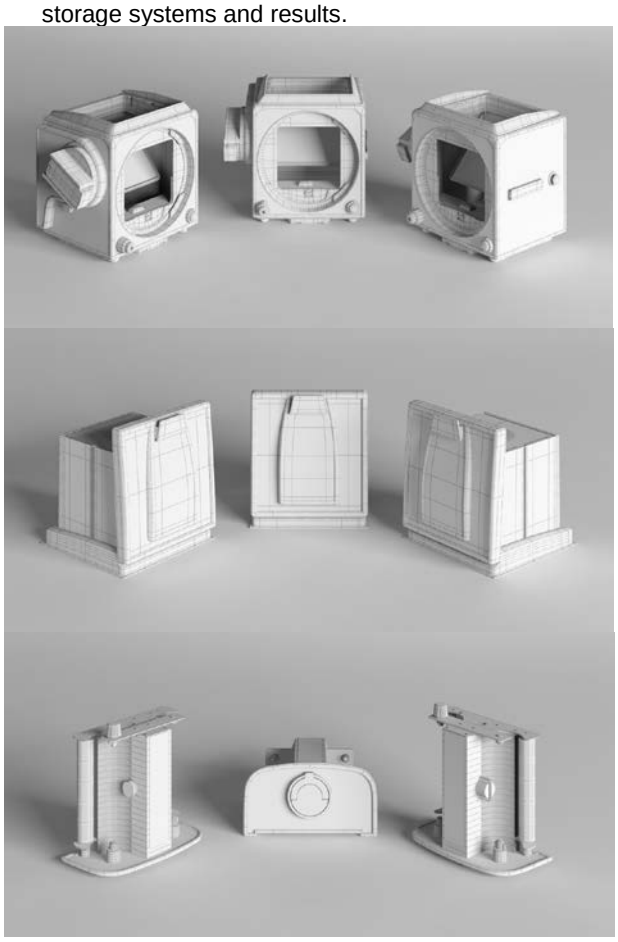


Fig. 2 Mesh and rendering of 3D objects modeling.

- It is a course in which a great deal of information is manipulated, both in text and graphics. To give an idea of the resources necessary for this course, a series of images is shown (fig. 2 & 3), taken from the projects presented by one of the online groups, which shows the extent of these resources. It is useful therefore to compare the results of the online and campus students given the high requirements of hardware and software.

Lastly, as this course is an example of Project Based Learning, it requires specific 3D software which is characterized as resource-hungry. This is fundamental in testing the response capacity of the applications based on transmission systems (as the remote receiver may not receive some of the actions quickly enough, and would therefore lose part of the information.

The other two courses (“b” & “c”) have as their learning objective the acquisition of competencies relating to Human-Computer Interaction. These competencies include, in course “b”, the understanding of ‘human factor’ knowledge such as the attention mechanism, perceptive processes and higher cognitive processes, as well as others relating to motivation and emotions. This course had a value of 3 ECTS credits. The competencies to be acquired in course “c” include understanding usability and accessibility, and mastery of the method of “User Centered Design”. This course had 6 ECTS credits.

These courses were chosen for the research for the following reasons:

Performance depends to a great extent on the understanding of concepts through reading, reflection and discussion, activities which do not involve using computer programs, so the hardware and software requirements should not influence the comparative results in the assimilation of knowledge or acquisition of competencies between the online and campus students.

