

ARTICLE



Sentiment analysis in virtual exchange: Comparing lingua franca and L1-L2 synchronous interactions

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Abstract

This study aims to contribute to the growing body of literature examining the socio-emotional and cognitive trajectories of participants in Virtual Exchange (VE). While sentiment analysis has been applied to asynchronous VE interactions and post-exchange written data, its use in analyzing oral interactions within synchronous VE settings remains limited. This research analyzes data from a VE in which Spanish, French, and Irish undergraduates collaborated via videoconferencing. Student dyads interacted using either English as a lingua franca (Spain-France) or bilingually in English and Spanish (Spain-Ireland), and the study examines differences in socio-emotional responses between the two groups. Using LIWC (Linguistic Enquiry Word Count) and supported by content-based qualitative analysis, findings revealed significant increases in word count, positive emotion, affect, and social processes, alongside reductions in negative emotion and anxiety between initial and final interactions. Notably, Group 2 (the L1-L2 group), despite having students with lower proficiency levels in the target language, showed higher results in positive emotion, social, and cognitive processes. This occurred even though they produced fewer words in the L2, highlighting the potential of employing both the L1 and L2 to enhance socio-emotional outcomes in VE.

Keywords: sentiment analysis; socio-emotional skills; virtual exchange

Language(s) Learned in This Study: English, Spanish

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Introduction

Sentiment analysis is a prominent technique within the field of natural language processing, whose main purpose is to identify subjective information from a text as related to individuals' emotions, sentiments and feelings towards people, events and/or topics. Over the past two decades, sentiment analysis has been applied to online interactions to better understand the social, emotional, and cognitive dynamics that shape learners' experiences in virtual environments. The current study contributes to a growing body of research using sentiment analysis to examine interactions in virtual exchange (VE) contexts, which have been shown to be particularly emotional environments for language learners (Feick & Knorr, 2022; Fondo & Jacobetty, 2020; Vinagre & Oskoz, 2020). VE is “an umbrella term that defines educational practices or approaches that use online technologies to bring together students situated in different geographical locations and/or from different cultural backgrounds in order to foster intercultural and/or disciplinary learning through sustained interaction and/or collaboration with their distant peers” (Helm, 2024, p.2).

Previous research in this area has highlighted cultural differences in relation to the degree of interpersonal connectedness and the importance of task design in promoting positive attitudes towards VE interaction

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and fostering effective collaboration (Helm & Baroni, 2020). This study explores whether there are differences in the socio-emotional responses of VE participants across three interactions that relate to whether learners were navigating the VE using English as a lingua franca or using their mother tongue (L1) along with a foreign language (L2).

Literature Review

Virtual Exchange

Virtual exchange (VE) stands at the intersection of language learning and intercultural communication, offering opportunities for learners to engage with language and culture in authentic contexts. In today's increasingly interconnected world, intercultural communicative competence is paramount for individuals seeking to navigate global landscapes. VE involves engaging L2 learners in sustained opportunities to collaborate and communicate with online peers, without the constraints of geographical boundaries, and under the guidance of trained facilitators or educators. Through scaffolded activities such as collaborative projects, tasks, and discussions, VE participants can develop linguistic competence while simultaneously gaining insights into their partners' cultural nuances. In this context, research studies have emphasized the transformative potential of VE for L2 learning, highlighting its ability to enhance linguistic proficiency, culture knowledge, and intercultural competence (Rámila & Vinagre, 2023). While offering participants an international exchange experience, VE can also provide the opportunity to foster 21st century employability skills including digital literacy, communication skills, and critical thinking (O'Dowd & Vinagre, 2024). Indeed, by engaging in meaningful interactions with peers from diverse linguistic and cultural backgrounds, learners can expand their communicative repertoires and develop strategies for effective intercultural communication (Helm, 2024). Moreover, research indicates that VE experiences can foster motivation and autonomy in language learners, as they navigate real-world communication challenges and actively engage with authentic language use (Lenkaitis, 2021).

There are different approaches to VE implementation, but generally, they fall into two main categories: (1) educator-led collaborations between multiple classes and (2) pre-packaged VE programs facilitated by specialized organizations. In this study, the first configuration was followed, bringing together three classes from three different countries to participate in discussions prompted by their teachers, who are also the authors of this paper. The VE was fully integrated into the students' lessons, and vocabulary and topics for the interactions were prepared during the face-to-face sessions with their teachers before meeting their foreign partner. All participants were given credit toward their final course grade for their contributions to the exchange. In the VE, two specific approaches were followed: lingua franca-based VE (English as a Lingua Franca, ELF) and L1-L2 VE (English-Spanish). In the first approach, students communicated using a common L2 shared by all participants who have different L1s. The use of a lingua franca in VE has become increasingly popular and holds significant value in settings where learners with diverse linguistic backgrounds cannot speak each other's L1s and therefore rely on a third language to communicate. In the L1-L2 approach, participants typically alternate between their native languages, providing opportunities for both language production and feedback (Akiyama, 2017). In this context, some studies (van Mulken & Hendriks, 2014) indicate that participants in L1-L2 interactions use different communication strategies and are more effective in realizing communicative goals when compared to those in ELF interactions.

Sentiment Analysis and Virtual Exchange

Sentiment analysis is a technique used in natural language processing that uses algorithms to identify and extract subjective information from a text. This subjective information refers to expressions that describe people's sentiments, attitudes, appraisals, emotions or feelings towards a person, topic, event, and their properties. The application of sentiment analysis to online interaction has been the focus of much research in the last twenty years, with findings that describe the social, emotional, and cognitive processes that affect students in these environments (McCabe, 2017; Oztok et al, 2013). Regarding studies that apply

sentiment analysis to VE, Liaw and English (2014) analyzed the online asynchronous interactions of Taiwanese and French students who used ELF to communicate. Findings revealed that French participants used lower percentages of social words, defined by the authors as words used to talk about the process of communication including those that refer to social roles, relationships and interactions between people, as well as those words that situate speakers in a social context (i.e., relational address, reference to others, or relationship markers). In the online forum, the Taiwanese wrote more about their family, friends, and other people than their French counterparts, suggesting a higher degree of interpersonal connectedness. However, as online interactions intensified, all participants developed interpersonal relationships with each other. Along these lines, Helm and Baroni (2020) analyzed a sub-corpus of an extensive written dataset produced by participants in the context of the EVALUATE project. Adopting a content analysis based on the principles of Grounded Theory (Charmaz & Belgrave, 2018) as their primary methodological approach, and supported by sentiment analysis using the LIWC (Linguistic Inquiry Word Count) software, the authors drew on the participants' reflective journals to explore their emotional responses in VE. They identified some general trends regarding the emotional journey of the learners and found that most participants' attitudes were oriented towards similarity to facilitate task completion while they avoided the risks of critical episodes, and very few displayed evidence of curiosity and interest in exploring cultural diversity or divergences in opinion.

Other studies have explored attitude in VE discourse by applying Appraisal Theory to data analysis (Oskoz & Gimeno-Sanz, 2019; Ryshina-Pankova, 2018; Vinagre & Corral, 2019; Vinagre & Oskoz, 2020). In these studies, the participants' written contributions were analyzed according to the semantic resources used to negotiate affect, judgments, and valuations. Findings from these studies suggest that participants in VE tend to choose mostly positive affective language, and this choice supports the need to create a close and friendly atmosphere for effective collaboration and learning to take place. Oskoz and Gimeno-Sanz (2019) corroborate these findings, showing that learners prefer to use positive affective, judgment, and appreciation markers, which suggests their interest in creating an environment of solidarity and closeness with their VE partners. In another study, Vinagre and Oskoz (2020) suggest that despite observable cultural discourse differences between participants from different countries, when interacting online in VE, participants tend to adopt and integrate each other's pragmalinguistic discourse patterns. Finally, the impact that the topic of discussion has on participants' discursive practices in VE has also been investigated, suggesting that topics that encourage learners to base their contributions on evidence to move beyond their personal and emotional viewpoints, may help them uncover new perspectives (Oskoz & Gimeno-Sanz, 2019; Vinagre & Oskoz, 2020).

