The Task is in the Text:
Texting and Second Language Oral Fluency

By

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DISSERTATION

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DEDICATION

This dissertation is dedicated to my grandfather and brother.

“When are you gonna get your fud?” was scribbled on the bottom of almost every letter my grandfather mailed me. Thank you for your never ending support and encouragement, and for always believing in me.

The bright moon shone every night and early morning through the window in my office where I wrote this dissertation. Dear brother, thank you for providing a never ending light to guide the completion of this dissertation.

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[1] https://mangolanguages.com/

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ABSTRACT

Text messaging is the most popular form of communication (Lionbridge, 2019; Ceci, 2022), and mobile phone ownership is high, especially among university students (Chen & Denoyelles, 2013). Research on mobile language learning is increasingly found on the forefront of computer-assisted language learning (CALL) (Loewen et al., 2019; Stockwell, 2022), and studies exploring the use of text messaging for language learning is no exception (Cavus & Ibrahim, 2009; Derakhshan & Kaivanpanah, 2011; Kennedy & Levy, 2008; Kim, 2011; Li & Cummins, 2019; Tabatabaei & Goojani, 2012). However, vocabulary studies for English as a Second Language (ESL) tend to dominate the literature (Burston & Arispe, 2022).

As a communication platform, text messaging offers three intriguing characteristics for supporting the development of language learning skills. First, texting allows users to receive input, produce output, and engage in negotiation of meaning, which interactionist theorists say is essential for language acquisition (Blake & Guillén, 2019). Second, while users text back and forth, they work towards a shared communication goal, and engage in a collaborative, communicative activity, which is a necessary component for language learning in a socioconstructivist framework (Arnold & Ducate, 2019). Lastly, text messaging is a hybrid form of discourse in that it includes elements of both spoken and written discourse.

This study reports on the impact of text messaging on second language (L2) oral fluency of non-native speakers of Spanish. We compare pre- and post-treatment speech samples of two groups of learners who carried out weekly communicative tasks either via WhatsApp (experimental group) or Zoom (control group). The results of the mixed methods study (n=20) suggest that text messaging as a modality for language learning may offer some of the same affordances that speaking face-to-face does, especially as it pertains to speech rate (a measurable variable of fluency). Although there were no statistically differences for the other assessment

measures of fluency across the two groups (unique words, total words, pauses, fluency, or percentage of impediment caused by incomprehension), the qualitative measures highlighted more opportunities to practice the Spanish language outside of class, increased opportunities to engage in the language in a low-stress, low-stakes environment, and the partner connection and community building this type of learning supported. The data from this study also offers insight into best practices for task design in communicative language learning activities, particularly, in a mobile environment. Lastly, the data supports previous research that the technological modality needs to align with the learning task itself (Stockwell, 2022).

CHAPTER 1: Introduction: Overview of mobile-assisted language learning, text messaging for language learning, and the present study.

1.1 Introduction: topic and learning challenge

Text messaging is today's most used form of communication (Lionbridge, 2019; Ceci, 2022). Moreover, ownership of internet-enabled mobile phones continues to increase with "more than three quarters of the population own[ing] a mobile device with internet access (GSMA Intelligence, 2019, as cited in Stockwell, 2016, p. 22). In fact, mobile device ownership and mobile learning (m-learning) practices are especially high among university students (Chen & Denoyelles, 2013). A definition of mobile learning that aligns with the themes explored in this dissertation is the concept of "facilitating students' education through personal electronic devices, most commonly smartphones" (Huls, 2022). Beyond supporting language learning, Stockwell (2016) also emphasizes that mobile learning opens up a wealth of interactive and social possibilities that can enrich the learning process quantitatively and qualitatively (p. 12). Research on mobile learning continues to offer support for enhancing learning especially in terms of student engagement:

- more efficient learning, and teaching specific skills and concepts, as well as offering analytics for and about learning (Colin et al., 2021);
- collaborative learning, flexibility, personalization, outdoors inspiration, and cultural authenticity (Kukulska-Hulme & Viberg, 2018);
- and enhanced accessibility and student learning overall (Huls, 2022).

Concerning mobile-assisted *language* learning (MALL), studies in this field are increasingly at the forefront of research in technology-enhanced language learning (TELL) (Burston, 2013; Loewen et al., 2019; Stockwell, 2022). Within MALL theory, two fundamental principles emerge: a) the idea that learning can occur anywhere and b) the presence of GPS and

the ability to interact with one's surroundings (Stockwell, 2016). Among the various topics explored in MALL research, notable themes emerge such as learner autonomy (Loewen et al., 2019), and accessibility and ability to interact with one's surroundings (Stockwell, 2016). Additionally, there is a growing call for further research employing a robust interactionist approach within a MALL environment (Ziegler et al., 2022).

Current MALL research predominantly focuses on English as a target language, with a primary emphasis on vocabulary (Burston & Arispe, 2022). This focus extends to studies on text messaging for language learning (Cavus & Ibrahim, 2009; Derakhshan & Kaivanpanah, 2011; Kim, 2011; Li & Cummins, 2019; Tabatabaei & Goojani, 2012), although a few studies have explored Italian vocabulary vocabulary (Kennedy & Levy, 2008; Levy & Kennedy, 2005). However, other studies have explored non-vocabulary related topics, such as electronic journal dialoguing (Alsaleem, 2013), idioms (Hayati, Jalilifar, & Mashhadi, 2013), negotiation of meaning (Castrillo, Martín-Monje & Bárcena, 2014), and academic proficiency (McSweeney, 2017). These studies still contribute valuable insights to the study of text messaging and language learning, despite not being directly related to oral proficiency. Nevertheless, there exists an opportunity for further contributions in the realm of research on text messaging and language learning, particularly in the exploration of languages beyond English and a broader scope of language skills.

One such language skill is oral proficiency. Considerable research has been conducted in the domain of technology-mediated communication (TMC) and (L2) oral proficiency development (Lin, 2014; Moneypenny & Aldrich, 2018; Morris & Blake, 2022; Payne, 2020; Payne & Whitney, 2002). Scholars have further extended their thinking and blended the topics of oral language proficiency development via TMC to inquire about a potential cross modality transfer effect, exploring practicing language in one modality (e.g. writing) and being assessed in

another modality (e.g. speaking) (Abrams, 2003; Blake, 2009; Beauvois, 1992; 1997; Chun, 1994; Kern, 1995; Kost, 2004; Razagifard, 2012). Payne and Whitney (2002) have pointed towards a transfer effect across writing to speaking, but the need for more research on a cross-modality transfer effect is crucial as TMC environments become more important for language learning.

In the context of the interactive and multimodal nature of text messaging, two essential frameworks support the rationale for utilizing text messaging for language learning: 1) a sociointeractionist framework for second language acquisition (SLA), and 2) the recognition of text messaging as a hybrid form of technology-mediated discourse. First, when interlocutors text back and forth, they work towards a shared communication goal while, at the same time, negotiating meaning, taking turns, and engaging in a collaborative communicative activity. This interaction and collaboration are core components of an interactionist and socioconstructivist framework for language learning, respectively (Arnold & Ducate, 2019; Blake & Guillén, 2020). Second, text messaging is considered by many a hybrid form of discourse, in that it embodies aspects of both aural and written communication (Androutsopoulos, 2006; Crystal, 2008; Herring, 2007; Tagliamonte, 2016). This highly interactive, multimodal form of communication creates a supportive environment to facilitate language learning.

For these reasons, text messaging may create an effective environment to support second language (L2) learning. This paper explores text messaging (TM) within a sociointeractionist SLA framework and proposes a research study designed to help understand the effect that texting in Spanish could potentially have on the development of L2 oral proficiency by non-native speakers.

In summary, drawing on sociointeractionist theories of SLA and treating text messaging as a hybrid form of discourse, we expect to reveal the affordances for text messaging supporting

L2 skill development. Learners may benefit from the interaction and collaboration afforded within this modality, as well as the ability to simultaneously engage in features found in both spoken and written discourse. There is also the added benefit of the ubiquitousness of mobile communication and the level of comfort and familiarity that learners already have with the modality of text messaging. With appropriately designed interactive and collaborative learning tasks, language learners can leverage the text messaging environment as a way to extend language learning outside of the classroom

1.2 The proposed study

This dissertation explores the relationship between written TMC in L2 Spanish and oral proficiency. MORE specifically, this study investigates the impact of text messaging on learners' L2 Spanish oral fluency. It achieves this by utilizing the widely used messaging app WhatsApp[2] as the platform for interactive communicative activities (learning tasks). WhatsApp affords the same communication features mentioned above, such as asynchronous or synchronous communication, added pragmatic and emotional elements via emoticons, and even language play. Engaging in both immediate or delayed turn taking, while also being allowed to see a written transcript of the language produced is beneficial for language learners. WhatsApp allows learners to privately message each other in an end-to-end encrypted platform, as well as easily export their chat to later turn it in as a learning assignment. Further, carrying out learning tasks via a platform such as WhatsApp allows learners to extend their learning outside of the classroom, complete the task when and where it is accessible to them, and develop their own autonomy and pace during their L2 journey. This free and secure messaging platform also features accessibility and convenient submission capabilities.