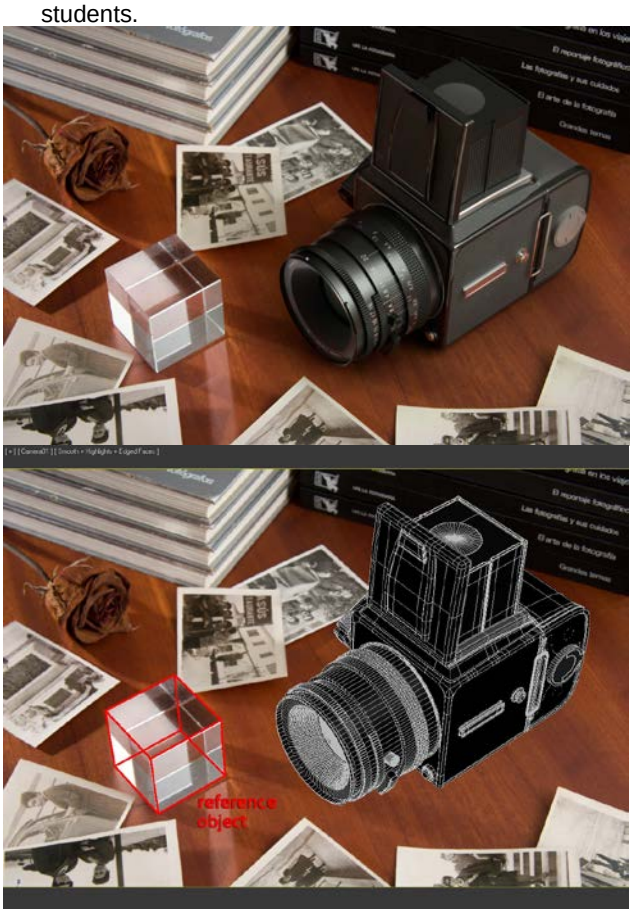


Fig. 3 Photography, wireframe and rendering model.

- Group work is required, and therefore valid consequences can be deduced relating to communication and integration between the members, as well as to the planning, coordination and distribution of the work, and the reliability of the data storage systems and results.
- They are courses in which the students have to find and study documents with scientific and technological content and with professional reports related to the field of 'Human Computer Interaction' along with 'User Centered Design', 'Usability', 'Accessibility', among others. Based on this documentation and the explanations given by the teacher in the synchronous sessions, the students do exercises and give presentations in which they describe the documents they have studied, and debate their viewpoints and conclusions. In addition, as practical exercises, the students have to apply various techniques designed to improve the usability and accessibility of the multimedia applications they generate.

4.2 Materials

In order to respond to the first question of the research (Q1), an analysis was carried out of the responses to a scale and one open question which had been given to students in the pilot test in the previous course. The scale was made up of 29 items related to the objective of the research. The possible responses to each item were on a scale of 7 points:

1) "Very bad" or "Very low",
2) "Quite bad" or "Quite low"
3) "Bad" or "Low"
4) "Neither good nor bad"
5) "Good" or "High"
6) "Quite good" or "Quite high"
7) "Very good" or "Very high"

The distribution of the 29 items is as follows:

- 1 item of general assessment of online course.
- 2 items assessing platforms for online course: web-conferencing and virtual learning environments.
- 6 items to assess the usefulness of the resources offered by the web-conferencing platform.
- 6 items to assess the operation of the resources offered by the web-conferencing platform.
- 7 items to assess the usefulness of the resources offered by the virtual learning environment.
- 7 items to assess the operation of the resources offered by the virtual learning environment.

In addition, the students were asked to respond to an open question to support their assessment in item 1 on online course system. Students could write as much as they liked to respond to this question. They were given a text about an online course system, which explained that it included the combination of technological resources and the teaching-learning model. The students were given a period of various days to reply online, and they could reply at any time, but each student could only give one response.

The students were sent a message asking for their participation, explaining the objective of the research, the procedure for responding to the online scale, and guaranteeing their anonymity.

In order to respond to the second question of the research (Q2), the final marks of the students of the three courses were compared, using the databases of the computer system which collected all the students' marks. The marks were transferred to specific software to carry out the statistical analysis (SPSS.12).

4.3 Subjects

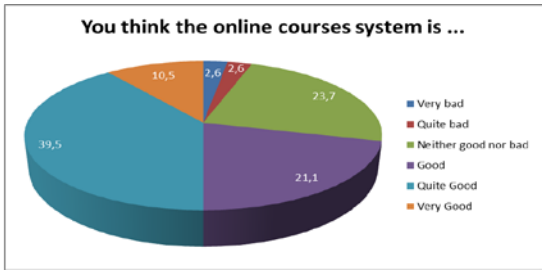
A total of 38 out of the 39 students who took the three courses completed the online questionnaire, and the comparison of the averages of the second stage of the research was made for the total number of students in each of the courses, online and on campus.

