Immersive virtual reality versus webcam in an online language course

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Abstract. This paper investigates the differences between Immersive Virtual Reality (IVR) and the webcam (WBC) in the context of a Spanish distance-learning course. Two specific objectives were set: (1) to determine the existence of a relationship of dependence between the device used and the oral interaction, and (2) to analyse the existence of a dependency relationship between the device utilised and the perception of copresence. To that end, online courses and semi-structured interviews were conducted. Regarding the first objective, there is a higher chance of speaking exchanges between student-tutor and tutor-student when using WBC. As for the second objective, we did not have sufficient feedback to determine whether the perception of copresence varies depending on the two profiles. However, the analysis indicates that non-verbal communication was essential for IVR volunteers to experience copresence. The conclusions suggest that the IVR could be more appropriate than WBC for socio-constructivist and communicative teaching pedagogies[2].

Keywords: immersive virtual reality, CALL, CMC.

1. Introduction

1.1. The interest of the research

Three reasons led us to investigate IVR: first, the scarcity of studies in the field of language teaching at the time of this research. It has not been until recently that investigations have flourished (Jauregi Ondarra, Gruber, & Canto, 2020; Melchor-

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2. Article based on a PhD research, for more detail visit: https://eprints.ucm.es/id/eprint/64682/

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Couto & Herrera, in press; Yang, Lo, Hsieh, & Wu, 2020). The second reason was to explore its potential use as a Computer-Mediated Communication (CMC) device for distance courses. Finally, the drop in prices is favouring the use of this product, with models such as the Oculus Quest 2 that stands out from other devices (see supplementary materials).

1.2. Aim and objectives

The generic aim of our research was to analyse the performance of the IVR and WBC in the context of a distance Spanish course. In more detail, our specific objectives were the following: to determine if there was a dependency relationship between the technological device used and the oral interaction maintained during the communicative exchange; and to analyse the possible existence of a dependency relationship between the technological device used and the perception of copresence by the students.

2. Method

2.1. Research design

We designed an empirical study in which the two main aspects mentioned above were examined: oral interactions and perception of copresence, defined as "the sense of being together with others in a mediated – either remote or virtual – environment" (Zhao, 2003, p. 445). To achieve the first objective, it was intended to verify in quantitative terms the sustained oral interaction between the educational actors of two groups of L2 learners of Spanish, differentiated according to the role of the communicator, tutor or student, as well as the devices used to maintain communication: Head Mounted Display (HMD) or WBC. As for the corpus of analysis, we took a sample of all sessions, consisting of five hours and 39 minutes for the WBC group and six hours and 25 minutes for the IVR group. Regarding the analysis, firstly, we transcribed the corpus from the recordings. Secondly, we added it to an Excel file, where it was divided into turns and labelled. Finally, we loaded all data to SPSS for statistical analysis.

Regarding the second specific objective, we intended to go in-depth, from a qualitative perspective, about how the perception of copresence could be related to the device employed. We considered that the use of WBC or the HMD could promote different ways of interacting with the environment and with the rest of

the communicators, which could be reflected in the perception of copresence. To accomplish this objective, a content analysis of the semi-structured interviews[3] was carried out, eight with volunteers belonging to the IVR profile and two to the WBC profile. As for the data process, we transcribed the interviews and loaded them to Atlas.ti 8, where a content analysis was realised.

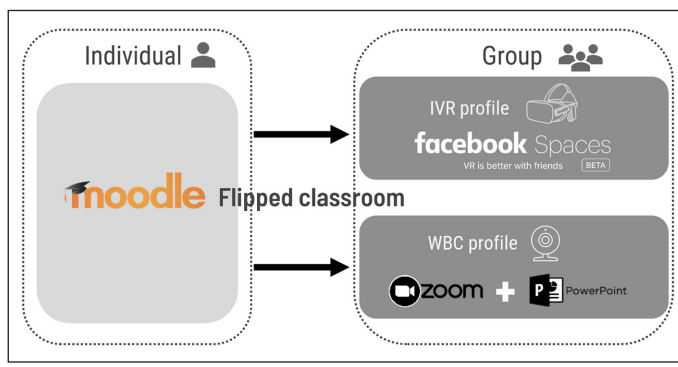
2.2. Participants

We planned two profiles (IVR and WBC) depending on the device used. Each profile would have three groups with three members each, for a total of 18 volunteers plus an extra pilot group for the IVR profile. However, we had difficulties finding students for the WBC profile, and finally, we could only create one group formed by two members.