Even though sentiment analysis in VE has become more prominent in the last few years, to the authors' knowledge, only one study (Vinagre & Giralt, 2019) has applied sentiment analysis to the participants' oral interactions in synchronous VEs. The authors analyzed 30 oral interactions from 10 Spanish and Irish university students (five dyads), randomly selected from a total of 86 participants, who engaged in VE via videoconferencing. Using LIWC as a tool for analysis, their preliminary findings showed that the results for word count, affective, and cognitive processes increased for the Spanish students (English L2) during the VE, while for the Irish students (Spanish L2) whose level of competence in the foreign language was lower, the increase was present only for the affective and cognitive processes categories.

Linguistic Inquiry Word Count (LIWC) and Sentiment Analysis in VE

Although there are various lexicon-based tools available for sentiment analysis (i.e., Linguistic Inquiry and Word Count (LIWC), SentiStrength, and Sentiment Analysis and Cognition Engine (SEANCE)), LIWC was adopted in this study since previous research in the field has used this tool for data analysis (Guth & Helm, 2017; Helm & Baroni, 2020; Rámila & Vinagre, 2023). LIWC is a text analysis software program that counts the words in a text according to specific dictionaries that have been developed to capture people's social and psychological states (Pennebaker et al., 2015). It operates on the premise that the language we use reflects our thoughts, feelings, and personalities. In LIWC, there are over 80 categories that include basic linguistic measures such as frequency of content words (i.e., nouns, verbs,

adjectives, and adverbs), in addition to function or style words (i.e., articles, prepositions, auxiliaries, and pronouns) that are used for analysis. From a psychological perspective, content words carry the substantive meaning of a message by conveying ideas, objects, actions, and qualities. In contrast, style words provide the grammatical framework that links content words together and signal how ideas relate to one another. While content words answer the question of what is being communicated, style words reveal how it is being communicated, reflecting the speaker's relational stance, shared knowledge, and psychological or social orientation (Tausczik & Pennebaker, 2010).

When analyzing a text, LIWC counts the frequency of words according to the words in the dictionaries and places them into different emotion categories, offering a quantitative measure of the emotional content in the text. For example, the appearance of words such as 'love', 'nice' and 'excited' would contribute to a higher score in positive emotion, while words such as 'angry', 'hate' or 'upset' would contribute to increasing the score in negative emotion. Regarding cognitive processes, they are related to the construction of meaning through sustained reflection: "Reflection is marked linguistically by insight and causal words, for example, acknowledge, admit, aware (insight) and because, effect (causal), and cognitively complex thinking is marked by differentiation (hasn't, but, else)" (Guth & Helm, 2017, p. 17). Therefore, for the purpose of the current study, the following categories were included in the analysis:

- *Word count* (an indicator of sustained interaction, Schrire, 2006)
- *Affect, Positive emotion, Negative emotion* (emotional responses and attitudes toward interaction, Johnson & Sinatra, 2013)
- *Cognitive process* (an indicator of the extent to which learners are able to construct and confirm meaning through sustained reflection, Garrison, 2017)
- *Social process* (which corresponds to the manifestation or feeling of learners' ability to identify with the group, communicate openly in an atmosphere of mutual trust, and gradually build personal and affective relationships, Garrison, 2017)
- *Anxiety* (a negative emotion that may hinder cognitive or social learner engagement in the tasks or the interaction with their peers, Halverson & Graham, 2019).

Simon and Schug (2025) recently have reported initial levels of anxiety in VE that tended to subside as the interactions developed. Nissen et al. (2025) also suggest that there is a relation between social processes (social presence) and anxiety in VE, with results showing that the scores for initial anxiety are inversely proportional to several scores for social presence. Nissen and colleagues found that the higher the initial anxiety, the lower the scores for several items linked to social presence.

To corroborate or refute these claims, and given the scarcity of studies that analyze sentiment in oral synchronous VE interactions, the present study aims to investigate the socio-emotional responses of students participating in the Erasmus+ Virtual Exchange-Spain, France, Ireland (EVE-SFI). The study examined the linguistic realizations present in the three interactions (video recordings) held in the VE. The following research questions (RQs) guide the present study:

RQ1: Are there any differences in the socio-emotional response of participants over time across the three interactions performed in the VE?

RQ2: Are there any differences in the socio-emotional response of participants from Group 1 (students using English as a lingua franca) and Group 2 (students using the L1 and the L2) across the three interactions performed in the VE?

To investigate if there are any significant socio-emotional differences between the students in Group 2 (L1-L2) from UAM with higher competence levels (B2-C2) and those from UL with lower competence levels (B1-B2), RQ3 was formulated as follows:

RQ3: In Group 2 (students using the L1 and the L2), do students with higher language competence (B2-C2) differ in their social-emotional responses from those with lower competence (B1-B2)?

Methods

Project Context

The data for this study was collected from the EVE-SFI higher-education VE. The exchange brought together 88 undergraduates who enrolled in foreign language programs at Universidad Autónoma de Madrid (UAM, $N = 49$), Université Clermont Auvergne (UCA, $N = 11$), and University of Limerick (UL, $N = 28$), and its primary aim was to develop the participants' L2 speaking and interaction skills.

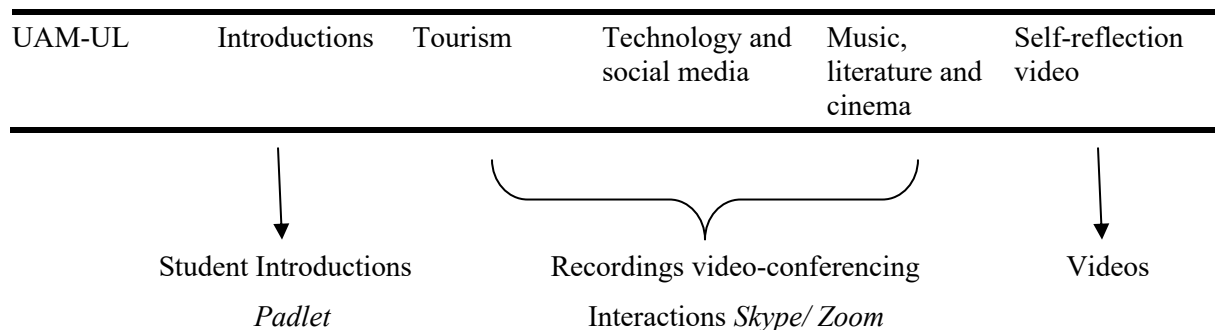
The students were 71 females and 17 males, and out of these, 20 (17 females and three males) were selected randomly to participate in the study. The proficiency level of the foreign language of students at UAM and UCA was between B2 and C2 based on the CEFR, while the proficiency level of the foreign language of students from UL was mostly B1–B2. All the proficiency levels were measured by the entry exams at the students' respective universities. Over six weeks, the students collaborated in partnerships paired randomly to carry out five interrelated tasks that followed the progressive model (O'Dowd & Lewis, 2016) of VE task design. The first task was an information exchange task (icebreaker) in which participants had to introduce themselves on *Padlet*. In subsequent weeks, they had three 20-minute interactions on topics that were directly related to their course content (comparison and analysis task type) via videoconferencing (*Skype* or *Zoom* as per students' choice), using either ELF (UAM-UCA, Group 1) or the L1 and L2 (Spanish and English for UAM-UL, Group 2). The last task was a self-reflection video in which the students elaborated on different aspects of what they had learned and the competencies they thought they had improved on during the VE.