The number of students who followed the course on campus is greater than those online, and in most cases the size of the groups can be considered to be small (n < 30). None of the students was in more than one group.

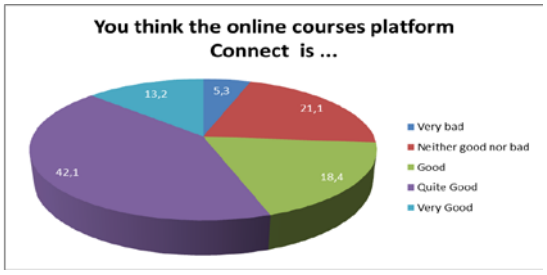
5. Results

5.1 Results corresponding to the first research question (Q1)

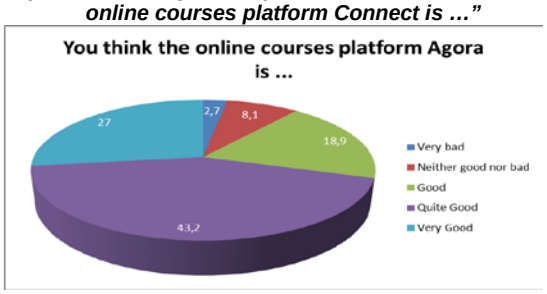
In order to respond to this question a descriptive analysis was carried out of the responses given to the 29 items of the scale, along with an content analysis of the open question to which the students responded. Tab. 1 to 8 show the descriptive statistics obtained for each item, and graphics Graph.1 to Graph.3 show the percentages obtained for items of assessment of the online courses system and online platforms used: web-conferencing (Connect) and virtual campus (Agora).



Graph. 1 Percentage of responses to item: "You think the online courses system is..."



Graph. 2 Percentage of responses to item: "You think the online courses platform Connect is ..."



Graph. 3 Percentage of responses to item: "You think the online courses platform Agora is ..."

The average assessment for the system of online courses is 5.18, and the average assessment of the platforms used, web-conferencing and virtual campuses, 5.26 and 5.78 respectively.

It seems important to note that 50% of students considered the online courses system "quite good" or "very good" and 21.1%, considered "good". Only 5.2% considered the online courses system "quite bad" (2,6%) or "very bad (2,6%)". The remainder 23.7% 21.1%, considered the system "Neither good nor bad".

The overall assessment of the platforms used: web-conferencing and virtual campus is also very positive, as can be seen in Tab. 1, 3 and 4 and in the Graph. 2 and the Graph. 3.

The average assessment of web-conferencing platform is 5.26 and the virtual campus of 5.78. 73.7% of students considered that the web-conferencing platform is "good", "quite good" or "very good" and 21% “neither good nor bad”. The virtual campus average assessment is even higher, 5.78. 86.8% of students considered that the virtual campus is "good", "quite good" or "very good" and 7.9% “neither good nor bad”.

As can be seen in Tab. 5-8, also valued highly the use and operation of all functions and learning opportunities on those platforms.

The lowest score obtained in relation to the usefulness of the features of web-conferencing platform corresponds to the "The possibility to create sub-classes for group work", (5.59) and the highest corresponds to the "The possibility to record lectures and review", (6,66).

In case of virtual campus, the lowest score obtained in relation to the usefulness of the features corresponds to the "The possibility to run the virtual campus from a PDA, Tablet or Smart phone ", (5.17) and the highest corresponds to the "The possibility to receive short messages sent from the mobile phone on campus (notices, notifications) ", (6,43).

In relation to the functioning of the web-conferencing platform, the highest score corresponds to "The possibility to record lectures and review" (6.05), and the lowest to "The possibility of watch video and hear audio (webcam and micro) of the teacher and in real time while explaining"(4.92).

