

Juan Arias-Masa, Laura Alonso-Díaz,
Sixto Cubo-Delgado,
Prudencia Gutiérrez-Esteban,
Rocío Yuste-Tosina
Spain

Assessment of the Use of Synchronous Virtual Classrooms in Higher Education

Abstract

The presented paper describes the characteristics of a study conducted on Synchronous Virtual Classrooms (SVCs), virtual spaces which harbour such resources as videoconferences, shared desk-tops, etc. The main objective of the research was to assess teaching and methodological, communication and technological aspects of SVCs in e-learning processes. Empirical methodology of quantitative and descriptive nature was used; a questionnaire was designed to assess these issues with a sample of 116 university students from six different fields of study at the University of Extremadura. As a conclusion, we report that SVCs with a constructive methodology enhance students' creativity, favour virtual collaborative work, promote critical and independent thought, and create alternative channels to stimulate students' active participation by means of flexible and attractive interfaces.

Keywords: *e-learning, information and communication technology, management system platforms, synchronous virtual classrooms, higher education, videoconference*

Introduction

The knowledge society and the application of technology to education are continually developing processes. The emergence of Management System Platforms (MSPs), as shown in numerous studies in the field of e-learning (Russell, 2009; Winter et al., 2010; Shivetts, 2011; Hung, 2012, etc.), b-learning (Amaral,

2010; Shivetts, 2011; Rix, 2011; Lin & Wan, 2012, Kawiatkowska, 2014, etc.) and Personal Learning Environments (PLE) (Johnson & Liber, 2008; Dabbagh & Kitsantas, 2012) have brought about changes in conceptions of educational processes, principally with regard to overcoming space and time barriers. Nevertheless, as some researchers have reported (Alonso & Blázquez, 2009), lack of visual contact between teachers and learners continues to be a barrier in interaction processes in virtual spaces.

Notwithstanding the advantages derived from asynchronous learning, refuted in studies by Dziuban et al. (2007), Blanchette (2012) or Marín (2014), amongst others, it is clear that we are heading towards a kind of integrated technology which facilitates virtual, visual and auditory synchronous interaction. Consequently, new platforms have emerged whose main feature is communication by means of videoconference. From the educational perspective, the use of these platforms is a step forward in the evolution of e-learning, since they require new ways of managing distance learning.

Synchronous Virtual Classrooms (SVCs) are teaching and learning spaces which use information and communication technology to share, in real time, video and audio, documents, chats, virtual whiteboards, shared desktop use, etc., as part of a training experience. As with classroom teaching, direct audiovisual contact becomes possible, but without the presence of teachers and students in the same physical space.

In 2008 some early studies (e.g., Granda Candás, 2008; Fallery, Gerbaix & Ologeanu, 2008) discussed the possibility of including videoconference in online teaching, at the same time emphasizing the need for teachers to be trained in the use of this tool. Baruch, Yossi and Rachel (2008) reflect on the implications of the technical difficulties involved, though they conclude that in spite of these difficulties the benefits of synchronous learning for students are substantial.

Later, Skylar (2009) and Genevieve & Bratt (2009) experimented with the practical applications of videoconference-related technology in the field of education. Cunningham, Beers, and Holmsten (2010) incorporated the use of videoconferences in English teaching, with highly satisfactory results as far as students' pronunciation was concerned, though interest in this initiative seems to have waned somewhat due to technical problems with sound. Additionally, Falloon (2011) highlights the potential of videoconference in relation to student satisfaction when used in online courses. Burton and Kitchen (2011) studied different software applications for use in synchronous virtual classrooms; these settings were in turn investigated by Chia et al. (2012) for doctoral seminars and by Kear et al. (2012) for tutorials, with positive results regarding teaching possibilities.

Our investigations show that there are to date few studies on teaching methods in SVC settings. Research in this area is likely to increase, however, and the wide range of possibilities afforded by SVC teaching may well be found to be of educational benefit to adults, whose participation in e-learning experiences is, as White and Selwyn (2011) show, insufficient with respect to the overall increase in the use of technology. The scant scientific research in this area means that there are few validated and reliable questionnaires by which to assess teaching and learning processes in SVCs.

The presented paper reports on the results obtained from the assessment of the implantation of SVCs in a pilot sample at the University of Extremadura, for which a questionnaire was devised to assess issues relating to these new synchronous teaching and learning settings. In particular, we aimed to assess the teaching/methodological, communication, and technological aspects of SVCs within the teaching and learning processes.