Regarding, the content of the three discussion tasks (interactions), the UAM-UCA (Group 1) and UAM-UL (Group 2) VEs shared two discussion topics: (1) tourism and technology and (2) social media. The third topic varied between the two groups in order to align with the course content at each institution: employment for Group 1 and music, literature and cinema for Group 2. This design also allowed us to explore whether having a different topic disrupted the trends observed when both groups discussed the same topics. The partner teachers provided discussion question prompts on the selected topics that were shared by all participants in the two groups. The interactions were initially prepared in face-to-face sessions, scaffolded by the instructors, although this preparation differed depending on the institution. At UAM and UCA, students prepared for interactions through thematic content and vocabulary activities. At UL, the topics discussed during the interactions were first practiced in the face-to-face lab lessons, which focused on developing aural skills through listening exercises. Across all institutions, face-to-face sessions also served as opportunities to debrief the interactions and address linguistic, intercultural, technical, and organizational issues. For example, at UAM, students analyzed their recordings of interactions individually, looking for improvements in their use of specialized vocabulary and communicative skills. At UCA, students reviewed recordings of their interactions to assess their language level by identifying examples of complex structures, phrasal verbs, or idiomatic expressions they used, as well as words or phrases they used inappropriately. At UL, students discussed in groups about the positive impact of the interactions with a native speaker focusing on language gains, (inter)cultural learning, and improving confidence. See [Table 1](#) for all tasks in the VE, and guidelines for the three interactions and the self-reflection video in [Appendix A](#) and [Appendix B](#).

Table 1

Summary of Tasks and Technologies Used (modified from Vinagre et al., 2020)

	Task 1	Task 2: Discussion	Task 3: Discussion	Task 4: Discussion	Task 5
UAM-UCA	Introductions	Tourism	Technology and social media	Employment	Self-reflection video



Data Collection and Analysis

Before the VE started, a form was sent to all participants asking them for consent to use the data gathered from the project for research purposes. After the VE finished, only data from those participants who gave consent were included in this study. The data analyzed comprised the screencasts from the three interactions produced by 20 students (i.e., 10 dyads, five from UAM-UCA, Group 1, and five from UAM-UL, Group 2).

The 60 screencasts were anonymized, and personal information was removed and replaced by artificial identifiers that allowed us to link the data back to individuals. The parts in English were transcribed automatically using *Otter.ai*, while those in Spanish were transcribed manually since *Otter.ai* does not recognize Spanish. The English and Spanish transcripts were then checked by the researchers and subsequently verified by research assistants to ensure adherence to the conventions provided by Pennebaker et al. (2015) to prepare oral texts for LIWC sentiment analysis. Two different dictionaries were chosen for the analysis, the English dictionary (2015), already built in the system by default for the data in English, and the Spanish dictionary (2007) which was sent by LIWC at the request of one of the authors, for the data in Spanish.

Results were then normalized (per 1000 words) per interaction to allow for total word count variation. This measure helped account for the fact that students in Group 1 had higher levels of L2 proficiency and also that students in Group 2, in addition to having lower levels of proficiency, were instructed to change to another language after 10 minutes into the interaction, thus producing lower word counts in the L2. Finally, descriptive statistics (raw numbers, means, and standard deviations), test of normality of distribution (Shapiro-Wilk), and t-tests ($p < 0.05$) were applied to establish comparisons between groups and interactions.

To answer RQ1, a quantitative analysis was performed on the transcriptions from the interactions using the LIWC categories word count, affect, positive emotion, negative emotion, social process, cognitive process, and anxiety, and compared over time across interactions. From Group 2, only the participants' L2 data were included in the analysis, so that results were comparable between the two groups. Similarly, to answer RQ2, the same LIWC categories were analyzed and compared across interactions and groups, using only the participants' L2 data. To analyze whether there are differences in the socio-emotional response of participants from UAM with higher-level language proficiency (levels B2–C2) and those from UL with lower-level competence (B1–B2), in their L1 and L2 contributions across the three interactions (RQ3), the same LIWC categories were analyzed using Group 2's full data set (L1 and L2). These categories were then compared per language and institution across interactions.

To enable a layered and richer analysis of the data, a qualitative analysis was performed on the students' self-reflection videos ($N = 20$), which were transcribed using *NotebookLM* and then analyzed following a content analysis approach (Hsieh & Shannon, 2005). This approach entails a comprehensive coding of the data by categorizing it into codes and subcodes. In the case of this study, a deductive approach was followed since the codes were taken from the SOCIEMOVE project codebook (SOCIEMOVE, 2025), an instrument based on the frameworks by López Mondéjar and Tomás Pastor (2017) and Zhou and Ee

(2012), developed to assess socio-emotional skills in VE. The codebook had already been tested and validated, and a new category ‘Impact for the future’ was added by the authors to code all data observed. All participants completed their self-reflections in their L2 (English for UAM and UCA, Spanish for UL). To ensure reliability of coding, one researcher coded all the data in English, a second researcher coded all the data in Spanish, and a third researcher coded 20% of all data. Each response could have multiple codes, and the percentage of inter-rater reliability was greater than or equal to 73% for all variables in the first round. Then, further meetings and discussions were held to ensure that, in cases where discrepancies arose, consensus was reached among the three researchers. Frequency of occurrence was also included in the analysis, and while frequency of occurrence is not necessarily always considered an indicator of significance in qualitative coding, it is nevertheless commonplace in many approaches to qualitative analysis. When reporting on the qualitative data, contributions from participants at UL were translated into English by the authors. The codebook, which presents the findings from the qualitative analysis, can be consulted in Vinagre et al. (2025). Finally, the content of the students’ interactions was checked to provide context to the results from the LIWC analysis when required (RQ3).

Results and Discussion

To answer RQ1, which examined differences in participants’ socio-emotional responses over time across the three VE interactions, total results per LIWC category (word count, affect, positive emotion, negative emotion, social and cognitive process and anxiety) and interaction are shown in [Table 2](#)

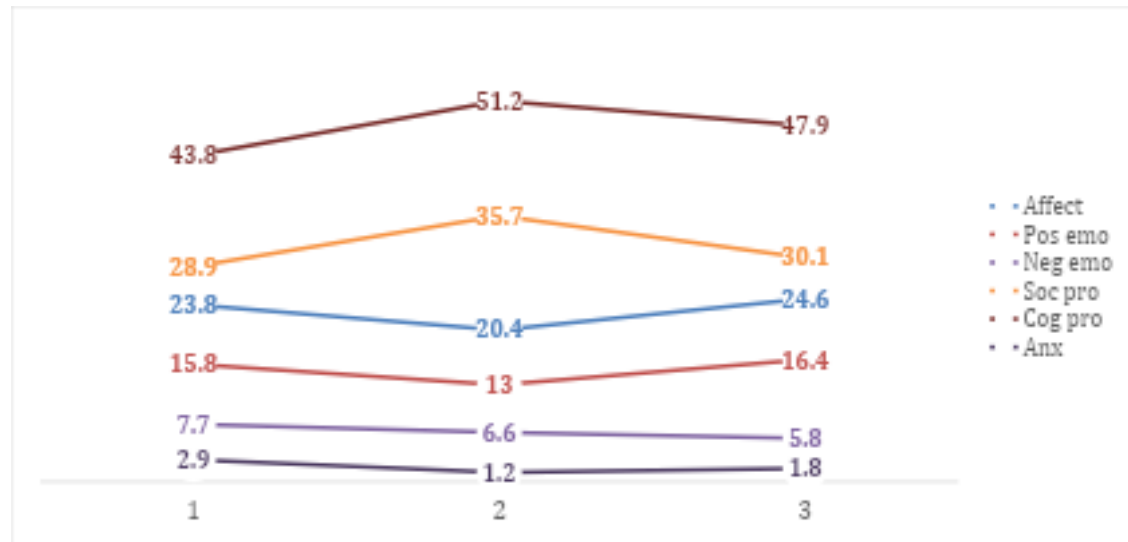
As illustrated, out of a total of 70445 words analyzed, the highest results belong to the category cognitive process (3355 words, 37.7% of all the words in the categories analyzed) which, as mentioned previously, indicates that the participants were able to construct meaning through sustained reflection. Examples from the data include words such as ‘believe’, ‘reality’, ‘remember’, ‘questions’ and ‘problems’. The second highest result was social process (2223 words, 25%) an indicator of the participants’ ability to identify with the group, communicate openly, and build personal and affective relationships (Garrison, 2017). Some examples are ‘mother’, ‘family’, ‘friend’, ‘people’ and ‘our’. In third place, the category affect is found (1623 words, 18.2%) closely followed by emotion (1543, 17.3%). Within this last category, the participants used mostly positive emotion (1068 words, 12%) and less negative emotion (475 words, 5.3%). Examples of affect and positive emotion include ‘good’, ‘united’, ‘kind’, ‘interested’, and ‘tolerant’, while examples of negative emotion include ‘fear’, ‘attack’, ‘terrorists’, ‘alone’, and ‘assault’. Finally, the lowest result is for the category anxiety with 143 words (1.4%). Some examples in this category are ‘fear’, ‘obsessed’, ‘worried’, ‘stressed’, and ‘stressful’.