In the virtual campus platform, the highest score regard to the functioning corresponds to "The materials section" (6.17) and the lowest to "The possibility to run the virtual campus from a PDA, Tablet or Smartphone" (5.34).

Of the total of 38 students who completed the scale, 30 (78.94%) also responded to the open question. A content analysis of responses to the open question was conducted in order to find groups of reasons given to justify the assessment of the online courses system and to assess the importance of each category by the number of reasons including.

Propositions were extracted from each response of each student. Each of the propositions referred to a reason. Eighty-one propositions were obtained. Tab. 9 shows, by way of example, some of these propositions.

Ten teachers, including the authors, experts in online learning and web-conference, grouped into categories such propositions. Following, we applied the technique of cluster analysis, with the clusters based on an average linkage cluster analysis algorithm.

Ten categories have been established. Tab. 10 shows the information corresponding to aspects of online course considered as strengths, while Tab. 11 shows aspects in which further progress are needed.

5.2 Results corresponding to the second research question (Q2)

In order to respond to this question a comparison was made of the students' marks in each group.

Given the small size of the groups in most cases, the Mann Whitney U test was used. Tab. 8 shows the results of the comparison of the average marks each of the groups in the three courses.

In two of the three courses there are significant differences in the average marks. In course “a” and course “c”, the group which carried out the course online obtained a mark which was significantly higher than that of the campus group.

The results of course “b” show that the average mark of the campus group is higher than that of the online group, in contrast to courses “a” and “c”, but in this case, the differences are not significant. It is relevant that the campus group is smaller than the online group, unlike in the other two courses (“a” & “c”).

6. Discussion

In terms of the first research question (Q1), Tab. 1 to 5 show that the medians in all the items are equal to or higher than 5 out of 7, corresponding to the options 5 ("Quite good" or "Quite high"), 6 (“Good” or “High”) and 7 ("Very good" or "Very high").

These results show a clear positive appraisal, both of the online training system and of the web-conferencing platforms and the virtual learning environment.

They also suggest a high consideration of the usefulness that both platforms have for the learning process and a positive appraisal of their operation.

We consider that these results allow us to respond affirmatively to the first research question, and they are in line with the first of the conclusions obtained by Tucker & Neely [14], as a result of their research.

The open responses indicate that the strong points of the system relate to saving in time and money provided by distance study, the possibility for the students to manage their own time and the study process for progressive learning. Added to these are the organization and planning of synchronous sessions and materials, and the possibility for interaction and collaboration.

These results seem to be in line with those found by other researchers. For example, Kear *et al.* [6] conclude that it is important to have an appropriate balance between planned sessions and improvisation by the teacher, and to improve interaction, which gives a greater sensation of social presence.

Alpanis *et al.* [1] also insist that a prerequisite is to plan the synchronous sessions so that there is little improvisation and also to make these sessions very structured. They suggest that if these sessions are organized on a regular basis, this may generate inflexibility for the profile of students who have a professional activity in parallel with their studies.

The weak points are related mainly with problems with operating the technology, and with adapting to the teaching-learning model for students with other obligations.

The results found by Loch & Reushle [7] also seem coherent with the main weak point obtained in this research, as they refer to the importance of technology working correctly.

In relation to the second question of this research, the results of the comparison between the average marks obtained by the campus and online groups do not provide

sufficient evidence to confirm that the one group of students performs better than the other.

Although in groups "a" and "c" the online groups have a higher average mark than that of the campus groups, and this difference is statistically significant in both cases, the fact that group "b" does not confirm this result suggests that there may be reasonable doubt as to whether the online learning system gives greater effectiveness in the learning process.

Lou *et al.* [8] suggest an idea which is in line with the interpretation of our results: "*In synchronous instructor-directed undergraduate Distance Education, when media are used to deliver the same instruction simultaneously by the same instructor and with the same course activities and materials, there is little reason to expect undergraduate students to learn differently in the remote sites than at the host site*".