Research Methodology

Methodologically, the study was conducted from an empirical, quantitative and descriptive perspective. This methodological approach was justified by the guarantees that it offered in relation to internal and external validity of the investigation, and also because of the ease by which information on the results of a particular educational issue can be rapidly obtained.

Research Sample

Assessment of learning experiences through synchronous virtual classrooms was carried out in the following university degree courses:

- Degree in Psychopedagogy
- Master's Degree in Research in Social and Judicial Sciences
- Master's Degree in Research in Engineering and Architecture.
- Technical Engineering in Telecommunication and Telematics
- Degree in Social Education
- Degree in Primary Education

Table 1 shows the number of students from each degree course participating in the study, with graphic distribution in Figure 1. Students grouped by ages are shown in Figure 2. Men made up 53% of the sample, and women 47%.

Table 1. Number of students from each degree course who participated in the study

ACADEMIC DEGREES	N	%
Psychopedagogy	12	10.34
Master in Social and Judicial Sciences	19	16.38
Telematics Engineering	11	9.48
Engineering Architecture Master	9	7.76
Social Education	30	25.86
Primary Education	35	30.17
	116	100

Figure 1. Percentage of participation of each of the degree courses involved.

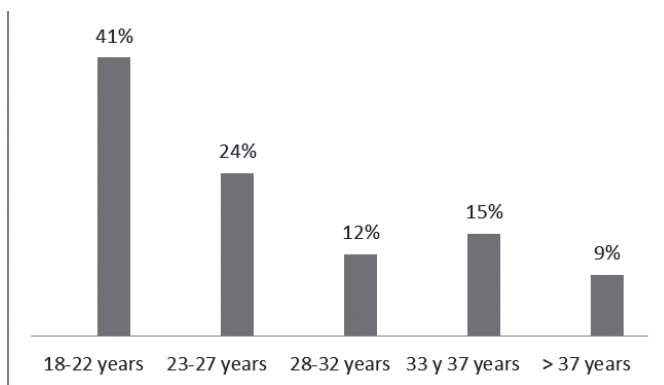
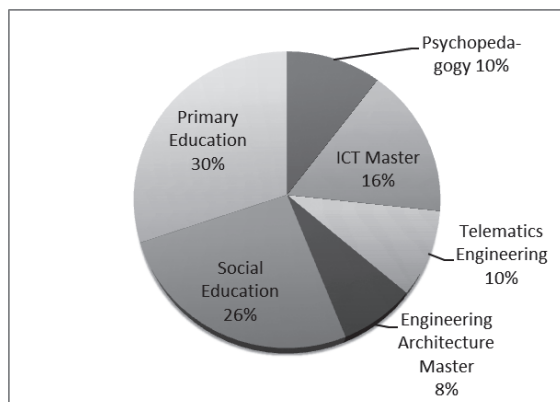


Figure 2. Age distribution of the participants.



Instrument and Procedures

A questionnaire was devised to assess the following dimensions related to SVCs:

1. Socio-demographic aspects
2. Teaching and methodological aspects
3. Communication aspects
4. Technical aspects

The different stages in the elaboration of the questionnaire are defined in the following sections:

Phase 1. Preliminary phase to outline the structure and content of the questionnaire.

The preliminary version of the questionnaire was elaborated by our research team. Its structure was related to the four previously mentioned dimensions and the content of each was organized for assessment on a Likert scale. The relation between the dimensions and the variables used are shown in Table 2.

Table 2. Dimensions and variables.

Dimension	Variable
Socio-demographic aspects	Sex
	Age
	Degree studied
Teaching and methodological aspects	Structure of the subject
	Subject matter
	Time distribution of the subject
	Organization of the subject
	Elements contained in the subject
	Self-regulation of time
	Creativity
	Interaction and cooperative work
	Critical thought and expression of ideas and opinions
	Activities proposed
	Individual work and team work
	Tasks undertaken to motivate learning
	Satisfaction with activities to continue with the subject
	Activities suitable to be done in virtual settings
	Material provided is diverse
Material provided facilitates learning	