[2] https://www.whatsapp.com/

Furthermore, when prompted with appropriately designed tasks, WhatsApp's communicative and multimodal environment positions it as a prime tool to test the impact that text messaging might have on L2 skill development. Meaningful tasks designed for language learning should, at a minimum, follow the five requirements listed below (as inspired by Ellis, 2009 and Skehan, 1998):

i. The tasks should focus on meaning and not language form.

ii. There should be some kind of gap that learner(s) is/are trying to reconcile.

iii. Learners should primarily rely on their own linguistic resources to complete the task.

iv. There is a clearly defined task outcome, other than use of the language.

v. There should be some connection to a real-world activity.

Effective task design should also clearly classify task types (e.g. decision-making, info-gap, opinion exchange, etc), consider task sequencing and complexity as integral elements to the design process, and also include clear task phases (e.g. pre-, during, and post-task) (González-Lloret, 2016). In this manner, by thoughtfully incorporating interactive tasks into a WhatsApp communication exchange, learners can draw on the benefits proposed by a sociointeractionist perspective of SLA. Additionally, they can leverage the affordances of text messaging as a hybrid form of discourse to develop L2 language skills, including oral fluency.

The synthesis of these above elements is the crux of this dissertation research, which explores the impact of text messaging via WhatsApp on Spanish L2 oral fluency. This study employed a mixed-methods approach, with both quantitative and qualitative measures. Over the course of the study, all participants completed weekly Communication Activities (learning tasks) either via WhatsApp (treatment group) or via Zoom (control group). For quantitative data, all participants completed pre- and post-treatment speech elicitation tasks to account for the impact

of the treatment on measures of fluency, as measured by speech rate, total words, unique words, and total pauses. For qualitative measures, questionnaires and exit interviews were employed to understand the experience and perceptions of the study participants. The participants were high beginner learners (n=20) of Spanish over the course of two 10-week academic sessions.

1.3 Research Questions

This study explored how WhatsApp messaging impacts L2 oral fluency. We tracked certain finite measures—such as total words, unique words, speech rate, and total pauses– as well as learner and instructor perceptions of language learning via text messaging and mobile devices in a semi-structured naturalistic environment. The following research questions were addressed:

- Research Question 1: What is the relationship between text messaging and oral fluency, as measured by 1) total words, unique words, and speech rate? 2) number and duration of pauses? 3) percentage of impediment of pronunciation in comprehensibility? 4) turn-taking?
- Research Question 2: What are the learners' and instructors' perceptions about…
    a. …the relationship between their L2 texting behavior and their L2 oral fluency?
    b. …language learning via a mobile device in a semi-formal learning environment?
    c. …task design of the communicative activities?

1.4 Scope of the present study

Although the present mixed-methods study offers insight into specific fluency variables (quantitative results) and learner attitude and experience with mobile-assisted language learning (qualitative results), for reasons discussed in Section 7.1 the present study is limited in nature

and further research should be employed for further contribution to the relevant scholarship. For example, the field would benefit for the study to be duplicated with a much larger participant pool, as well as to track the learners through further study, adding longitudinal information to the data.

1.5 Dissertation overview

The dissertation is organized into seven chapters: Chapter 1 provides an introduction and overview to the dissertation study. In Chapter 2 we provide an in-depth review of the research on mobile-assisted language learning and text messaging for language learning, as well as a theoretical justification for drawing on sociointeractionism and considering TMC as a hybrid form of discourse. In Chapter 3 we outline the study's methodology, including a detailed description of the participants, curriculum, and course details, task design, research design, data collection, and assessment measures. Chapters 4 and 5 provide the data analysis and results for the quantitative and qualitative analysis, respectively. In Chapter 6 we discuss the results presented in the preceding sections. Finally, chapter 7 concludes the dissertation by presenting study limitations, implications for teaching and future research.

CHAPTER 2: Theoretical Framework and Review of Research

2.1 Introduction

The following section first provides an overview of a sociointeractionist perspective of second language acquisition (SLA), highlighting the essential components as they pertain to a technology-mediated communication (TMC) environment, specifically mobile devices and text messaging. Second, the chapter offers a look at the topic of the cross-modality transfer effect in a TMC environment and presents relevant literature, especially in regards to text-based TMC L2 language practice and oral assessment. Third, we discuss the research that deals with mobile-assisted language learning (MALL), more specifically text messaging for second language (L2) language skill development and learner and instructor perceptions. The following section constitutes a brief overview of task-based communication activities and their justification for incorporating them into this study. Finally, we conclude by proposing the viability of technology-mediated communication as an efficient and attractive modality for enhancing L2.

2.2. Second language acquisition, sociointeractionism, and text messaging

Researchers in second language acquisition agree that interaction is an essential element for second language acquisition and development to occur (Ziegler et al., 2022). More specifically, interactionist theories of second language acquisition espouse the view that second language learning is best accomplished through social interactions (Blake & Guillén, 2020). Building on that viewpoint, SLA socioconstructivists concur that language learning is supported through the collaboration and co-construction of meaning between two or more interlocutors (Arnold & Ducate, 2019). While interactionist and socioconstructivist theories of second language acquisition require no additional validation, applying these theories as a framework to guide contemporary research is a valuable endeavor. This is especially true due to the highly

dynamic and rapidly evolving world of technology-mediated communication (TMC). In this specific context, our focus is text messaging. In this dissertation we argue that text messaging is a form of TMC that fulfills the tenets of both interactionism and socioconstructivist theories of language learning, thus capitalizing on a conceptual framework that synergistically integrates both perspectives. Accordingly, the term sociointeractionist/-ism will be used throughout the paper to elucidate both theories conjoined into one.

In general, interaction refers to both interpersonal and intrapersonal activities that are a product of face-to-face communication (Lin, 2014). Studying the interpersonal interaction and communication between humans, in this case language learners, can help provide insight into the process of interaction– the process of L2 learning– rather than simply gauging the end product, what learners have already learned (Ellis, 1999; Lin, 2014). Many SLA scholars have endorsed the use of TMC for language learning due to its ability to create environments prime for communicative interaction (Ziegler et al., 2022), which also offer authentic social, communicative context which reflects face-to-face communicative environments (Lin, 2014).

The interactionist approach to second language acquisition asserts that second language learning is best accomplished through social interactions. This is particularly true when the interlocutors are negotiating toward a mutual comprehension of each other's message meaning (Blake & Guillen, 2020; Gass, 1997; Pica, Kanagy, & Faludun, 1993). Further, Chapelle (2009) highlights the interactionist framework's emphasis on psycholinguistic processes for language learning. This involves noticing language during meaning-oriented tasks, which encompass receiving input, engaging in negotiation for meaning, and producing output. Such meaning-focused interaction, which may include corrective feedback, can facilitate second language development (Ziegler et al., 2022).

Through negotiation and feedback, learners' attention may be drawn to noticing the gap

between their own production and target forms (Gass, 1997). Furthermore, learners have the opportunity to monitor their production (Swain, 1995, 2000), as well as test their hypotheses about the L2, when they produce output. Together with learners' cognitive capacity, these psycholinguistic factors work jointly during conversational interaction which can facilitate L2 development (Long, 2015), especially when learners "talk to learn" (p. 81). This particular link between communicative interaction and L2 development is supported by empirical and synthetic research conducted over the last three decades (e.g., Mackey, 2020; Mackey & Goo, 2007; Ziegler, 2016).

Communicative interaction entails the participants to take turns and negotiate meaning. Turn taking involves participation of all parties involved in the communication, taking turns to receive input, by listening or reading, and producing output, through speaking or writing. Communicative turn taking can also involve non-linguistic cues, such as nodding in comprehension and reacting with facial expressions. In a TMC context such as text messaging, turn taking can also include multimodal elements such as emoticons, gifs, or memes. This conversational process requires interlocutors to take turns and negotiate meaning, engaging in a back and forth of clarification as they work towards a mutual understanding of meaning or form.

Negotiation of meaning is an important learning strategy for L2 learners to employ because the process simultaneously draws explicit attention to the linguistic form or meaning and provides learners with extra linguistic information (Blake & Guillén, 2020). Additionally, meaning negotiation is one discursive strategy that can facilitate opportunities for learners to notice gaps in their linguistic knowledge (Blake, 2000). For example, during negotiation interlocutors may perform clarification requests, modeling, and/or overt correction. Raising the learner's conscious awareness of their own language production can "serve the metalinguistic function of helping to internalize linguistic forms, test hypotheses about the language, and

increase control over previously internalized forms" (Payne & Whitney, 2002, p.8). These interactions between learners create the potential for them to become explicitly aware of their linguistic gaps, and the miscommunications and breakdowns can serve as a catalyst for the learner to modify their production and knowledge (Morris & Blake, 2022). Engaging in communication breakdowns and negotiation of meaning in a TMC mode like text messaging may offer an additional benefit in raising the learner's mental awareness of their linguistic gaps because text messaging is a visual that allows learners to see the errors and repair strategies, and revisit them. This persistent nature of text messaging may be advantageous over the ephemeral nature of spoken discourse, as it pertains to noticing linguistic gaps.