It is also notable that in course "b", in which the campus students obtain a higher average mark, the size of the campus group (n = 16) is slightly smaller than the online group (n = 24), in contrast to groups "a" and "c" in which the campus group was larger. This could indicate that the variable 'group size' may have more influence on students' performance than the variable 'study mode' (campus versus online), especially taking into account the other factors which are same for the two groups (content, teacher, materials, study documentation, activities, instructive design and course structure).

7. Conclusions

Students who study online using web-conferencing software and a virtual learning environment perceive that these applications are appropriate for their learning process, and their performance is not inferior to that of campus students. This provides a guarantee of the reliability of this technology, and gives support to their continued use and to further research into the potential benefits and difficulties which will need to be overcome in their use in university degree courses.

We consider that the results we have obtained in our research are coherent with those of other research in the same subject, and support the idea that use of this technology, in conjunction with, for example, virtual learning environments and learning objects, has potential and should be further researched.

Some of the results obtained refer to the need to adapt the learning-teaching model to the profile of the students, which will influence the structure and dynamic of the courses and their instructive design. Other research has studied the influence of instructive design or the effectiveness of web-conferencing software in the learning process. However, there is relatively little research in this direction, and as the data suggest that this may be a relevant factor, it is necessary to continue emphasizing this area.

Appendix

Item	N	Minim	Maxim	Mean	SD
You think the online courses system is	38	1	7	5,18	1,312
You think the online courses platform Connect is …	38	1	7	5,26	1,408
You think the online courses platform Agora is …	37	1	7	5,78	1,205
N valid	37				

Tab. 1 Descriptive statistics for items of assessment of the courses system and online platforms used: web-conferencing (Connect) and virtual campus (Agora).

	Frequency	Percent	Valid Percent	Cumulative Percent
Very bad	1	2,6	2,6	2,6
Quite bad	1	2,6	2,6	5,3
Neither good nor bad	9	23,7	23,7	28,9
Good	8	21,1	21,1	50,0
Quite Good	15	39,5	39,5	89,5
Very Good	4	10,5	10,5	100
Total	38	100	100	

Tab. 2 Frequencies of responses to item: "You think the online courses system is..."

	Frequency	Percent	Valid Percent	Cumulative Percent
Very bad	2	5,3	5,3	5,3
Neither good nor bad	8	21,1	21,1	26,3
Good	7	18,4	18,4	44,7
Quite Good	16	42,1	42,1	86,8
Very Good	5	13,2	13,2	100
Total	38	100	100	

Tab. 3 Frequencies of responses to item: "You think the online courses platform Connect is…"

	Frequency	Percent	Valid Percent	Cumulative Percent
Very bad	1	2,6	2,7	2,7
Neither good nor bad	3	7,9	8,1	10,8
Good	7	18,4	18,9	29,7
Quite Good	16	42,1	43,2	73,0
Very Good	10	26,3	27,0	100
Total	37	97,4	100	
System	1	2,6		
Total	38	100		

Tab. 4 Frequencies of responses to item: "You think the online courses platform Agora is …"

	N	Minim	Maxim	Mean	Std. Deviation
… The possibility of watch video and hear audio (webcam and micro) of the teacher and in real time while explaining	37	1	7	4,92	1,570
… The possibility to record lectures and review	37	1	7	6,05	1,224
… The possibility to share documents and desktop	36	1	7	6,00	1,309
… Chat during the session	37	1	7	6,00	1,333
… The file sharing	37	1	7	5,84	1,344
… The possibility to create sub-classes for group work	35	1	7	5,83	1,339
Valid N (listwise)	34				

Tab. 5 Descriptive statistics for items related to the usefulness of the resources of the web-conference platform (Connect): "In your opinion, what is the degree of usefulness of each of the resources of the web-conferencing platform?"