Dimension	Variable
Teaching and methodological aspects	Material in relation to content
	Students prepare their own material
	The material contributes to the acquisition of competences
Communication aspects	Synchronous virtual classrooms open up new channels of socialization
	Teachers intervene regularly in the virtual classroom
	Teachers encourage participation in the virtual classroom
	Students become involved and participate in the course
	Teachers' responses are fast and clear
	The interface is accessible and easy to use
	Adequate time distribution
	New channels of communication between students and teachers
	Diversity in the classroom is catered for
	Feelings of solitude
Technical aspects	Flexibility of the virtual classroom
	Control of access
	Preparation of the session
	Creation of scenarios
	The virtual classroom is appropriately structured and organized
	The online help system is useful
	Quality of texts, images and sound
	Organization and functionality of the elements offered
	Recording and printing of contents
	Accessibility of the interfaces
Structure and usability of the system ensure optimal cognitive performance	

Phase II. Validity of content in experts' opinions

The validity of the content of the questionnaire was obtained from the analysis made by 11 experts on two aspects of the questionnaire:

- The structure, i.e., organization of the questionnaire into different dimensions
- The content of each of the dimensions

The experts were requested to evaluate, on a scale of 10 points, the Suitability and Relevance of each of the elements of structure and content.

Analysis of the results on validity was made in three phases:

1. Averages of the Suitability and Relevance of each of the elements of the structure and of each item of content.
2. Analysis of the experts’ suggestions on each element of the structure and on each item of content, in relation to general aspects, such as composition, spelling, meaning, etc., noted in the field of Observations.
3. Analysis by our research team of the results of the above two sections and the elaboration of a second version of the questionnaire, which was used for the reliability analysis which will be described in the following section.

Phase III. Reliability analysis by means of a pilot sample

Reliability of the questionnaire was obtained by applying Cronbach’s Alpha analysis to a pilot sample of 25 students of the degrees included in the study. The results obtained with SPSS programme version 19 are shown in Tables 3 and 4.

Table 3. Reliability of the test

Cronbach’s Alpha	N of Items
.958	46

Table 4. Analysis of the situation of the test if an item is deleted

	Scale Mean if Item Deleted	Scale Vari-ance if Item Deleted	Corrected Item-total Correlation	Cronbach’s Alpha if Item Deleted
1. The structure of the subject is suitable for the proposed objective	181.45	565.399	.552	.957
2. The subject contributes to the scientific and professional qualifications	181.34	573.091	.341	.958
3. The timing is appropriate in relation to the contents	182.03	559.463	.488	.958

The decision on the final version of the questionnaire was made not only considering the reliability of the test, but also the data in the last column of Table 4 (only three items are shown as an example), which show the extent to which reliability is modified when an item is deleted.

Phase IV. Final version of the questionnaire

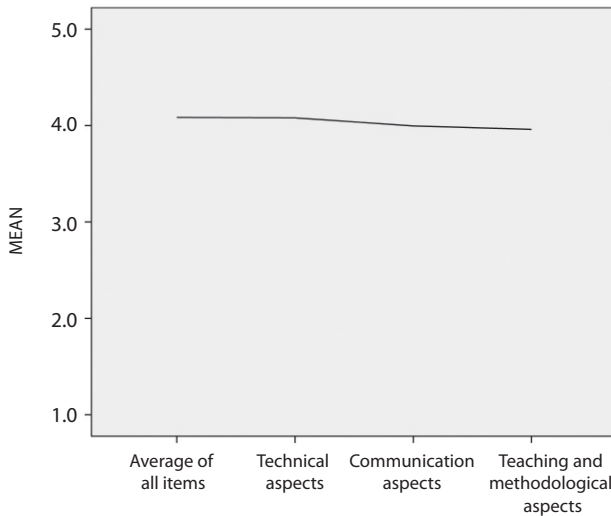
The results of the previous analyses show that the test is sound, valid and reliable. The final version, which was applied to the sample, produced data presented in the following section.