Similarly, these breakdowns and negotiations can also result in what Swain (2000) calls forced output, resulting in drawing the explicit attention of the learner to the linguistic forms, and driving the listener to, in turn, produce target language output. This explicit attention and analysis of language can highlight the learners' logical and intuitive awareness of the linguistic forms, which can benefit their learning process and language acquisition (Norris & Ortega, 2000). This forced output can push the learners from a simple semantic and lexical comprehension to executing communication with syntactic precision (Swain, 2000, p. 99). Swain (2000) also suggests that from the perspective of the listener, receiving the resulting output, can provoke emerging linguistic capacity of the learners.

Historically, negotiation of meaning has been studied in face-to-face conversational exchanges. However, over the past fifty years the rapidly developing digital communication technologies have nudged this scope of study into the realm of technology mediated communication (Blake, 2000; Chapelle, 2009; Thorne & Smith, 2011). For example, chat rooms, telecollaboration and telecommunication, and in more recent decades, mobile technologies, have become the most ubiquitous technology producing digital social spaces prime for communication

and interaction (Castrillo et al., 2014; Li & Cummins, 2019; McSweeney, 2017).

Increasingly more studies are exploring communication breakdowns and negotiation of meaning in the online environment and digital spaces (Blake, 2000; Payne & Whitney, 2002; van der Zwaard & Bannink, 2019), which now includes text messaging (Castrillo et al., 2014). Some of the topics studied have been the amount of language production, student participation, and student attitude in a chatroom environment versus face-to-face situations (Kern, 1995; Warschauer, 1996). For example, Castrillo et al. (2014) explored the use of WhatsApp as a communication mode for spontaneous, colloquial written communication for Spanish students of German. Researchers have paid particular attention to meaning negotiation strategies, which they defined as the modification of input and interaction (p. 50). The researchers used a qualitative approach to exploring meaning negotiation by analyzing the written interactions the learners carried out via their WhatsApp chat sessions. For instance, they looked at strategies the participants employed to repair communication breakdowns, such as repetition, rephrasing, explicit and implicit corrective feedback, and clarification requests. Data point towards an improvement in meaning negotiation skills, a slight reduction of linguistic mistakes, and a generally overall positive experience by part of the learners (Castrillo et al., 2014).

Additionally, in a study of Spanish language learners in a synchronous chat room environment, Blake (2000) discovered that this setting facilitated increased learning by providing more opportunities for negotiating meaning, particularly during jigsaw-based tasks. Furthermore, Payne and Whitney (2002) showed two thirds of the participants engaging in synchronous TMC discourse commented that they noticed other people's mistakes more when conversing in this mode in contrast to a face-to-face environment. This can be beneficial to L2 learners because this type of increased linguistic awareness may "push learners to engage in more syntactic processing and 'notice' gaps in their linguistic knowledge, especially since chatroom exchanges occur in

written form" (p. 24). While *noticing* can also be beneficial to language learners in spoken discourse, in written form the language is more static and easier to review and reflect on (perhaps various times), as opposed to the more ephemeral nature of language in a spoken context.

Van Zwaard and Bannink (2019) also offered a unique insight into different types of negotiation of meaning (NoM) or differentiated NoM behaviors depending on the modality. Over the course of two years, the authors explored differences of NoM modes and behavior across synchronous face-to-face telecollaboration (via Skype) and instant text chat collaboration. Learners participated in different tasks and different tasks via the different modes. These results (which align with the authors' previous findings, 2014, 2016 and 2018) show there is a clear uniqueness of NoM approaches depending on modality. For example, the video call NoM behaviors seemed negatively affected by social constraints and the physical location of the webcam, which the authors suggest put the learners into more "face threatening" context, and ultimately resulted in more episodes of negotiation of face than negotiation of meaning" (p. 119). In contrast, during the synchronous chat sessions, the participants did not have the presence of webcam pressures and they had time to read and reflect on messages before responding, which the authors point towards a potential benefit of "relative anonymity" (p. 199). The authors suggest that this setting may have contributed to more incidents of negotiation of meaning. In an earlier study, Van der Zwaard and Bannink (2014) corroborated this finding as they also discovered higher instances of negotiation of meaning during instant chat than during video conferencing sessions. Given the close relevance of this topic to this dissertation, it is notable that the authors observe task-based collaboration projects often foster informal learning environments, diverging from more structured learning environments. Within such environments, learners may lean towards self-correction rather than interactive peer negotiation of meaning (p. 129). The idea that learners' interaction and language use vary with task design and

technological modality has implications for this dissertation, especially in the task-based communication activities (See Section 2.6 and Section 3.5.1).

It is clear that the topics of interactive communicative behavior, such as negotiation of meaning and turning explicit attention to linguistic forms in a TMC environment, is a productive topic of research within SLA. Research has been carried out on both written and oral forms of technology-mediated communication, and has offered insight into a variety of contexts, linguistic behaviors, and discourse strategies. In addition to taking turns, interactive meaning making, and repairing communication breakdowns, in these digital communication spaces language users (learners of language) also construct a shared understanding and may work towards a collaborative goal. This co-construction of meaning is discussed further in the next section.

Socioconstructivism

Interactionism is also informed by a socioconstructivist perspective of language learning in a TMC environment. For instance, as Lai (2016) suggests, the interactionist and sociocultural points of view can be intertwined, as "effective interaction between interlocutors may also be influenced by the social dynamics in the learning environment" (p. 278). Collaboration is a core component in a socioconstructivist framework for language learning, as students work together to co-construct meaning, solve problems, and discover solutions (Arnold & Ducate, 2019). Although there are many tribes of constructivism in SLA, a common thread among them is that language development is usage-based. Language skills evolve through real-world experiences (Ellis, 2003), where learners construct meaning through engaging and interacting with the world and semiotic resources, and participate in social situations.

Nielson (2022) advances the notion that socioconstructivist activities can generate more engagement than other types. The act of working with another learner to solve problems or make decisions, with a special emphasis on giving learners time and space to co-construct meaning, is

a fundamental component of sociocultural learning. Kukulska-Hulme and Viberg (2018) suggest that mobile devices are particularly well suited for collaborative learning, citing reasons such as flexibility, timely feedback continuity, personalization, socialization, active participation, peer coaching, self-evaluation, outdoors inspiration, and cultural authenticity. For example, García Botero et al. (2019) highlights data about language learners interacting with Duolingo. The data revealed a perception that mobile language learning tools can support autonomous, informal learning. However, an analysis of actual learner behavior did not completely reflect this perception. Given that a constructivist perspective for SLA that learning is an active, social, and collaborative processing involving the use of symbolic or material tools (Lee, 2007, p. 637), a platform like text messaging offers learners sufficient time, space, flexibility, and linguistic resources for active engagement in the target language. Moreover, when stimulated by a prompt, such as a task, learners are provided with a pedagogical sound framework that guides them through a dynamic interaction process, encompassing input, output, and feedback.

Recognizing text messaging as a space for collaborative meaning-making through shared experience, social interaction, and the exchange of input, output, and feedback toward common goals is crucial. Taking this into account, it becomes evident that text messaging may serve as a prime space for learners to develop and enhance their language skills. This is because when interlocutors text back and forth they often work towards a shared communication goal, all the while negotiating meaning, taking turns, and engaging in a collaborative communicative activity. Given that TMC entails many interactionist and socioconstructivist characteristics, text messaging may create a conducive environment for fostering L2 learning and acquisition.

2.3. Hybrid form of discourse & cross modality transfer effect

Technology-mediated communication has often been touted as having a positive effect on L2 learners oral proficiency (Blake & Morris, 2022; Lin, 2014; Moneypenny & Aldrich, 2018;

Ziegler, 2016). Although Lin (2014) also suggests that even though there may be a moderate positive effect of TMC on learners' oral proficiency, there could also be a negative impact on fluency. Very little research has examined the impact of practicing language via written TMC on speaking. The notion of practicing language in one modality, such as writing, and being assessed in another modality, such as speaking, is often referred to as a cross modality effect. A cross modality effect is an indication that one language skill (e.g. oral proficiency) has been directly or indirectly stimulated through engagement in another modality (e.g. writing). In this present study, we explore how participants in the treatment group practiced their language through a modality of writing, text messaging via WhatsApp, but were assessed on their oral fluency, with the goal to measure any impact of writing on speaking. This process is explained in Chapter 3: Methodology.