When comparing total results per interaction, a slight increase can be observed in the results for word count (23946 versus 23878), and the categories affect, positive emotion, social and cognitive process, and a decrease in the results for negative emotion and anxiety in the results of Interaction 3 when compared to those of Interaction 1 (see [Figure 1](#)). These findings would suggest that there is a relationship between social process and anxiety in VE, along similar lines as those indicated by Nissen et al. (2025). In the present study, social processes, affect, positive emotion, and cognitive processes increased over time, whereas negative emotion decreased. This pattern suggests an inverse relation among these categories (i.e., social processes, affect, positive emotion and cognitive processes increase, as anxiety and negative emotion decrease over time). These findings would suggest that sustained interaction over time (cognitive process) in an atmosphere that is conducive to building close and affective relationships (social process, affect, positive emotion) may contribute to lower anxiety and negative emotion responses in VE

participants, therefore supporting findings that indicate that students experience some anxiety during the beginning of a VE, which may decrease once they better know their partner and their culture (Háhn, 2021; Simon & Schugs, 2025).

Figure 1

Development of LIWC Categories over Time (Interactions 1–3)



Results for Interaction 2 showed an increase in cognitive and social processes with a decrease in number of words (word count), affect, positive emotion, and anxiety when compared to the other two interactions, and also negative emotion (when compared to Interaction 1). Despite obtaining lower results in affect and positive emotion, the interaction had a positive impact on the participants' cognitive and social processes since scores for these two categories increased while anxiety decreased (the lowest score out of the three discussions). This increase is likely due to the nature of the topic of discussion (technology and social media), since students used abundant cognitive process words related to communicating with others through different apps ('meet', 'think', 'different', 'question', 'feeling', 'understand', 'imagine', 'mistake', 'want', 'know', 'Facebook', 'Snapchat') as well as others that reflected the social nature of this communication ('culture', 'cultures', 'social', 'hear', 'communicate', 'interact', 'people', 'share', 'talking', 'phone', 'friends'), with very few anxiety-related words in their interactions, which indicates they felt at ease and enjoyed the task. This interpretation is also supported by the content in participants' self-reflection videos: "I love uh I have uh enjoy the second one uh because uh the technology topics was uh my favorite my favorite subject" (UCA5); "She was very easy to talk to and I thought she was a very charming girl. The task I liked the most was talking about technology" (UL1). Findings from Interaction 2 would suggest that, regardless of the results in the positive emotion and affect categories, anxiety still lowers when results in social and cognitive processes are high. Another explanation, given the higher results from Interaction 3 when compared to those from Interaction 1, would be to suggest that for the categories of affect and positive emotion to increase, working with the partner over time is required.

The qualitative data supports the quantitative findings that showed higher levels of anxiety and negative emotion, and lower levels of social engagement in the first interaction. Several participants described feeling "uncertain" or "uncomfortable" at the beginning of the VE due to the unfamiliar learning context. One participant mentions: "the first one [interaction] was the task in which I didn't really enjoy that much...I didn't really know how this would come out to and if I was doing it right or wrong" (UAM3-UCA). This perception was also shared by one participant as pertaining more to the uncertainty regarding the interaction than to not knowing their partner: "there was still some stress during the first task because we didn't really know how it was going to go so there was this kind of apprehension, but not the kind

Table 2*Total Results per Category and Interaction*

Categories	Interaction 1			Interaction 2			Interaction 3			Total words 70445			
	Total	Mean	SD	Total words *Note 1	Mean	SD	Total words *Note 2	Mean	SD		Total words *Note 3		
Affect	569 (35%)	28.45	12.5	23.8	463 (28.5%)	23.15	9.43	20.4	591 (36.4%)	29.55	10.56	24.6	1623 (18.2%)
Positive emotion	379 (35.4%)	18.95	8.40	15.8	296 (27.7%)	14.8	6.28	13	393 (36.7%)	19.65	6.86	16.4	1068 (12%)
Negative emotion	186 (39%)	9.3	6.36	7.7	150 (31.5%)	7.5	4.35	6.6	139 (29.2%)	9.5	5.57	5.8	475 (5.3%)
Social process	691 (31%)	34.55	13.79	28.9	809 (36.3%)	40.45	12.96	35.7	723 (32.5%)	36.15	14.85	30.1	2223 (25%)
Anxiety	70 (48.9%)	3	2.95	2.9	29 (20.2%)	1.45	1.62	1.2	44 (30.7%)	2.2	1.76	1.8	14 (1.4%)
Cognitive process	1047 (31.2%)	52.35	16.47	43.8	1160 (34.5%)	58	15.8	51.2	1148 (34.2%)	36.15	14.85	47.9	3355 (37.7%)
Total	2942			2907					3038				8887

Note 1. 23878/ Rate per 1000 words; Note 2. 22621 / Rate per 1000 words; Note 3. 23946 / Rate per 1000 words.

where you don't know the person in front of you" (UCA3). Participant UAM-UL1 expressed how this affected the interaction: "I was very nervous and I didn't know what to say. I didn't have that little bit amount of time to calm down and I was very nervous and I got vlogged and I couldn't express myself." Similarly, students described the first task as the least enjoyable, explaining, "I think the first task is the one I *have [did] not enjoy because it was the first. It was new and um it was a little cringe. The only task I found most difficult" (UCA5) or "Task 1 is the most difficult for being the first" (UL3). These reflections underscore the initial socio-emotional challenges participants faced in VE and support the quantitative findings for these three categories in Interaction 1 when compared to those in Interactions 2 and 3.

As participants progressed in the VE, they developed growing ease and familiarity with each other, a finding that is also reflected in the content from the participants' self-reflection videos, and which supports the increase in the quantitative results for the categories affect, positive emotion, and social processes over time. One participant observed that "it [the VE] really helped us be more comfortable with each other and not be stressed" (UCA3), while another describes that "after the second and the third [interaction] it was uh more more *avenant [pleasant] and so it [the interactions] became more informal and more nice" (UCA5). As the VE advanced, the comfortable social environment and the lower anxiety levels seem to have facilitated participants' ability to feel more confident and overcome their shyness and lack of confidence when speaking in their L2: "I know that I'm very shy and this experience has helped me to express myself and explain my ideas. It is not easy to exchange with somebody but I did it and it was not that difficult" (UL3) and "I am quite shy when I speak to a native of Spanish (...) but I learnt to overcome this and speak with confidence" (UL1). Reflecting this growing confidence, one participant remarked that "it's not so difficult to start talking to people from other cultures" (UAM4-UL), highlighting the VE's role in facilitating intercultural interaction.

To answer RQ2 (Are there any differences in the socio-emotional response of participants from Group 1 (students using ELF) and Group 2 (L1-L2) across the three interactions performed in the VE?), results from the LIWC categories compared per interaction and group are shown below (Table 3, Figure 2, Table 4, Figure 3, Table 5, and Figure 4).