Research Results

The following results show the means of the dimensions of the questionnaire, and the overall scores obtained. The Likert-type scale used is interpreted as follows:

- 1. Strongly disagree
- 2. Disagree
- 3. No opinion or uncertain
- 4. Agree
- 5. Strongly agree

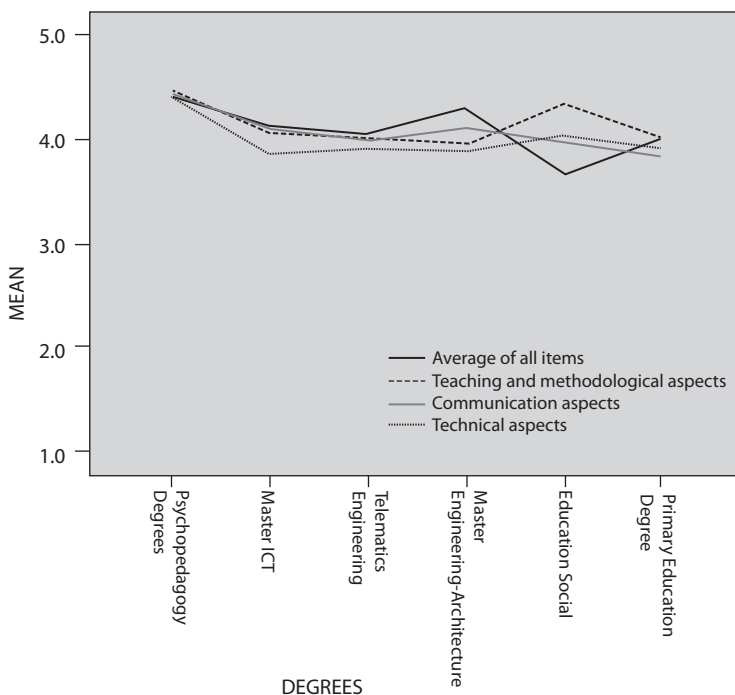
Figure 3. Means of the dimensions of the questionnaire



The graph shows a very positive evaluation of the three dimensions assessed and of the overall scale when all the items are considered globally.

The results of the ANOVA analysis of the average differences between the various University Degrees in the sample and the dimensions of the questionnaire, together with the overall scores obtained, are shown in Figure 4. A positive evaluation, which is very similar, for the different degrees studied is obtained.

Figure 4. Analysis of the University Degrees in the sample and the dimensions of the questionnaire



Discussion and conclusions

The results outlined above relate to the evaluation of a pilot experiment in SVC use at the University of Extremadura. The study was done by means of a questionnaire, which allowed us to evaluate, in a suitable and reliable way, several

Figure 5. Descriptive analysis of the dimensions of the questionnaire and University Degrees

	N	Mean	Std. Deviation	Std. Error	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Average of all items									
Psychopedagogy Degrees	3	4,4148	,30110	,17384	,17384	3,6669	5,1628	4,10	4,70
Master ICT	6	4,1333	,60553	,24721	,24721	3,4979	4,7688	3,40	4,80
Telematics Engineering	7	4,0619	,32514	,12289	,12289	3,7612	4,3626	3,50	4,40
Master Engineering-Architecture	1	4,3000	.	.	.	.	.	4,30	4,30
Social Education	1	3,6667	.	.	.	.	.	3,67	3,67
Primary Education Degree	16	4,0271	,51043	,12761	,12761	3,7551	4,2991	3,10	4,80
Total	34	4,0846	,46632	,07997	,07997	3,9219	4,2473	3,10	4,80
Teaching and methodological aspects									
Psychopedagogy Degrees	3	4,4767	,06110	,03528	,03528	4,3249	4,6284	4,41	4,53
Master ICT	6	4,0717	,21498	,08777	,08777	3,8461	4,2973	3,73	4,32
Telematics Engineering	7	4,0271	,24123	,09118	,09118	3,8040	4,2502	3,59	4,32
Master Engineering-Architecture	1	3,9700	.	.	.	.	.	3,97	3,97
Social Education	1	4,3500	.	.	.	.	.	4,35	4,35
Primary Education Degree	16	4,0213	,43942	,10986	,10986	3,7871	4,2554	3,03	4,82
Total	34	4,0797	,35318	,06057	,06057	3,9565	4,2029	3,03	4,82
Communication aspects									
Psychopedagogy Degrees	3	4,4467	,29670	,17130	,17130	3,7096	5,1837	4,11	4,67
Master ICT	6	4,1283	,39560	,16150	,16150	3,7132	4,5435	3,44	4,56
Telematics Engineering	7	4,0000	,37528	,14184	,14184	3,6529	4,3471	3,44	4,56
Master Engineering-Architecture	1	4,1100	.	.	.	.	.	4,11	4,11
Social Education	1	4,0000	.	.	.	.	.	4,00	4,00
Primary Education Degree	16	3,8537	,56404	,14101	,14101	3,5532	4,1543	2,78	4,89
Total	34	3,9965	,48075	,08245	,08245	3,8287	4,1642	2,78	4,89
Technical aspects									
Psychopedagogy Degrees	3	4,4233	,13577	,07839	,07839	4,0861	4,7606	4,28	4,55
Master ICT	6	3,8600	,28848	,11818	,11818	3,5562	4,1638	3,56	4,33
Telematics Engineering	7	3,9286	,35291	,13339	,13339	3,6022	4,2550	3,39	4,50
Master Engineering-Architecture	1	3,8900	.	.	.	.	.	3,89	3,89
Social Education	1	4,0600	.	.	.	.	.	4,06	4,06
Primary Education Degree	16	3,9238	,52074	,13019	,13019	3,6463	4,2012	2,94	4,83
Total	34	3,9606	,42703	,07323	,07323	3,8116	4,1096	2,94	4,83