Among other results, but still relevant to this study, Abrams (2003) reported an increase in the quantity of oral language produced by the synchronous TMC group. Beauvois (1992) also points towards increased oral language production (and positive attitudinal changes) as a potential result from synchronous TMC. Kern (1995) compared synchronous written TMC with synchronous oral discussions and showed that in the virtual environment students took more than twice as many turns and used a greater variety of discourse functions (in comparison to their oral discussions). Additionally, some studies have zoomed in even more on language production aspects, for example specifically examining the effect of text-based TMC on the impact of L2 fluency (Blake, 2009; Razagifard, 2012). Razagifard (2012) explored the impact of both asynchronous and synchronous text-based TMC environments on L2 oral fluency, which showed results of significant gains with the synchronous TMC group as compared to asynchronous group and the control group (which did not include any text-based TMC homework assignments). The author reports that all measures of fluency in this study (mean length of pauses, articulation rate,

fluency runs, phonation-time ratio, and speech rate) were statistically significant. However, although results indicate that the text-based TMC group made substantial fluency gains in comparison with the control group, the fact that the control group was not engaging in this extra language practice, regardless of modality or not, needs to be taken into consideration. Further, Blake (2009), found that the text-based TMC group showed significantly higher gains in phonation time ratio and mean length of run (specific elements of fluency). Other studies have investigated cross-modality transfer effects and found no statistically significant differences. For instance, Kost (2004) explored the development of overall language skills in beginner learners of German through engagement with based synchronous TMC. While learners perceived the online discussions to be beneficial for both production skills, speaking and writing, no statistically significant differences were observed among groups.

Moreover, an underlying theme that unites these studies on cross-modality transfer effects is the exploration of the internal processes of language production. In line with the perspective of Payne (2020), this present research study also agrees with the notion that although speaking and writing differ regarding modality and physiology of expression, they share the same underlying cognitive process (p. 224). Payne (2020) cites Levelt's (1989) speaking model and Flower and Hayes' (1981) writing model to illustrate similar shared cognitive processes among the two productive modalities, speaking and writing: "(a) processes for conceptualizing or planning language production, (b) processes dedicated to lexical access and formulating expressions together with an articulatory plan for pronunciation, and (c) a mechanism for articulation" (p. 224). Although the similarities in the cognitive processes seem to align, the mode of articulation is obviously different. However, Payne (2020) also brings to the light the potential similarities between speaking and writing in the same temporality, specifically synchronous production, or dialogue, such as "synchronous text chat closely resembles transcribed speech minus any false

starts or other speech artifacts" (p. 224). These striking similarities between two modes of language production have encouraged several scholars to research the notion of a cross-modality transfer effect (Abrams, 2003; Beauvois, 1997; Blake, 2009, Payne & Whitney, 2002); as will be detailed further in this paper), and many results point towards a positive impact on language practice in written modality on oral performance. This present study explores language practice in a text modality (text messaging) with an oral assessment measure. However, in the study that follows, the textual language practice allowed learners to engage with the language either asynchronously or synchronously outside of a lab or classroom, thus creating a more natural environment, and potentially less of a controlled laboratory environment.

While previous studies have drawn on Levelt's model of language production for their methodological framework regarding the cross-modality transfer effect (Blake, 2009; Payne & Whitney, 2002), this present study primary attributes the potential cross modality effect between text-based TMC (WhatsApp, in this case) and oral fluency to the hybrid discourse nature of TMC. This is because text messaging includes many of the same communicative features as more traditional TMC (e.g. email, instant messenger (IM), or Facebook Messenger), and in fact may offer even more in the realm of L2 communication and SLA, due to its multimodality, social nature, and popularity in use. Although the interaction that occurs in text messaging is written[3], this modality also includes features similar to oral discourse, and it is often multimodal. The dialogic turn-taking process in text messaging can be both asynchronous and synchronous, and users can go back and forth, providing and receiving instantaneous input and output. This mode also allows users to take the time to edit and revise their own message and re-read messages they have received.

To demonstrate the hybrid nature of the language used within TMC, Tagliamonte (2016)

[3] Audio messages and video calls are elements of text messaging, including WhatsApp. Because this study did not discuss/include audio and voice messages, these topics have been mostly excluded from discussion. However, this is a deeply integrated part of text messaging and should be considered for future research.

presents four situational factors of computer-mediated communication, *participants, platform, time,* and *editing.* Since texting constitutes a mode of TMC, some of these elements can be attributed to this modality. For example, Tagliamonte suggests that time refers to whether the communication register (or mode) is persistent or ephemeral. The author highlights that writing is (generally) time-independent, where writers "may take time to edit and structure their texts in order to create a permanent document" (p. 4). While this classification can be applied to text messaging, the author also highlights additional aspects when discussing speech characteristics, which also apply to text messaging, such as the ephemeral nature, time-dependency, almost immediate response requirement, and the fact that generally speech is not permanent. While communicating via text messaging is technically written, texters may write as if they were imitating their own speech in an attempt to establish a more formal register (Thurlow & Poff, 2013, p. 11), which may be what Tagliamonte (2016) is alluded to when he notes that "TMC registers are positioned in between" (p. 4) orality and literacy. We hypothesize in the present study that this "inbetweenness" or hybrid nature of the discourse (Androutsopoulos, 2006) is what creates the learning affordances of TMC.

Other linguists also point towards the hybrid nature of this mode of discourse, such as the use of emoticons and acronyms, phonetic spelling, spelling words as they sound in an oral setting, and some use rebus abbreviation and/or logograms, words formed from letters which represent symbols such as *b4* (before) in English (Crystal, 2008; Herring, 2007) and *salu2* (*saludos*) in Spanish. Another feature distinctive to oral discourse in texting is clipping. Clippings can come in the form of g-clippings (removing g from -ing words like *borin* and *tryin*) and other clippings, such as *hav* (have) and *wil* (will) (Waldron, Kemp, Plester, & Wood, 2015), or *porfa* or *xfa* (*por favor*), (and *ntonces* (*entonces*) in Spanish. While clipping is not exclusive to

textese[4], it still exemplifies capturing an oral reflection of discourse in a written environment.

2.3.1 Text-messaging as a hybrid mode of discourse

Combining the features mentioned above with further technological developments, text messaging can create a space of communication where the interaction that occurs between participants is a type of hybrid discourse. First, text messaging can be either *asynchronous*, where users reply in delayed time, or *synchronous*, where users engage in immediate turn taking. On one hand, texting is in fact written communication, producing text-based language, and within a temporality where users can take time to edit, read, and reflect on previous messages. On the other hand, texting incorporates many aspects found in synchronous face-to-face oral conversations, where "rapid message exchange, informality, and representations of prosody" (Herring, 2007, p. 2) may also be present. Text messaging is also multimodal, affording the use of emoji, gifs, memes, video and voice recordings, which is something traditional writing cannot do. Including items such as emoji in text messaging interaction can add emotional reactions and stimuli found in oral discourse. Communication also requires nonlinguistic cues, such as facial expressions and gestures, and the paralinguistic compensation strategies mentioned above (e.g. unique spelling, emoji or gifs) in a message can aid in the objectives of the communication, and even potentially help fix breakdowns in communication.

Building on the notion that text messaging straddles the line between written and spoken language, Payne and Whitney (2002) argue that the varied pace that exists between speaking and synchronous technology-mediated communication (TMC) offers a strategic advantage to second language learners. This is because it may provide a conversational context with lower cognitive

[4] This name referred to the language used in text messaging, which is often categorized as informal discourse, encompassing elements of abbreviations and phonetic-like spelling.

demands preserving the essence of traditional tasks and interactions. Further, despite its inherently transient quality, text messages can physically remain in existence for as long as the user desires. The significance of these observations in this present study is that WhatsApp seamlessly integrates and allows for features of both spoken and written discourse, thereby meeting the aforementioned criteria for hybrid discourse.

Furthemore, the dialogic turn taking in text messaging is similar to face-to-face communication since the interlocutors can go back and forth, providing and receiving instantaneous input and output. An aspect unique to text messaging is that users can also take the time to edit and revise their own message, as well as re-read messages they have received. In the realm of L2 learning, this allows learners the time to look up unfamiliar words and to research or confirm concepts before responding. This extra planning time could potentially lessen L2 cognitive processing demands, common in early stages of language learning, and help stimulate language production Morris and Blake (2022). For example, Payne and Whitney (2002) suggest that because people do not typically text (or type) as fast as they can speak, in a written TMC environment the learner's cognitive processing demand may be minimized because "the amount of language that an individual has to parse, comprehend, and respond to is lower for a given time period." (p. 14). The resulting conversational environment simulates aspects of synchronous face-to-face discourse, including similar language tasks and interactions, but has an altered pace, helping to reduce processing demands.

2.3.2 Multimodality of text messaging

Another equally important aspect of text messaging is its multimodal nature. As multimodal input may offer pedagogical benefits to L2 learning (Brandl, 2008; Long, 2020), it seems reasonable to assume that the interactive multimodal communication platform of text messaging, a space which hosts both written and speech-like communication, may prime L2

learning, especially L2 oral proficiency. Payne and Whitney (2002) suggest this is due to the fact that with all of these elements combined, learners can practice "speaking" in an environment where affect and rate of speech are minimized (p. 25). As noted above, the multimodal elements found in text messaging include text, emoticons, gifs, memes, and audio and video messages. Audio and video messages are not extensively discussed in this dissertation, as they were not the primary focus of the study.

A lower cognitive load for an L2 learner can afford them more processing time and time for pre-task planning (Payne, 2020) before producing their desired language. Having these lessened cognitive demands may result in two obvious benefits. First, learners may feel less anxious and stressed when producing their language, resulting in a calmer environment and increased motivation to trial new language forms. Second, practicing this low-pressure, less demanding language production in a low-stress environment such as text messaging can serve as a scaffolding tool, for more high-stakes, larger conversational contexts where the learner is required to produce spoken language. Therefore, a texting platform like WhatsApp may serve well for scaffolding activities as they relate to productive skills.