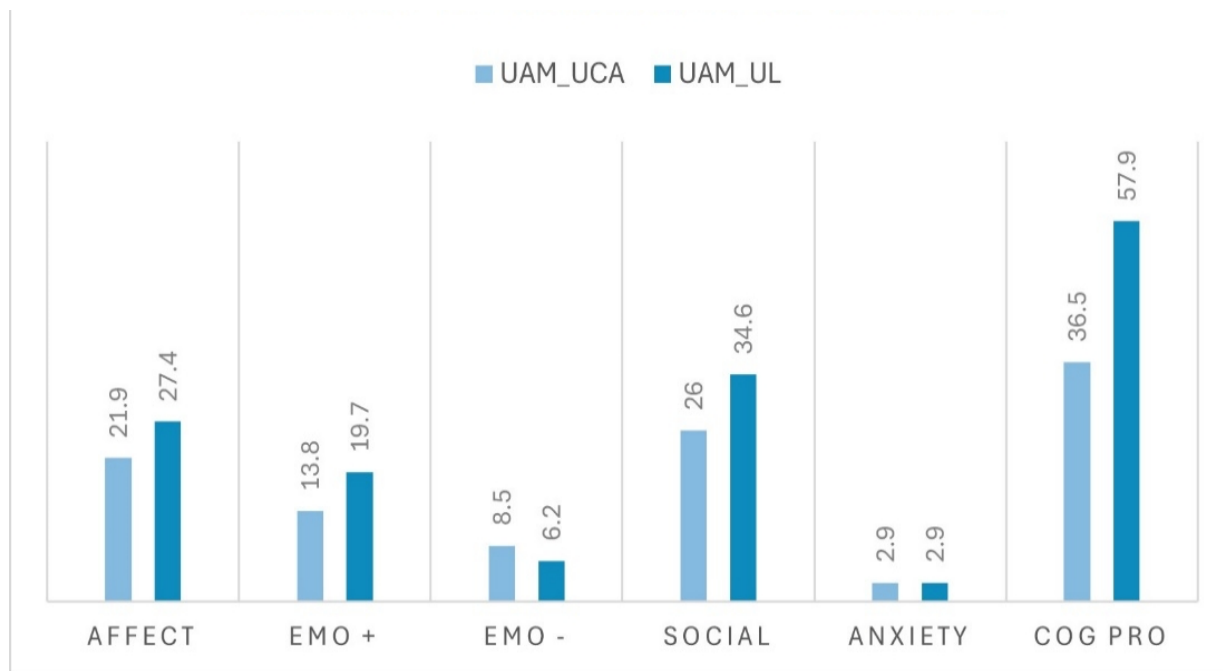
Table 3*Group Comparison for Interaction 1*

Categories	Group 1: UAM_UCA Interaction 1			Group 2: UAM_UL Interaction 1			Total per category (1895 total words)	t-test		
	Total	Mean	SD	Total words 15730/ Rate per 1000 words	Total	Mean			SD	Total words 8148/ Rate per 1000 words
Affect	345 (60%)	34.5	11.12	21.9	224 (40%)	22.4	11.2	27.4	569 (30%)	* $p = 0.026$ $t = 2.4244$
Positive emotion	218 (57.5%)	21.8	8.08	13.8	161 (42.5%)	16.1	8.11	19.7	379 (20%)	$p = 0.133$ $t = 1.5745$
Negative emotion	135 (72.5%)	13.5	4.90	8.5	51 (27.5%)	5.1	4.72	6.2	186 (9.9%)	* $p = 0.001$ $t = 3.9043$
Social process	409 (59.1%)	40.9	13.9	26	282 (40.9%)	28.2	10.8	34.6	691 (36.4%)	* $p = 0.035$ $t = 2.2815$
Cognitive process	575 (54.9%)	57.5	17.2	36.5	472 (45.1%)	47.2	14.6	57.9	1047 (55.2%)	$p = 0.166$ $t = 1.4437$
Anxiety	46 (65.7%)	4.6	3.20	2.9	24 (34.3%)	2.4	1.5	2.9	70 (3.7%)	$p = 0.065$ $t = 1.9685$
Total	1153				742				1895	

Note. t-test results are statistically significant for specific variables (* $p < 0.05$). $df = 18$ (all categories).

Figure 2

Total Words for Group 1 and Group 2 in Interaction 1



Note. Group 1 = 15730; Group 2 = 8148. Normalized x 1000

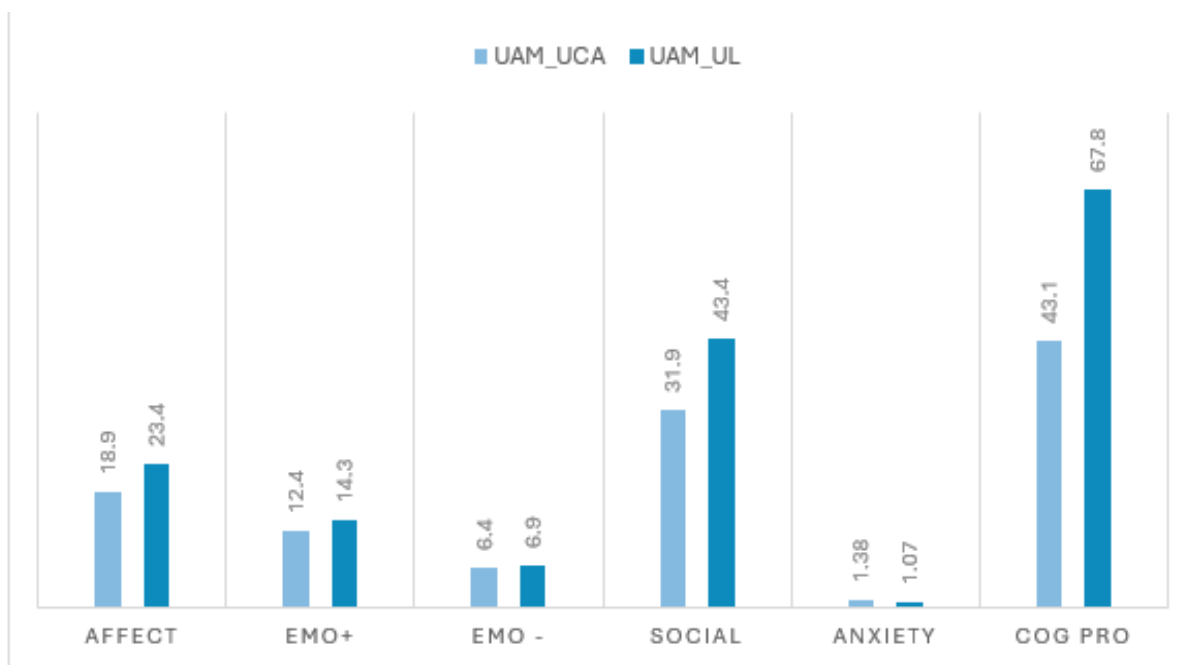
Table 4*Group Comparison for Interaction 2*

Categories	Group 1: UAM_UCA Interaction 2			Group 2: UAM_UL Interaction 2			Total per category (1747 total words)	t-test		
	Total	Mean	SD	Total words 15168/ Rate per 1000 words	Total	Mean			SD	Total words 7453/ Rate per 1000 words
Affect	288 (62.2%)	28.8	8.87	18.9	175 (37.8%)	17.5	6.16	23.4	463 (26.5%)	* $p = 0.004$ $t = 3.3089$
Positive emotion	189 (63.8%)	18.9	5.40	12.4	107 (36.2%)	10.7	4.59	14.3	296 (17%)	* $p = 0.002$ $t = 3.6588$
Negative emotion	98 (65.3%)	9.8	4.44	6.4	52 (34.7%)	5.2	3.25	6.9	150 (8.5%)	* $p = 0.017$ $t = 2.6437$
Social process	485 (59.9%)	48.5	9.59	31.9	324 (40.1%)	32.4	11.72	43.4	809 (46.3%)	* $p = 0.004$ $t = 3.3620$
Cognitive process	654 (56.3%)	65.4	13.38	43.1	506 (43.7%)	50.6	15.99	67.8	1160 (66.3%)	* $p = 0.038$ $t = 2.2447$
Anxiety	21 (72.4%)	2.1	1.79	1.38	8 (27.6%)	0.8	1.31	1.07	29 (1.7%)	$p = 0.080$ $t = 1.8533$
Total	1081				666				1747	

Note. t-test results are statistically significant for specific variables (* $p < 0.05$). $df = 18$ (all categories).