Figure 6. ANOVA analysis between University Degrees and the dimensions of the questionnaire

		ANOVA				
		Sum of Squares	df	Mean Square	F	Sig.
Average of all items	<u>Between Groups</u>	,619	5	,124	,529	,753
	<u>Within Groups</u>	6,557	28	,234		
	Total	7,176	33			
Teaching and methodological aspects	<u>Between Groups</u>	,632	5	,126	1,016	,427
	<u>Within Groups</u>	3,484	28	,124		
	Total	4,116	33			
Communication aspects	<u>Between Groups</u>	1,051	5	,210	,895	,498
	<u>Within Groups</u>	6,576	28	,235		
	Total	7,627	33			
Technical aspects	<u>Between Groups</u>	,747	5	,149	,794	,563
	<u>Within Groups</u>	5,271	28	,188		
	Total	6,018	33			

dimensions of the significance that synchronous virtual classrooms have in the university.

Our findings indicate that the designed questionnaire will guarantee content validity in relation to the structure and content of the questionnaire. A reliability analysis ensures that assessment of the different dimensions of the questionnaire is precise and sound.

Additionally, through detailed analysis, some interesting conclusions were drawn on the teaching, methodological, communication and technological aspects of SVCs regarding teaching and learning processes. With respect to teaching and methodological aspects, it can be observed that if SVCs are used with a constructivist methodological design, student creativity is enhanced. SVCs encourage collaborative work, since they offer an ideal space for face-to-face interaction, facilitated by a number of resources in addition to video and audio, such as virtual whiteboard and shared notes. We have also observed that success in the use of SVCs depends on the number of people interacting simultaneously: a reduced group of participants communicating in real time favours exchange of ideas and opinions and development of independent critical thought. Research by Gillies (2008) confirms the efficacy of similar formats applied in a pedagogical context.

With regard to communication aspects, our findings indicate that the use of SVCs contributes to educational development on the collaborative work level promoted by Web 2.0. As interactive spaces which encourage the creation of groups

and networks, SVCs promote multidirectional communication by overcoming spatial barriers. We coincide with Skylar (2009) and Genevieve & Bratt (2009) that the educational and innovative use of videoconference gives rise to significant training experiences worth studying. We also concur with Kawiakowska's (2013) conclusions that the feeling of solitude in a student diminishes on becoming part of a learning group or community in which others are in the same situation; this perception occurs in SVC use.

Finally, we are interested in those technological aspects of SVCs which assist the teaching and learning processes themselves and as such we agree with Sancho (2012) that it is more important and useful to think in pedagogical rather than technological terms in order to encourage appropriate didactic innovation in the preparation of teaching plans. The carefully prepared interfaces of the SVCs studied, together with the possibility to access them from different operating systems, are positive factors that enhance the teaching process. Flexibility, structure, organization and a suitable online help system take the process further towards a successful learning experience.

In sum, we conclude that the teaching/learning practices studied are positive and relevant to the educational field. SVCs are generating new systems of communication worth serious research in the sense that they are leaving behind the asynchronous conceptions that have characterized distance education. In this regard, direct communication, which is part of traditional teaching, is combined with other particular elements of communication that SVC users must learn to exploit from the pedagogical point of view: shared virtual whiteboards, the possibility of sharing files and notes in real time, etc. What clearly emerges from our study is a very positive consideration of interaction and cooperative work, the encouragement of creativity, and the creation of new channels of communication among participants in training activities.

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