Text messaging, and platforms like instant message (IM), seem to resemble face-to-face discourse more than other forms of TMC because it includes shorter and more frequent turns (Tagliamonte, 2016). Gill (2010) also explored attributes of IM by applying conversational and turn-taking maxims and concluded that the modality of IM should be placed between asynchronous TMC and synchronous TMC on such a continuum, citing its uniqueness in timing and turn-allocation (p. 58). As such, these communicative features have even lead some scholars to carry out research exploring text messaging apps (e.g. SMS and WhatsApp) specifically in regards to turn-taking (Thurlow & Poff, 2010), meaning negotiation (Dolores Castrillo et al., 2014), as well as the role of turn-taking on instances of meaning negotiation (Blake, 2000).

Communicating (in any language) also requires nonlinguistic cues, such as facial expressions and gestures, and the paralinguistic compensation strategies mentioned above (e.g. unique spelling, emoji or gifs) in a message can aid in the objectives of the communication, and even potentially help fix breakdowns in communication. This multimodal characteristic may make text messaging a space where "possibilities for social, phatic communication" (Wood, Kemp & Plester, 2014) are abundant, and a place where communication-based social interactions occur, either in real-time or asynchronously.

This unique combination of written and spoken communication in one single modality provides an interesting case to explore in the realm of how practicing a L2 in one modality (such as writing) may affect other language skills (such as speaking). This phenomenon has been referred to as a cross-modality transfer effect. Several studies have examined a potential cross-modality effect in TMC, and the theoretical perspectives, methodologies, and results have varied substantially. For example, previous research suggests that when learners engage in discourse via a chat-room platform, a direct transfer of skills (across the modality from writing to speaking) does occur, and L2 oral proficiency can be indirectly developed through this computer-mediated communication interaction (Blake, 2009; Kern, 1995; Beauvois, 1992; Payne & Whitney, 2002). It should be noted that the following review is selective rather than comprehensive and extracts only the main points of those studies with particular relevance to this dissertation.

2.3.3. Research exploring a cross-modality transfer effect

One of the earliest studies to approach the topic of a cross-modality transfer effect explored the unique opportunities for communication in a synchronous local area network chat for both Portuguese and French (Beauvois, 1992). The students interacted via InterChange (a communication platform developed by the Daedalus Group), which allowed students to

communicate via typing and sending messages to each other and their instructor. The author provides details about the program's application in a Portuguese class, emphasizing the positive environment and attitudes of the students, and interaction with the software. Beauvois also highlighted instances she observed of effective language learning processes, such as students solving grammatical problems, asking and answering questions among peers and the instructor, and a low-stress and fun environment. Additionally, the author highlights the students' positive reactions to seeing their name on the screen, receiving feedback from their peers, confirming that their message has been understood, and carrying out quick interaction in reading and writing.

Based on Beauvois's observation of this successful Portuguese class, the author experimented with her own case study for a student who was experiencing challenges with French. The computer lab sessions involved discussion topics from the textbook, as well as questions and answers between the other student and instructor. Although the computer lab sessions were limited to four visits, the author reported a perceived extension in length of the student's messages with another student, in contrast to messages directed at the teacher. Students also expressed the feeling that they had more freedom to express creatively and with less worry. Although this paper does not explicitly explore the cross-modality transfer effect itself, its novel experiments stimulated a swath of future research questions and set the stage for much more research to come, including planting research questions such as "Will there be a transfer of skills from one domain to another: from this reading-writing-thinking exercise to improved oral language?" (p. 463). This seminal paper was instrumental in setting the stage for future research including this dissertation.

Kern (1995) continued the exploration of the Daedalus InterChange local area network application among students of French and compared the discourse quantity and characteristics among writing sessions with the synchronous InterChange discussion and oral discussions. Both

discussions centered on the same topic. Forty French 2 students participated in the study with one of the primary aims being to see what beginning language learners got out of the tool, as it was assumed if earlier language learners benefitted from the tool, then more advanced learners would as well. Students in the study engaged in computer lab discussions for a total of seven times during the study (once every 2 weeks), and completed discussion questions relating to the general theme of the lesson or a reading from the class. The online discussions generally preceded face-to-face oral discussion. Researchers collected three primary points of data, including 1) the students' InterChange transcripts (written language), 2) students' oral production transcripts of discussions about the same topics, and 3) questionnaire inquiring about the students' and instructors' experience with the program and overall experience. Researchers coded and analyzed both the typed and spoken transcripts for items such as discourse functions, questions, commands, length of turns, and use of English. Also recorded was the number of utterances produced by each participant such as number of words, messages, or phrases.

The author reports that in the InterChange session students took twice as many turns, produced almost four times more sentences, and produced a greater variety of discourse functions, as compared to their oral discussions. Additionally, students reported favorably in using the tool citing reasons of a break in classroom routine and allowing for more direct interaction among participants (in contrast to oral discussions), and building more confidence. However, a few comments reported drawbacks from the tool such as the difficulty in reading all of the written chat comments at once. A few other cited disadvantages were compromising grammatical accuracy, the fast pace may compromise ability to thoroughly read the messages, and students getting off topic. Kern (1995) offers a well-rounded look at several advantages and disadvantages of facilitating second language chat communication in a chat networked environment; it also highlights how the efficacy of certain technology-mediated language

learning environments need to be framed in the terms of goals when considering effectiveness. For example, is the goal a fluid conversation or a grammatically accurate report? Or is the goal for students to produce language or focus on syntactic complexities?

Further, Beauvois (1997) reported that study participants who participated in the technology-mediated communication modality outperformed their non-TMC peers on oral exams, regarding elements of pronunciation, pronunciation, grammatical accuracy, lexical choice and accuracy, and content. Similarly, Beauvois also reported positive results in her study (1998a) about computer-mediated discussion on networked computers, highlighting linguistic, cognitive, and affective benefits for the language student. Additionally, in her 1998(b) study which also involved interactive TMC through the use of InterChange sessions, Beauvois and researchers informed that the French learner experimental group which engaged in TMC practice showed higher proficiency of oral expression at the end-of-unit oral exams, in contrast with the control group, who engaged in face-to-face conversations. The author also highlights the ability of these environments to create a "conversation in slow motion" (p. 93), which provides students with more time to reflect on their language before producing their desired utterance something that "is not possible in oral exchanges of information" (p. 93).

In another early stage study that explored the effect of language practice in one mode (text-based TMC) on oral discourse features, Chun (1994) suggested that the interactional structures in written practice carried out via InterChange with first-year German students could potentially be transferred to students' spoken discourse. For instance, Chun (1994) calls attention to the increased student-student participation, in contrast to student-teacher interaction found in common traditional language classrooms. Learners provided feedback to each other and demonstrated a higher sociolinguistic competence in greetings and saying goodbye, clarifying, confirming, and apologizing (p. 28). The author suggests that the strong resemblance between

these types of utterances in spoken conversation would carry over any gains made in the written conversation into spoken discourse.

Similarly, Abrams (2003) reported on a study measuring the oral proficiency between learner groups of German, who participated in synchronous and asynchronous TMC versus participants with no TMC component. Although this study did not provide evidence that the TMC interaction produced better quality oral production of the learners, there was an increase of language quantity reported by those that engaged in the TMC activities. This study particularly explored the potential transferability assessing lexical richness, lexical density, syntactic complexity, and amount of language from TMC to oral interaction. Abrams (2003) offered insight into if TMC has a positive effect on oral performance and any possible differences in the effect of synchronous or asynchronous technology-mediated communication on oral performance.

Payne and Whitney's (2002) study constitutes perhaps the most seminal study on this topic. This study measured how synchronous technology-mediated communication may affect L2 oral proficiency. The authors hypothesized that L2 oral proficiency may be positively affected because through the TMC engagement the communicators are developing the same cognitive mechanisms underlying spontaneous conversational speech. Payne and Whitney's (2002) study examined third-semester Spanish students, split into two groups, where one group received instruction and classroom engagement face-to-face, while the other group performed the same in a chatroom environment. The participants' oral proficiency was measured before and after the treatment using a proprietary oral assessment tool (see Payne & Whitney, 2002, pp. 15-19, 30-32). The results in this study show data that L2 oral proficiency can be developed through chatroom interaction in the target language, as shown by the oral proficiency gains made by the

experimental group. Even though the interaction was carried out via typing (writing), they showed gains in their oral skills (speaking).

Building upon prior research, Payne and Ross (2005) analyzed the chatroom language and dialogue produced by the experimental group (from Payne & Whitney, 2002) to investigate the role it plays with working memory, SMC, and the cross-modality transfer effect from chat-writing to oral proficiency. Looking at repetition, relexicalization, and number of words, utterances, and turns per chat session the authors showed evidence of 1) the frequency and relexicalization declining in frequency over the course, 2) there was a difference in number of words per utterance across a low-span and high-span chat style, and 3) an interaction was observed between phonological working memory and executive function. While not within the scope of this paper, there is potential for future research to expand on the current study by examining language use and patterns in both WhatsApp messages and transcribed Zoom dialogues. This could shed light on prevalent linguistic patterns and strategies across different modalities and their potential impact on variables such as fluency, including speech rate, total words, unique words, and number of pauses.