Figure 3

Total Words for Group 1 and Group 2 in Interaction 2



Note. Group 1 = 15168; Group 2 = 7453. Normalized x1000.

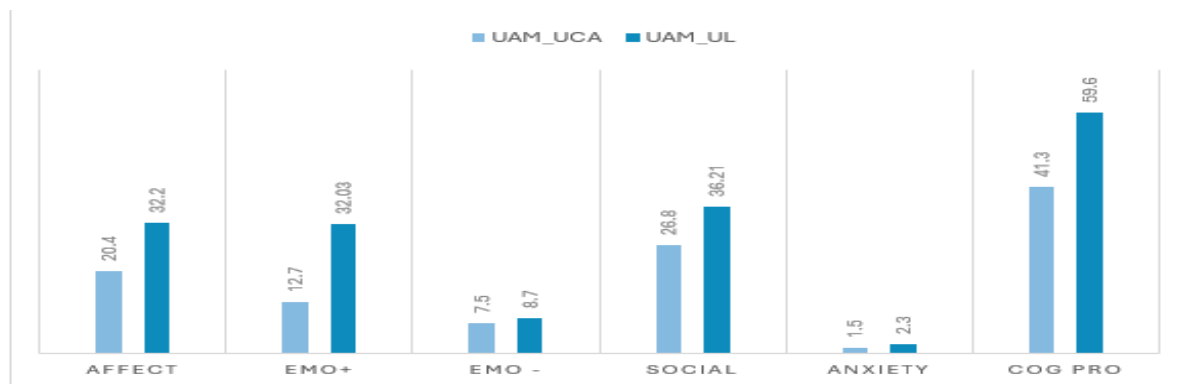
Table 5*Group Comparison for Interaction 3*

Categories	Group 1: UAM_UCA Interaction 3			Group 2: UAM_UL Interaction 3			Total per category	t-test		
	Total	Mean	SD	Total words 15330/Rate per 1000	Total	Mean			SD	Total words 8618/Rate per 1000 words
Affect	313 (52.9%)	31.3	11.77	20.4	278 (47.1%)	27.8	9.49	32.2	591 (30.5%)	$p = 0.474$ $t = 0.7320$
Positive emotion	196 (49.8%)	19.6	7.18	12.7	197 (50.2%)	197	19.7	6.91	393 (20.3%)	$p = 0.975$ $t = 0.0317$
Negative emotion	115 (60.5%)	11.5	6.15	7.5	75 (39.5%)	75	7.5	4.03	190 (9.8%)	$p = 0.103$ $t = 1.7203$
Social process	411 (56.8%)	41.1	14.51	26.8	312 (43.2%)	312	31.2	14.17	723 (37.2%)	$p = 0.140$ $t = 1.5436$
Negative process	634 (55.2%)	63.4	17.49	41.3	514 (44.8%)	514	51.4	13.52	1148	$p = 0.103$ $t = 1.7166$
Anxiety	24 (54.5%)	2.4	1.77	1.5	20 (45.4%)	20	2	1.82	44 (2.2%)	$p = 0.624$ $t = 0.4982$
Total	1059				882				1941	

Note. $df = 18$ (all categories).

Figure 4

Total Words for Group 1 and Group 2 in Interaction 3



Note: Group 1 = 15330; Group 2 = 8616. Normalized x1000

Results per interaction and group showed that students from Group 1 (ELF) produced nearly double the number of words in the L2 compared to students in Group 2 (L1-L2) in all three interactions. This finding is to be expected since students in Group 2 also used the L1 in their interactions, and here, only results from the L2 are presented. However, when comparing the normalized results (rate per 1000 words), students from Group 2 (L1-L2) showed higher results for affect, positive emotion, social and cognitive processes in the three interactions, suggesting that having lower levels of competence in the L2 does not equal producing lower socio-emotional and cognitive responses in VE. To investigate these results further and answer RQ3, results of the LIWC analysis per interaction, language and institution (UAM-UL) are presented below (see [Table 6](#), [Table 7](#), [Table 8](#), and [Figure 5](#) below).

Table 6*Total Results (Interaction 1) per Institution and Language*

Categories	Group 2: UAM Interaction 1			Group 2: UL Interaction 1			Paired t-test
	Total L1	Total L2	Total	Total L1	Total L2	Total	
	Total words 7525=3279(L1_SP)4246 (L2_EN)			Total words 8672= 4734(L1_EN) 3983(L2_SP)			
Affect	89 (40.6%)	130 (59.4%)	219	105 (52.7%)	94 (47.3%)	199	$p = 0.430$ $t = 0.8771$
Positive Emotion	62 (40%)	93 (60%)	155	73 (51.7%)	68 (48.3%)	141	$p = 0.506$ $t = 0.7293$
Negative Emotion	13 (28.8%)	32 (71.2%)	45	10 (34.4%)	19 (65.6%)	29	$p = 0.266$ $t = 1.2914$
Social process	137 (49.6%)	139 (50.4%)	276	147 (50.6%)	143 (49.4%)	290	$p = 0.715$ $t = 0.3919$
Cognitive process	278 (55.9%)	219 (44.1%)	497	176 (41%)	253 (59%)	429	* $p = 0.041$ $t = 2.9849$
Anxiety	2 (16.6%)	10 (83.4%)	12	3 (17.6%)	14 (82.4%)	17	$p = 0.326$ $t = 1.1180$
Total	581	623	1204	514	591	1105	

Note. df = 4 (all categories).

Table 7

Total Results (Interaction 2) per Institution and Language

Categories	Group 2: UAM Interaction 2				Group 2: UL Interaction 2				Paired t-test	
	Total words 6033 = 1942(L1_SP) 4091 (L2_EN)	Mean	SD	Total	Total L1	Total L2	Mean	SD		Total
Affect	54 (36%)	32	10.3	150	91 (53.5%)	79 (46.5%)	34	16.7	170	$p = 0.482$ $t = 0.7741$
Positive Emotion	41 (43.1%)	19	6.0	95	57 (51.9%)	53 (48.1%)	22	9.2	110	$p = 0.372$ $t = 1.0056$
Negative Emotion	13 (28.2%)	9	3	46	20 (51.2%)	19 (48.8%)	7.8	7.5	39	$p = 0.668$ $t = 0.4622$
Social process	104 (38.2%)	55.2	14.4	272	172 (52.4%)	156 (47.6%)	65.6	25.4	328	$p = 0.242$ $t = 1.3720$
Cognitive process	195 (43.1%)	90.4	6.8	452	191 (43.4%)	249 (56.6%)	88	36.7	440	$p = 0.715$ $t = 0.3924$
Anxiety	0 (0%)	1.2	1.7	6	0 (0%)	2 (100%)	0.4	0.5	2	$p = 0.405$ $t = 0.9300$
Total	407	614		1021	531	558			1089	

Note. $df = 4$ (all categories).