	N	Minimum	Maximum	Mean	Std. Deviation
… The possibility of watch video and hear audio (webcam and micro) of the teacher and in real time while explaining	37	1	7	4,92	1,570
… The possibility to record lectures and review	37	1	7	6,05	1,224
… The possibility to share documents and desktop	36	1	7	6,00	1,309
… Chat during the session	37	1	7	6,00	1,333
… The file sharing	37	1	7	5,84	1,344
… The possibility to create sub-classes for group work	35	1	7	5,83	1,339
Valid N (listwise)	34				

Tab. 6 Descriptive statistics for items related to the assessment of the functioning of the resources of the web-conference platform (Connect): "What is the assessment you make of the functioning of each of the resources of the web-conference platform (Connect)"

	N	Minimum	Maximum	Mean	Std. Deviation
… The materials section	37	4	7	6,41	1,013
…The qualifications section	38	1	7	6,21	1,277
… Paragraph online questionnaires	37	1	7	5,65	1,549
… The possibility to read or download documents of general interest (schedules, rules)	38	3	7	5,89	1,134
… The possibility to send and receive messages	38	2	7	6,24	1,101
… The possibility to receive short messages sent from the mobile phone on campus (notices, notifications)	37	4	7	6,43	,835
… The possibility to run the virtual campus from a PDA, Tablet or Smartphone	36	1	7	5,17	1,920
Valid N (listwise)	34				

Tab. 7 Descriptive statistics for items related to the usefulness of the resources of the C.V. platform (Agora): "In your opinion, what is the degree of usefulness of each of the resources of the campus virtual platform (Agora)?"

	N	Minimum	Maximum	Mean	Std. Deviation
… The materials section	36	1	7	6,17	1,254
… The qualifications section	36	1	7	5,81	1,508
… Paragraph online questionnaires	35	1	7	5,51	1,358
… The possibility to read or download documents of general interest (schedules, rules)	36	1	7	5,97	1,341
… The possibility to send and receive messages	36	1	7	5,89	1,389
… The possibility to receive short messages sent from the mobile phone on campus (notices, notifications)	35	1	7	5,91	1,422
… The possibility to run the virtual campus from a PDA, Tablet or Smartphone	32	1	7	5,34	1,516
Valid N (listwise)	31				

Tab. 8 Descriptive statistics for items related to the assessment of the functioning of the resources of the campus virtual platform (Agora): "What is the assessment you make of the functioning of each of the resources of the campus virtual platform (Agora)"

N	Prop.	Category Description
5	9	It is considered necessary to improve the adequacy of the system to the profile and needs of online students with the aim for them to manage their time better, for example, flexible assistance class, reducing the duration of class sessions and guiding the system towards self-learning to a greater extent.
6	3	Reference is made to the limitations caused by the distance, for example, it is difficult to group work with a physical presence in one place, and reconcile the agendas for group work.
7	9	Reference is made to the fact that the mismatch in one place or physical space (classroom), causes the teacher has less feedback from students, the interaction may be more complicated, communication may be less fluent and some learning content can be more difficult to understand.
8	3	Reference is made to the need to improve the organization of some files (recordings) and virtual classroom, and also to provide a classroom for the students meet without relying on the intervention of the management.
10	20	Reference is made to the difficulties associated with the connections or other technical problems (audio, video ...)

Tab. 9 Examples of propositions.

N	Prop.	Category Description
1	8	Includes a positive assessment of the following: synchronous sessions with teachers, the speed with which teachers resolve questions, learning as a result of realization of practical exercises or projects, possibility to defend such exercises, and multimedia learning materials.
2	12	Includes a positive assessment of the following: the possibility to interact both with teachers and with peers, much like the interaction in campus, it is really possible to learn using this system and the system's functionality for interaction are adequate.
3	14	Includes a positive assessment of the flexibility of the system in two aspects: the possibility to take courses without having to travel, and the flexibility provided by the fact of recording classes and can watch them when you want and as often as necessary
4	1	Includes a positive assessment of the functioning of web-conference software.
9	2	Includes a positive assessment of the functioning of the connections.