The momentum and interest in exploring the topic of the impact of TMC on language proficiencies continued with Kost (2004), who explored the impact of TMC on the interlanguage development of beginning learners of German. A unique contribution of this study is the exploration of the effect of TMC on the learners' interlanguage development, focusing specifically on accuracy, proficiency, and communication strategies. The two participant groups either 1) participated in synchronous online discussion or 2) oral role plays. The researcher notes that although no statistically significant differences were shown between the oral and written proficiency at the end of the semester (as a result of the treatment), learners did note a perceived benefit of online discussions pertaining to their oral and written language skills. Additionally, the

author notes that the participants highlighted noticing their peers' vocabulary and grammar mistakes, which Kost reminds the reader is essential for converting input to intake (p. 10).

Curiously, data on the participants' experience showed that the learners found the chat activities more beneficial than the role play. In the present study that follows, the learner perception of activities seems contrary to that finding, in that the participants seem to prefer the face-to-face activities (via Zoom), but that may because of the perceived direct benefit of developing speaking and listening skills, as well as the awkward nature of the task design on the chat environment, which was WhatsaApp, in this case. This will be further discussed in Chapter 6. Although this present study did not include student ranking of activities (for effectiveness or motivation to complete) further iterations of the treatment have included a ranking system to gauge which tasks are more well received by the learners.

Two related studies, Blake (2009) and Razagifard (2012) initiated some of the earlier studies specifically pertaining to the effect of text-based TMC on L2 oral fluency on English language learners. Blake (2009) explored group differences among text-based internet chat and face-to-face interaction for a short 6-week study. Participants carried out oral fluency pre and post tests and the treatment groups engaged in an Internet chat communication using WebCT Vista Chat Room in real time and the control groups were in a face-to-face environment. While the author underscores the alteration in modality as a factor influencing the interaction variable, it is essential to emphasize that it may be *because of* the modality that the interaction variable may change.

This study showed the chat room group had higher scores on phonation time ratio and mean length of run measures, in contrast to the face-to-face and control groups, but the other three measurements (speaking rate, articulation rate, and average length of pauses) showed no significant differences. The authors report that the significantly higher gain scores of the Internet

Chat group on two of the assessment measures (phonation time ratio and mean length of run) add to support that oral fluency improvement is possible within a text-based chat environment. Further, although the third hypothesis, the Internet Chat group would demonstrate higher fluency gains than the in-person group, was not as strongly supported as the second, Blake points towards the fact that the study findings are still impressive regarding the comparison of online chat instruction with face-to-face instruction, which has "traditionally been considered the sine qua non of fluency instruction" (p. 236). The author also emphasizes that while data suggests the potential for development of oral fluency skills in a text-based internet chat environment, achieving this outcome is contingent upon effective instructional design (p. 238). The significance of instructional and task design is also a crucial related element to this present dissertation study, as will be further discussed throughout the paper. Pedagogically sound and intentional task design and instructional methods need to be at the base of any technology-enhanced language learning environment, to effectively support any language skill development, especially when assessing a cross-modality transfer effect.

Also exploring English language learners, Razagifard (2012) measured two different instructional contexts, synchronous and asynchronous text-based technology-mediated communication, and measured average length of pauses, articulate rate, fluency-run, phonation-time ratio, and speaking rate as dependent variables. The data suggests an improvement in the synchronous technology-mediated communication (STMC) group compared with the other two groups, and the asynchronous technology-mediated communication (ATMC) demonstrated gains over the control group (although they were not statistically significant). In this study, the participants in the treatment group completed tasks such as jigsaw or decision making tasks via a WebCT chat tool, and they also completed a post treatment oral post test. The assessment measures showed that the STMC group improved significantly in fluency compared

to both groups. Similarly, the author suggests the possibility for a transfer of language skills and L2 oral performance development from written to oral language.

The impact that real time communication has on the results of these studies should be explored more. If the immediate temporality (synchronous) of chatting, rather than the specific mode used, appears to have a greater impact, future studies could explore various modalities in real-time versus delayed time to further investigate this phenomenon. For instance, Blake (2009) noted that the feedback that the ATMC group received was limited by time, often waiting days or hours to receive instructor feedback. This scenario does not fully emulate a real life conversation, which is one ultimate goal for working on developing fluency skills. Regarding the topic of this dissertation, text messaging offers language learners the ability to interact both in asynchronous and synchronous ways, often selected by the learner themselves, choosing when they want to respond to a message.

With respect to studies such as Kost (2004), Blake (2009), Razagifard (2012), and this present study, it is important to consider what Payne and Ross (2005) point out about studies with no significant findings. The authors assert that “finding no significant differences is not a "non-result" from a pedagogical perspective. Achieving equivalent development in oral skills with reduced F2F oral interaction should be considered a positive result” (p. 37). As will be discussed further in the results and discussion sections of this dissertation a non-statistically significant result when comparing modalities for language skill assessment may imply that the experimental group (which used synchronous Internet Relay Chat Français on computers program in Kost (2004) and WhatsApp text messaging application in this present study) is not actually hindered by the modality in language skill development, but rather is on par with the more obvious winner for oral skill building environment. As such, Payne and Ross (2005) suggest that “the finding of "no significant differences" could be posited as a rejection of the

hypothesis that face-to-face is superior" (p. 37). Although this present study pushes the envelope even further in examining text messaging (carried out either asynchronously and synchronously) on learners' mobile devices and the effect on L2 oral fluency, the studies presented here collectively paved the way for sharing research findings, presenting novel methodologies in these unique environments which involve multiple modalities and underlying cognitive mechanisms.

2.4 Research on text messaging and L2 development - language skill development

There is a large body of research concerning the impact of text messaging on several realms of second language (L2) development. Most studies involve text messaging often dominate in English as the target language and vocabulary as the topic of study (Cavus & Ibrahim, 2009; Derakhshan & Kaivanpanah, 2011; Kim, 2011; Lai, 2016; Li & Cummins, 2019; Tabatabaei & Goojani, 2012), as is true in MALL research in general (Burston & Arispe, 2022). Other topics explored deal with oral proficiency (Andújar-Vaca & Cruz-Martínez, 2017), electronic journal dialoguing (Alsaleem, 2013), English language idioms (Hayati et al., 2013), negotiation of meaning in colloquial writing in German (Castrillo, et al., 2014), multimedia messaging (Saran & Seferoğl, 2010). Other topics have included text messaging and academic proficiency (McSweeney, 2017) and collaborative work and meaning negotiation (Castrillo et al., 2014). In the following section, we summarize a few widely cited, as well as studies more targeted in scope to represent a diverse collection of studies on text messaging and L2 language development. The following literature review is not a comprehensive list, but rather aims to provide readers with an overview of research related to text messaging and language learning emphasizing trends, findings, and observations, while also bringing to light a research gap: with respect to the absence of known primary research on a cross-modality transfer effect between

text messaging (a text-based TMC) and L2 oral fluency. Below, Section 2.5 reports on previous studies that also included data on the learner experience, such as perceptions and opinions.

In one of the first studies in this field, Cavus and Ibrahim (2009) used a homemade mobile learning tool called MOLT to explore SMS (short-message service) and technical English words. The participants were 45 first-year learners of English who were sent one-way text messages containing the target words via SMS from a computer controlled by the researchers. Over the course of the study (one academic semester), the participants were sent 16 messages daily (throughout eight hours), and were expected to read and learn the target words. To measure any impact or gains, the students all completed a pre- and post-test of the word meanings, and student grades on those tests were used to determine any effect of the treatment. A paired sample *t*-test indicated that using the MOLT system provides students with an advantage for word learning, as compared to previously learning words before using the system. The average word scores rose from 24.68 to 89.77 from the pre- to the post-test respectively. Although this study showed learning gains, the lack of a control group makes it difficult to draw any conclusions about the effect of the modality itself.

Lu (2008) also explored the effectiveness of vocabulary learning via SMS. The study consisted of 30 vocational high school, intermediate level English language learners. The participants were divided into two groups that switched between either using their mobile phones or studying print materials every other week (for the duration of the 2-week trial). The mobile phone groups received two SMS lessons every day between 7am and 5pm. On the last day of each week all participants took a word recognition test. There were 28 target words, including several word types (e.g. nouns, verbs, adjectives). The results of a two-tailed *t*-test showed that regardless of the modality (mobile versus paper material), both groups demonstrated significant gains in learning the 28 target words, although a delayed post test showed a decline in the word

learning. Further, the authors also report that there was no statistically significant correlation between students' self-reported reading frequency of the messages and their vocabulary gains.