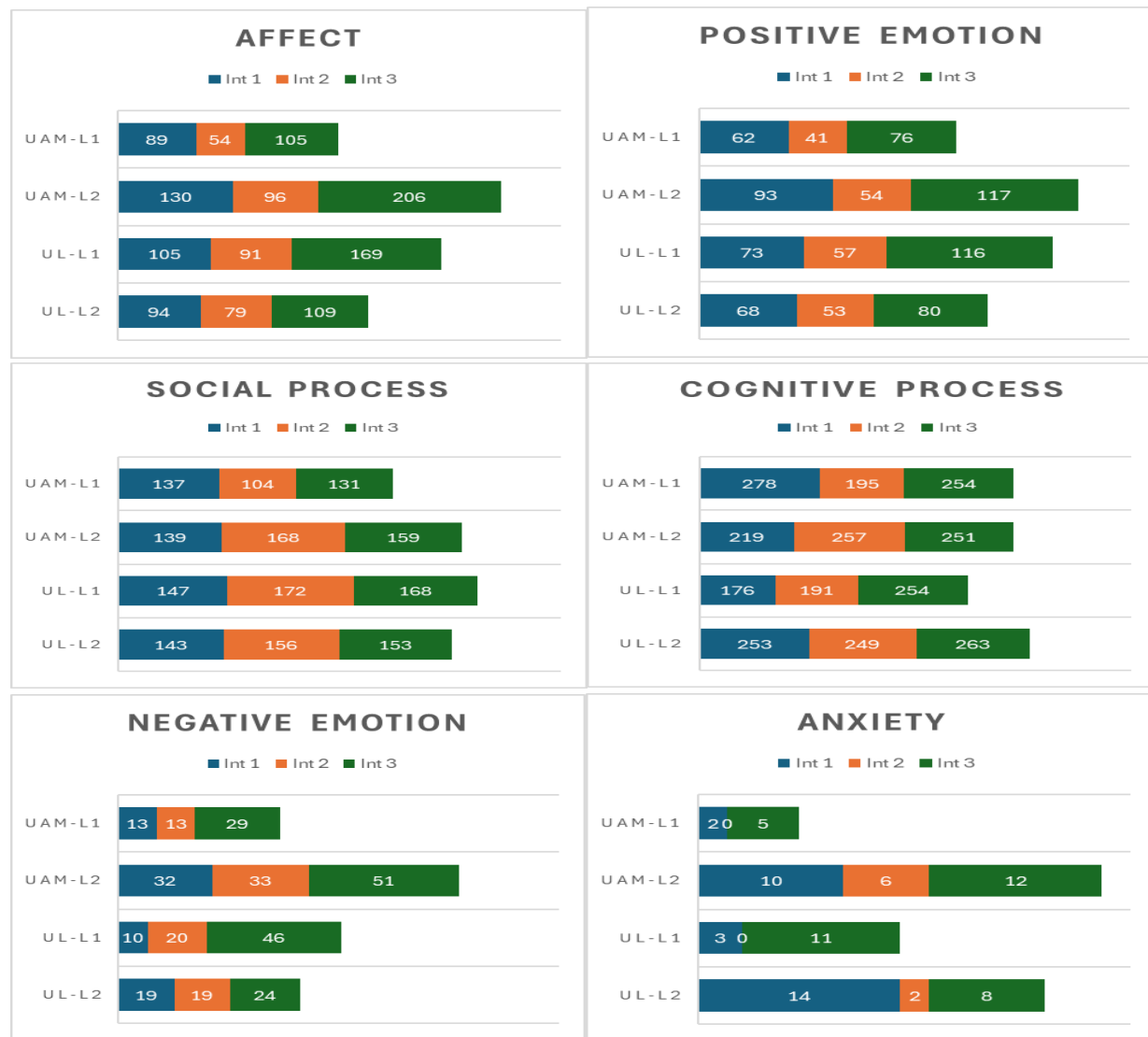
Table 8*Total Results (Interaction 3) per Institution and Language*

Categories	Group 2: UAM Interaction 3 Total words 7656=2891(L1_SP) 4765 (L2_EN)				Group 2: UL Interaction 3 Total words 8728 = 4875(L1_EN) 3853(L2_SP)				Paired t-test		
	Total L1	Total L2	Mean	SD	Total	Total L1	Total L2	Mean		SD	Total
Affect	105 (33.7%)	206 (66.3%)	54.8	10.3	311	169 (60.7%)	109 (39.3%)	55.6	24.8	278	$p = 0.911$ $t = 0.1188$
Positive Emotion	76 (39.3%)	117 (60.7%)	38.6	6.4	193	116 (59.1%)	80 (40.9%)	39.2	13.1	196	$p = 0.857$ $t = 0.1921$
Negative Emotion	29 (36.2%)	51 (63.8%)	16	3.3	80	46 (65.7%)	24 (34.3%)	15	10.2	70	$p = 0.804$ $t = 0.2654$
Social process	131 (45.1%)	159 (54.9%)	56	23.9	290	168 (52.3%)	153 (47.7%)	64.2	34.8	321	$p = 0.248$ $t = 1.3510$
Cognitive process	254 (50.2%)	251 (49.8%)	101	14.1	505	254 (49.1%)	263 (50.9%)	103.4	32.3	517	$p = 0.810$ $t = 0.2571$
Anxiety	5 (29.4%)	12 (70.6%)	3.4	2	17	11 (57.8%)	8 (42.2%)	3.8	2.1	19	$p = 0.717$ $t = 0.3885$
Total	600	796			1396	764	637			1401	

Note. $df = 4$ (all categories).

Figure 5

Total Results for all Categories per Institution and Language (Interactions 1–3)



When comparing total results per interaction, an increase can be observed in the results for word count by students from both institutions (UAM = 7656 versus 7525 and UL = 8728 versus 8672) in the results of Interaction 3 when compared to those of Interaction 1. Similarly, there is an increase in the results of the LIWC categories (affect, positive emotion, social and cognitive process) in Interaction 3 when compared to Interaction 1 for students in both institutions. In general, students from UAM with higher competence levels in the foreign language produced more socio-emotional responses in the L2, while those from UL, with lower competence levels, used the L1 more, probably as a compensation strategy. Being capable of producing socio-emotional responses in the L1 allowed students from UL to be able to match the socio-emotional lexical resources produced by their more advanced counterparts, since results are similar in both institutions with differences proving statistically non-significant.

These results are encouraging since they show that having lower levels of proficiency in the L2 is not a hindrance for students to develop their cognitive processes and socio-emotional responses in

communication, provided an L1-L2 approach is followed in the VE. Recent studies that focus on the value of translanguaging in online oral interactions reveal similar results (Canals, 2023). Using the L1 as a way to compensate when lacking lexical resources in the L2 can help students to communicate effectively with partners who have higher L2 competence levels, without frustrations building up due to failures in communication. Moreover, students from UL, in a similar manner to their counterparts from UAM, increased their production of socio-emotional and cognitive lexical resources in Interaction 3 when compared to 1, suggesting that the use of the L1 does not deter students but rather allows them to develop their lexical resources in the L2 over time.

Regarding anxiety and negative emotion, these categories also increased in Interaction 3 when compared to 1, which would suggest that students in Group 2 did not decrease their anxiety levels over time, especially when producing in the L2. However, after analyzing the content of the students' interactions, this increase actually responds to the nature of one of the topics. Students in Group 1 discussed employability while students in Group 2 discussed music, literature and cinema. It was this last topic that led to a more abundant use of lexical items linked to anxiety and negative emotion: "I cry a lot, like I'm so emotional as well it doesn't matter if it's happy or sad I just cry. Yeah, I remember the first time I cried with a movie was with Titanic you know, because I was just so, it wasn't because I was sad or anything just because I was so frustrated" (UAM2-UL); "They are into scary movies, horror story, horror films, that might be good" (UL5). Also, in their self-reflection videos, students in both groups expressed their sadness at the VE ending and this interaction being their last, which also contributed to the increase in negative emotion totals for this task: "Yeah this is our last call. It's sad. [...] I'm sad as well aw we can still we can still skype and then just like it's fine" (UAM2-UL1).