Tab. 10 Strengths of the system of online courses system

(the Online System) allows you to study at a distance
the class sessions should be shorter
(the online system) should aim towards self-learning rather than to make a “face to face” synchronous class session at distance classes
is possible to develop good communication between students and teachers
some signal delay
you can share files, move slides, questionnaires, download files
I see it “super organized”
teaching materials are great
practices have a major effect on learning
(the online system) makes it possible to interact like in a “face to face” synchronous class session
(the online system) makes it possible to defend exercises and practices, like in a “face to face” synchronous class session
(the online system) allows record lectures and watch them later if you were unable to attend or to solve doubts or study
sometimes there are some problems with connections
the communication is less fluid
the student asks fewer questions than it does in an “on campus” class
there are some technical problems
(the online system) allows flexibility
recording of classes is an advantage
would need to improve the quality of the audio signal

Tab. 11 Aspects in which further progress of the system of online courses are needed

Format		**on campus**	**online**
Course “a”	N	44	9
	Final marks (group mean)	7,57	8,33
	Mann-Whitney U	Asymp. Sig. (2-tailed): ,002	
Course “b”	Cant. Est. Group	16	24
	Final marks (group mean)	7,23	6,99
	Mann-Whitney U	Asymp. Sig. (2-tailed): ,901	
Course “c”	Cant. Est. Group	42	6
	Final marks (group mean)	6,56	7,78
	Mann-Whitney U	Asymp. Sig. (2-tailed): ,003	

Tab. 12. Summary of Mann-Whitney U Test. (p<.05)

	Format	**N**	**Mean Rank**	**Sum of Ranks**
Final Mark	On campus	44	24,07	1059,00
	Online	9	41,33	372,00
	Total	53		

Tab. 13. Ranks. Course “a”.

	Final Mark
Mann-Whitney U	69,000
Wilcoxon W	1059,000
Z	-3,090
Asymp. Sig. (2-tailed)	,002

Tab. 14 Test Statistics. Course “a”. (p<.05)
a. Grouping Variable: Course format
b. Grouping Variable: Course format

	Format	N	Mean Rank	Sum of Ranks
Final Mark	On campus	16	20,78	332,50
	Online	24	20,31	487,50
	Total	40		

Tab. 15. Ranks. Course “b”.

	Final Mark
Mann-Whitney U	187,500
Wilcoxon W	487,500
Z	-,124
Asymp. Sig. (2-tailed)	,901

Tab. 16 Test Statistics. Course “b”
a. Not corrected for ties.
b. Grouping Variable: Course format

	Format	N	Mean Rank	Sum of Ranks
Final Mark	On campus	42	22,21	933,00
	Online	6	40,50	243,00
	Total	48		

Tab. 17 Ranks. Course “c”.

	Final Mark
Mann-Whitney U	30,000
Wilcoxon W	933,000
Z	-2,993
Asymp. Sig. (2-tailed)	0,003

Tab. 18. Test Statistics a. Course “c”. (p<.05)
a. Grouping Variable: Course format

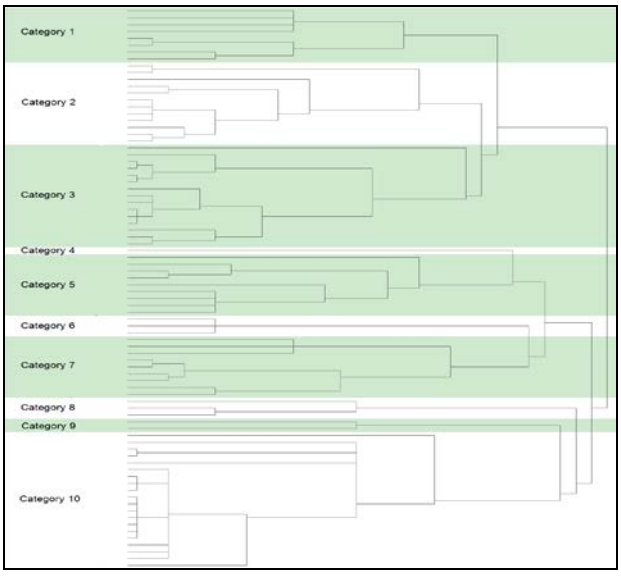


Fig. 4. Dendrogram. Cluster analysis

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