A similar study by Kim (2011) reported the effectiveness of SMS on vocabulary of 62 English language learners. Vocabulary items were selected from the course curriculum's textbook and sent via SMS text messages to the participants two times a week over a total of six weeks. For assessment measures, the researchers used a pre- and post- translation test of the target words. The students in the treatment group received two text messages related to the target words every week after class, while the students in the control group only had a class lesson. The treatment groups were further subdivided into two sub groups to test interactivity: one group only receiving one-way messages, and the other received and sent texts responding to quizzes. The latter was prompted to respond by writing the definition of the word. A one-way ANOVA was conducted to examine any effects of lexical item learning through SMS. Overall, the results indicate that there was a statistically significant difference among the three groups, highlighting more gains made by the two experimental groups than the control group. The mean differences between the pre- and post test between the experimental group 1 (one-way) and experimental group 2 (interactive-response) were 10.80 and 17.11, respectively, which again, illuminates the obvious need for interaction in language learning.

Expanding from isolated word lists to teaching English idioms, Hayati et al. (2013) assessed the efficacy of three different modalities for the instruction of English idioms. The study reports on 45 intermediate to advanced learners of English, separated into three groups with differentiated learning including a) a self-study approach, b) contextual learning approach, and c) the SMS-based learning approach (p. 70). The self study group (a) learned with a pamphlet of 80 English, including definitions and sample sentences. The second treatment group (b) received SMS-based materials on their mobile phones (which were sent from the instructor's computer).

Learners received four idioms via SMS daily. The third group (c) drew from a book on idioms, which were introduced through short passages, and was supported by the teacher and making connections to the learners' personal experiences. To assess differences in learning gains across groups, at the end of the study participants carried out the same 50-item multiple choice (as the pre-test). A paired-samples *t*-test revealed that there were statistically significant differences among all three groups. To explore differences in modalities an analysis of variance was then performed. Among this group tested, the results implies that the most effective modality was SMS, and the self-study group seemed to acquire the lowest degree of statistical significance compared with the other groups. The authors mention the potential impact of accountability and timeliness in the SMS group that the self-study group did not have, which may indicate that learners in the latter group may have required more direction or structure in their study routines. The self study group's motivation may also have been affected by the more independent learning environment.

Tabatabaei and Goojani (2013) continued the exploration of vocabulary learning with English language learners with their study involving 60 pre-university students. The participants were separated into two groups, one experimental and one control. Any gains were assessed through an achievement test, which was administered pre- and post- treatment. The assessment involved a multiple choice selection of forty vocabulary items. The study took place over two months, and both groups attended class twice a week. The experimental group sent the researcher a text message of an original sentence including the target word and the teacher responded with explicit or implicit feedback (when applicable). Afterwards, the students were tasked with sending one text-message with their sentence to three language partners from class. In contrast, the control group learners wrote the sentence and brought it to exchange with their partners during class time. This group was not able to receive feedback until they brought their sentence

to class. To discover any potential differences in pre- and post-test scores between the groups the researchers performed a *t*-test, resulting in significant differences among the post-test scores, emphasizing greater gains for the experimental group. Again, the results should be taken with caution considering the differences in how the learners engaged with the material.

Moving past mere isolated vocabulary learning, Castrillo et al. (2014) systematically examined the text messages that learners produced to explore negotiation of meaning among the messages, specifically using WhatsApp. The goal of the study was to understand how students negotiate meaning and reconcile clarity during language interaction. Over six weeks, 85 beginning German language learners, divided into five groups, engaged in collaborative writing tasks (although the specifics of the procedures are unclear). Castrillo et al. (2014) reports on just one of the five groups, offering insight into the number of messages sent by students, day of the week and time, and a deep look into discourse functions and negotiation of meaning cases and strategies and language use within the messages themselves. Using a qualitative approach to analyzing the students' messages, the authors found an improvement in learners' meaning negotiation skills and a reduction in some language mistakes. Consequently, they determined that this tool is an effective method for supporting language learning, particularly in relation to negotiation of meaning.

Leveraging WhatsApp as a tool for foreign language learning, Lai (2016) aimed to create full language immersion via the learners' mobile device of 45 middle school English language learners during a 3-month experiment. The main goal of the study was to explore the impact of mobile immersion on the learning of the high-frequency English verbs. The researcher used vocabulary test scores and a review of the chat histories as assessment measures. Study participants received a message in the group chat each weekday as "useful words of the day," consisting of 5 high frequency English words. The participants were prompted to chat freely

about any topics they wanted and were encouraged to make use of the prompted verbs as much as possible. They were also asked to refrain from using the voice feature found in WhatsApp and to only use the text feature. Online tutors were available for providing explicit feedback to the learners. Although the article mentions there was an experimental group (Mobile Group) and a control group (Control Group), the exact difference in treatment or instructional methodology carried out is unclear (pp. 281-284). The only clear distinction between the two groups is that "both groups went through the same learning activities except the mobile immersion element" (p. 283).

Drawing on an independent *t*-test for vocabulary gains, the data revealed no significant difference between the means of vocabulary gains for the mobile and control group. However, when analyzed individually, the mobile group exhibited greater variability in participant scores compared to the control group. This prompted researchers to investigate this variance by examining the number of chat entries per participant. This investigation revealed a significant correlation between the number of entries generated by a user and their vocabulary improvement. Consequently, the researchers conclude that mobile immersion did not prove to be effective. They also highlight a significant challenge in maintaining control over both the quantity and quality of chat interactions for each team and participant.

One of the more closely related studies to this present dissertation study is Andújar-Vaca and Cruz-Martínez (2017) who explored utilizing WhatsApp as a means to develop oral skills among 80 L2 English learners over the course of six months. The participants in this study *did* use the voice feature in WhatsApp, in contrast to being asked to only text in their interaction. For assessment measures, participants completed a pre- and post-treatment oral test, consisting of two students interacting at the same time for about 15-20 minutes. The experimental group engaged in voice communication via WhatsApp and the control group did not receive any

treatment, aside from traditional instruction and was only used to make comparisons between the two groups. The WhatsApp participants were encouraged to interact daily via the WhatsApp voice feature and the participants' speech samples from WhatsApp were observed for quantity and type of language related episode (LRE) that were produced during the interaction and were further divided into negotiation and feedback. Although the instructional prompts were not fully described. A repeated measures ANOVA test was used to explore differences among both the experimental and control groups, which resulted in statistically significant differences between the groups showing stronger gains in the experimental group in regards to pronunciation, grammar, vocabulary, fluency and comprehension. In general, the researchers found that the use of mobile phones was a powerful tool for the development of oral competency.

More recent studies utilizing mobile phones, specifically texting, focused again on vocabulary and English as a target language (e.g. Li & Cummins, 2019; Lin & Yu, 2017). Li and Cummins (2019) employed a one-way strategy of sending participants text messages including a target word, title of assigned reading where the word could be found and a sample sentence, and participants also received a weekly summary email over the course of nine weeks. Results of an ANOVA of pre- and post-treatment vocabulary scores revealed higher improvement by the treatment group than the control group, which used online dictionaries and dictionary apps to check target words and sentences. Lin and Yu (2017) explored mobile multimedia vocabulary development among a group of 32 middle school English language learners for four weeks. The learners received input in the form of text, audio, and picture with sound references. Assessment measures were also used comparing results of a pre- and post-treatment vocabulary test. Results of a two-way repeated measures ANOVA test show no significant results for presentation mode (text, image, audio) in vocabulary learning and gains, although there were significant effects on retention and time, such as some participants forgetting the learned words after two weeks.

As noted above, the literature reviewed is not exhaustive, but rather a selective sample of studies from the past fifteen years on text messaging and language learning. Our review highlighted a range of methodologies, languages studied, and targeted language skills, as including every study executed on text messaging and language learning is not feasible. In the following section we examine learner perceptions and attitudes towards text messaging and language learning.

2.5 Research on text messaging and L2 development - learner perceptions

As presented above, many studies on text messaging and language learning have analyzed quantitative data such as vocabulary learning gains, turn taking, negotiation of meaning, and quantity of utterances produced in oral assessment measures. Equally important to this field of study is understanding not only discrete quantifiable data, but also how the students and instructors experience these innovative approaches to language teaching. In the following section, the learners' perception and attitudes about text messaging for purposes of learning and mobile learning will be described. Instructor perceptions are also included when available.

Researchers have conducted various studies regarding the development of different linguistic features via text messaging, and have shown a variety of results in regards to how the learners and instructors have perceived the experience. In a study exploring undergraduate English language learners' (ELLs) perspectives on utilizing texting to support acquisition of academic and low-frequency words, Li, Cummins and Deng (2017) found an overall positive experience, highlighting the usefulness and effectiveness of the intervention. The students in their study used a program called Word Matters with content aligned with the lesson plans of the course and the data was collected through interviews (n = 10) and a post-treatment survey (n = 40) from a total of 48 students. Interestingly, the treatment modality of this study was determined

through inquiring with the students via a pre-treatment questionnaire about the students' preferred method of communication. The treatment included participants receiving three target words a day via text messaging (morning, noon, and afternoon). The text message content included a target word, page reference in the class reading, the word's definition, and an example sentence. Additionally, students were emailed a summary of the three daily words and a quiz of the previously learned words, and they also received a downloadable vocabulary summary at the end of each week and month (for additional review). Post-treatment data was collected through a post-treatment survey and interviews. The survey results indicated the vocabulary was helpful in supporting students in the required class readings and the participants also expressed interest in the word games and quizzes. A thematic analysis of interview transcripts also revealed that the treatment was well received by the students, highlighting five reasons specific to texting: acceptable frequency of target words texted daily, time-saving, ubiquitous/anytime & anywhere access, quick access, and preferred means over email messages (Li, Cummins & Deng, 2017, p. 826).