Conclusion

This study explored whether there were any differences in the social-emotional responses of two groups of VE participants (one using ELF and another using the L1 and L2) in three interactions. The results from the sentiment analysis indicate that there is a relation between social processes and anxiety (Nissen et al., 2025), with anxiety diminishing as social processes increase over time in the VE. One pedagogical implication of this finding is the recommendation that language educators incorporate preparatory conversations addressing learners' initial socio-emotional states prior to their first VE encounters to assuage fears and decrease anxiety levels. This aligns with Hahn's (2021) observation that students often experience nervousness at the outset of such projects and her suggestion that teachers can alleviate these anxieties by "facilitating open discussions about initial emotions" (p. 75). Indeed, it might be interesting to explore, from a pedagogical standpoint, the interest of including such open discussions after each interaction in a VE.

In the present study, social processes, affect, positive emotion, and cognitive processes also increased over time, while negative emotion decreased, suggesting an inverse relation between these categories (i.e., social processes, affect, positive emotion and cognitive processes increase as anxiety and negative emotion decrease over time). Another finding is that students with lower levels of proficiency in the L2 (B1-B2) do not produce fewer socio-emotional responses than their more advanced partners but rather used the L1 as a compensation strategy to communicate successfully in VE. In this case, the use of the L1 does not hinder the production of socio-emotional responses in the L2, as shown in the higher results achieved by these students in Interaction 3 when compared to Interaction 1. Moreover, the specific L1-L2 VE configuration also seems to be a contributing factor, with participants who engaged in this configuration producing higher socio-emotional responses than those in the ELF VE. These findings, which support those of previous studies that suggest that participants in L1-L2 interactions use different communication strategies when compared to those in ELF interactions (van Mulken & Hendriks, 2014), would endorse the application of the L1-L2 configuration as beneficial for participants' socio-emotional development in VE.

Despite these encouraging findings, the study is not without its limitations. The sample size included 20 students out of the 88 that participated in the VE, which only allows the provision of a partial, tentative picture and, therefore, results cannot be generalized. Future research should target large samples with participants with different levels of language proficiency in different languages engaged in both lingua franca and the L1 and L2 configurations to discover if these findings hold in those contexts. This may require a broader reconceptualization of VE data. Specifically, treating data generated through VE projects as a research output in its own right—and enabling the sharing of VE corpora—could significantly reduce the time required for data transcription and extend the scope of future studies (Aranha & Wigham, 2020). The amount and type of preparation at each institution may have also affected results. However, these variables are highly difficult to control given the challenges of aligning different institutions' curricula, class time, and course assessment to integrate VE into the foreign language classroom. Research perspectives could expand the number of interactions to investigate the socio-emotional response of participants over an increased number of interactions and/or longer interactions to corroborate or reveal contrasting findings. Other research could also look at translanguaging to investigate precisely how students with lower levels of competence in the foreign language use their mother tongue as a compensatory strategy. Additionally, employing identical tasks across these language configurations could help tease apart the effects of language choice from topic-related variables, thereby providing a clearer understanding of the factors influencing social-emotional responses in VE.

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Appendix A. Guidelines and Prompts for Interactions

Interaction 1: Tourism

- 1) Once you've both connected, check that you have started the recording software.
- 2) Start by getting to know your partner a little and share a few things about yourself.
- 3) Then, choose among the discussion questions below those that you find more interesting and talk about them with your partner. What are the differences between your two countries?
 - *How important is the tourist sector in your country? What's the biggest tourist destination and what types of tourists does it attract?*
 - *Does your country try to improve domestic tourism or does it promote international tourism (or both)?*
 - *How do you feel about tourists who visit your country? What are some of the benefits and drawbacks?*
 - *As a tourist, is it possible to get to know a country and integrate or do you only superficially visit a country? How can tourists make their trips less superficial?*
 - *People often feel that there is a difference between a tourist and a traveler. What could be some of the differences?*
 - *What intercultural advice would you offer to a tourist visiting your country? Are there any dos or don'ts?*
 - *Have any national or international events had an impact on tourism in your country (e.g. economic crisis, terrorism, natural disasters?) How is the tourism industry trying to recover?*

Interaction 2: Technology and Social Media

- 1) Once you've both connected, check that you have started the recording software.
- 2) Then, choose among the discussion questions below those that you find more interesting and talk about them with your partner. What are the differences between your two countries?
 - *What social media platforms do you usually use? Why do you prefer these ones over others?*
 - *Do you communicate more through social media or face-to-face?*
 - *Do you think people in your culture use a lot of technology in general? Where is used the most (i.e.: school, work, leisure, etc.).*
 - *Do you interact with people from other cultures in social media differently than you do with people from your own culture? Discuss which differences you are aware of (different emojis, more texts, more pictures, more hashtags, etc.*
 - *Do businesses use Social Media in your country? For what purpose?*
 - *Can you imagine a day of your life without social media?*
 - *Do you think the Internet has changed the way we live today?*

Interaction 3: Employment (UAM-UCA, Group 1)

- 1) Once you've both connected, check that you have started the recording software.
- 2) Then, choose among the discussion questions below those that you find more interesting and talk about them with your partner. What are the differences between your two countries?
 - *In general, how many hours a week do you think people work in your country?*
 - *Is there a law in your country about how many hours a week people can work?*
 - *Do you think people work too many hours?*

- *Do you think working longer hours actually means you do more work?*
- *Who do you think works longer hours: men or women?*
- *Which professions do you imagine work more extra hours: managers and professionals or skilled and manual labour?*
- *Why do people tend to work long hours?*
- *What negative things can be caused by working too long?*
- *How would you react if you were told in the job interview that the timetable would include shift work?*
- *How would you react if you were told that you would have to work a lot of overtime?*

Interaction 3: Music, Literature and Cinema (UAM-UL, Group 2)

- 1) Once you've both connected, check that you have started the recording software.
- 2) Then, choose among the discussion questions below those that you find more interesting and talk about them with your partner. What are the differences between your two countries?
 - *What is your favorite genre of movie/type of music?*
 - *Who are some of your favorite actors/singers?*
 - *What kind of movie is best for a date/song?*
 - *Do you cry during movies/when listening to some songs?*
 - *What is the best movie you have ever seen/your favourite song?*
 - *What was the scariest movie you have ever seen?*
 - *How often do you see movies/do you listen to music?*
 - *Do you usually watch movies at the theater or watch them at home?*
 - *Do you go to concerts often? What type of concerts?*
 - *Which is more important, acting or special effects?*
 - *If you made a movie or wrote a song, what would it be about?*
 - *If someone made a movie or wrote a song about your life, what kind of movie or song would it be?*
 - *Do you consume any type of culture (music, cinema, books) in the language that you are studying? Talk to your partner and share this information. What do you prefer: cinema, music or books and why.*
 - *What book/music/film would you recommend from the culture of the language you are studying? And from your own culture? Do your virtual partner know about them?*

Appendix B. Guidelines for Self-reflection Video

Your last task is a video recording of yourself talking about different aspects of the Virtual Exchange and self-assessing your participation.

The questions below can guide you when recording the video. You do not need to talk about all the points if you do not want to, you can include other points that you think are relevant to self-assess your participation in the VE. The video needs to be 5 minutes long.

- *In what ways do you think this project has helped you to learn Spanish/English and to interact in Spanish/English?*
- *In what way do you think this project has helped you to develop intercultural skills?*
- *Out of the three tasks, which task did you enjoy and why? Which task did you not enjoy and why?*
- *Which tasks did you find the most difficult and why?*
- *What problems did you encounter whilst working on the project? How did you solve them?*

- *Did you learn anything about yourself whilst working on this project?*
- *If you had the chance to take part in another telecollaboration project, what would you do differently?*
- *How was the mediated session? Did it have any benefit in preparation for your period abroad?*
- *Do you communicate with your virtual international partner outside the exchanges? (if you do, you can specify which channel –Social Media, email, Skype- and what are the general topics you talk about)*
- *Anything else you want to tell me about the project/ your learning this semester*

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