2.3. Course design

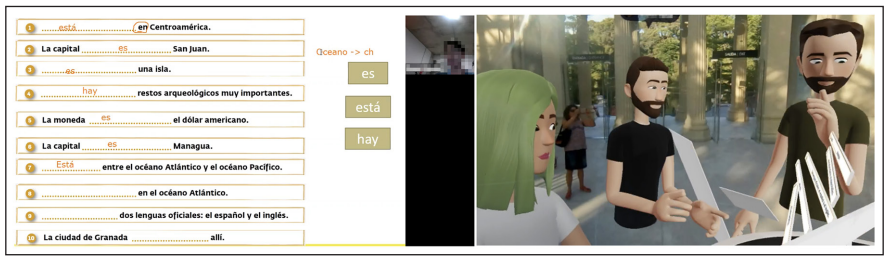
We designed an A1.1 Spanish online course with approximately 32 hours that followed the flipped methodology. The course was divided into two parts (Figure 1): the first one, an individual practice on a Moodle platform; and the second one, composed of interactive activities that took place in a virtual environment of synchronous communication – Facebook Spaces (IVR model) or Zoom, used in conjunction with PowerPoint (WBC model). It is important to note that each student participated from home with their device. In Figure 2 we can see an example of the lessons in both environments.

Figure 1. Course diagram



3. Script available at: https://www.iris-database.org/iris/app/home/detail?id=york:939552

Figure 2. Grammar exercise with WBC and IVR groups



3. Results and discussion

3.1. First specific objective

An analysis of a contingency table was used (Table 1) for the verification of this objective.

Table 1. Contingency table speaker-listener*device

		Device		Total
		IVR	WBC	
Student-student	Count	413	194	607
	% within Device	10.4%	6.3%	8.6%
Student-class (tutor+student)	Count	466	198	664
	% within Device	11.7%	6.4%	9.4%
Student-tutor	Count	1,388	1,271	2,659
	% within Device	34.8%	41.0%	37.5%
Tutor-student	Count	908	1,002	1,910
	% within Device	22.8%	32.3%	27.%
Tutor-class (student+student)	Count	808	436	1,244
	% within Device	20.3%	14.1%	17.6%
Total	Count	3,983	3,101	7,084
	% within Device	100%	100%	100%

This table shows that the participants who used IVR as a medium have higher percentages in the categories ‘student-student’, ‘student-class’, and ‘tutor-class’. On the other hand, the users who used the WBC show higher percentages in the categories ‘student-tutor’ and ‘tutor-student’. This seems to indicate a greater tendency for bidirectional interactions to occur between the tutor and the student if the device used is WBC. On the other hand, in the case of using the IVR, the

messages seem to be more group-oriented or more one-to-one, but between students. This interpretation of the percentages was corroborated by an analysis of the residual errors (Table 2).

Table 2. Corrected typified residuals speaker-listener*device

	Device	
	IVR	**WBC**
Student-student	6.1	-6.1
Student-class (tutor+student)	7.6	-7.6
Student-tutor	-5.3	5.3
Tutor-student	-9	9
Tutor-class (student+student)	6.8	-6.8

Finally, we decided to check the strength of the relationship between the device and the communicative actors with Cramèr's V, which yielded a result of 0.169. This value indicates an existing, although low, relationship. In conclusion, we can affirm that the device used is related to oral interactions. These results invite us to think that the interaction between communicators of the IVR environment is more natural, more similar to that which can be given in person, an interpretation that is based on our experience as tutors of the lessons.

3.2. Second specific objective

The lack of informants from the WBC profile has impeded our ability to verify whether the sense of copresence of this type of user was lower than those who used the IVR. However, we believe that some observations point in this direction, especially from the assessments of the 'experienced realism' dimension, which measures the subjective experience of realism in the virtual environment (Schuber, Friedmann, & Regenbrecht, 2001). The information collected in the interviews with the IVR volunteers shows that the avatar in Facebook Spaces was able to transfer elements of non-verbal communication in a very satisfactory way, which allowed a more fluid and natural communication and, consequently, a high perception of copresence. This assessment could explain the results observed concerning the first specific objective.

4. Conclusions

With our first specific objective we have proved that using an HMD in an IVR environment encourages oral interactions between students in a more effective

manner than WBC. As for our second specific objective, it was not possible to contrast it; nevertheless, we found two relevant observations:

- the students who used the HMD state that the main factor to have a copresence feeling is the capability to receive/transmit non-verbal elements; and

- the HMD seems to be more suitable, compared to a WBC, to receive/transmit non-verbal elements. Therefore, the HMD could facilitate the oral exchange in a better way. This evaluation could explain the results obtained in the first objective.

If we go back to our main objective, these conclusions invite us to consider that the HMD is more suitable than WBC in the context of an online course where we want to promote oral interactions among participants.

5. Supplementary materials

https://www.iris-database.org/iris/app/home/detail?id=york:939666

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