Lin and Yu (2017) designed a similar study aimed at vocabulary learning, in which they sent Taiwanese English learners multimedia messages (MMS) for four weeks. The messages were sent in four different ways: text, text+picture, text+sound, and text+picture+sound and each mode consisted of nine target words. To understand the students' experience with the activity, the researchers sent students a perception questionnaire on the vocabulary learning program at the end of the study. The survey comprised 13 questions including topics such as affective aspect, the different types of presentation modes, the technical components, and included one open-ended question. Researchers reported that the majority of participants had positive attitudes about the experiment and commented on topics such as finding the vocabulary lessons interesting, motivating, effective, and beneficial. Although some participants experienced

technical issues such as screen display and sound quality, slow transmission speed, and small screens, the majority of participants (70%) report not experiencing technical difficulties (p. 537). Additionally, participants enjoyed the multimedia nature of the message and its effectiveness in learning new lexical items. Some comments included enjoying the "book-less" (p. 537) nature of the vocabulary lessons and how the students could study on their mobile phones during their commute. The latter comment is another piece of evidence supporting the topic of learning accessibility which continues to be a frequently discussed topic in the discussion of mobile learning affordances (Huls, 2022; Stockwell, 2016). However, not all participants enjoyed the experience; they shared comments about not being motivated to learn English on their mobile phones, low memory storage on the mobile device, and some cited the interference of background noise.

In an exploratory study of WhatsApp and negotiation of meaning, Dolores Castrillo, Martín-Monje and Bárcena (2014) report that students found the experience to be highly enjoyable and asked for similar types of learning experiences for the future. Similarly, Hayati et al., (2013) explored the push mode of SMS in the teaching of English idioms to Persian English language learners. Results of a post study survey showed that participants responded enthusiastically to the treatment. One point of constructive criticism extracted from the surveys was a concern about the small size of the screen, and a small minority of students reported they preferred to receive the idiom messages via email. Additionally, there were also concerns reported about the cost of sending and receiving messages.

Tabatabaei and Goojani (2013) also explored the effectiveness of text messaging on vocabulary learning to Iranian English as a Foreign Language (EFL) learners. For a total of six weeks, all participants engaged in in-person classes, including group work and receiving input to new target words to be learned. The experimental group sent the researcher one text message

with an original sentence including the target lexical item, to which the researcher replied back with explicit or implicit feedback. Participants also had to send messages to partners from class. This contrasted with the control group who wrote sentences for each word and exchanged them with their partners during the next in-class session, and they also received feedback. In order to assess the participants' attitudes of the experiment they were sent an attitudinal questionnaire, which revealed positive attitudes towards the application of SMS on vocabulary learning, although the article did not report specifics as to the "positive attitudes" reported by the learners.

In another study evaluating the effectiveness of SMS for vocabulary learning, Kim (2011) reports positive feedback from students about their use of this medium for vocabulary learning. Participants in experimental group 1 received messages, while experimental group 2 received and sent texts to answer quizzes. To assess perceptions of the experience, participants completed a questionnaire, as well as an in-depth interview. Participants enjoyed the experience and found it beneficial, especially regarding the repetitive nature of the engagement with the lexical items to be learned, the easiness and immediacy of the medium. However, students complained about the high frequency of messages and limited storage capacity. Students in this study also provided suggestions for using SMS, including desiring to learn grammar via this method, having a more regular time to receive the messages, and a small minority suggested reducing the amount of words in each message while increasing the number of messages.

Cavus and Ibrahim (2009) also explored the development of technical English words using SMS with a homemade system called MOLT (mobile learning tool) with 45 undergraduate 1st year English language learners which deployed unidirectional messages to the students. Overall, the students enjoyed the experience, rating the tool and activities highly positive. One of the reasons cited was the fact that the tool brought a higher level of flexibility to learning, as "now they could learn anywhere anytime" (p. 86). The authors also highlighted the potential

interest of students to use their mobile phones may have acted as motivation for them to learn the new words. Overall, the students enjoyed the experience, the MOLT system and they also expressed potentially more effectiveness with two-way communication due to the increased interactivity, which is similar to Kennedy and Levy (2008) who reported study participants wanting the ability to reply to the researchers push/one-way messages in order to "try out answers on someone" (p. 322). In a similar study, Lu (2008) also explored vocabulary learning via short-message service (SMS) on a group of English language learners. Participants reported advantages of convenience and effective time management, as well as the novel experience. In response to being asked about the disadvantages of the experience, students reported technological limitations, not being satisfied with the learning content, and some simply reported not liking the experience.

Branching into languages other than English, Kennedy and Levy (2008) continued their work on learning Italian through SMS on a group of first-year learners. Also using a one-way push notification dynamic, the researchers integrated content on culture, course announcements, on-campus related events, grammar, and vocabulary. For instance, some word-related messages included requesting opposites and discussions on suffixes across English and Italian. The researchers employed the bulk, discounted SMS service of a major telecommunications provider in the region the study was carried out. The researchers sent the students a total of 55 messages in the seven-week duration of the study, averaging 1.3 messages per day. The two primary research goals were to 1) explore the student reactions to the use of SMS to send course-related material to them on a regular basis, and 2) understand their preferences concerning the type and difficulty level of the message. The participants' reporting of their experiences was collected through pre- and post-trial questionnaires. Students appreciated the experience overall, and they thought the message content was useful or enjoyable. They also had varying degrees of

acceptability for the frequency of the messages, and the push and pull mode. Moreover, 84% of students expressed enjoyment and usefulness in receiving messages for vocabulary reinforcement and fostering interest in Italian vocabulary. A smaller majority found them helpful in consolidating their grammatical knowledge. Additionally, students appreciated course reminder messages and the diversity of message types. Some students reported wanting to be able to reply, especially when the prompt included a task.

Overall, the study data also show an overwhelming response that the messages were too frequent to the students´ liking, and they reported they found the messages more intrusive than they originally thought they might be. Few expressed privacy concerns, in regards to sharing their phone numbers and most were able to engage in the same activity via email if that were the case. Based on the student feedback about the frequency of the messages, for future application of this methodology, the researchers suggested an opt-in approach, where students could select either high- or low-frequency of receiving messages. Overall, the students reported that, in general, they found the experience acceptable, enjoyable, helpful, useful and, over all, there was a variety of responses regarding the frequency of receiving the messages, as well as at what times of day the students preferred to receive the messages.

Although not a comprehensive review of every study executed on the perceptions of text messaging and foreign language learning, the reviewed studies offer an insightful look into student experiences with this modality for language learning over almost ten years. In general, learners enjoyed utilizing text messaging for language learning, citing reasons for the novelty of the mode and experience, flexibility, and overall motivation. Disadvantages include certain technology limitations including low storage on the digital device and a small screen, as well as a sense of too many messages causing the experiments to feel invasive.

As reviewed in this chapter, participants have clearly expressed their opinions about the

frequency of the messages, motivation, effectiveness, and feasibility of the tool and experience for their language learning. Common in these questionnaires is an open-ended question where learners can offer non-prompted information. Some of these questions and responses aim to help answer the question "do students find using their mobile devices, especially messaging platforms, as an acceptable way of learning outside of class?" Overall, students seem to support using the devices themselves, as well as the affordances the devices offer to extend learning outside of the classroom. Considering the variability in the methodologies of studies conducted so far, which includes a diverse array of participants, a mix of results regarding learner perception of the experience is expected. It is worth noting, however, that the majority of the studies cited here explore vocabulary learning, which warrants its own specific pedagogical methods such as repetition and spaced learning (Nation, 2020; Schütze, 2017), and ultimately will produce participant feedback about the MALL experience, as pertaining lexical development.

2.6 Communication activities (learning tasks)

As outlined in Section 2.2, interaction and collaboration towards a shared goal are essential components for second language acquisition to occur (Arnold & Ducate, 2019; Blake & Guillén, 2020). One approach to curating environments, facilitating interaction and collaboration is through engaging learning in learning tasks. In this context, the concept of a task draws on the guidance from Ellis (2009), Skehan (1998) and González-Lloret (2016), as outlined in Section 1.2, and considers a task per the following definition (per Ellis (2003), as cited in González-Lloret, 2016):

> A piece of classroom work that involves learners in comprehending, producing or interacting in the target language while their attention is focused on mobilizing their

grammatical knowledge in order to express meaning, and in which the intention is to convey meaning rather than to manipulate form (p. 2).

Research has shown how leveraging technology-mediated communication platforms for language learning purposes can support various aspects of language development, especially to support conversational skills. For example, Moneypenny and Aldrich (2018) share research that discusses how online tools can increase confidence and equalize participation among learners, improve pronunciation skills, and even evoke more intensive communicative experiences. Technology also affords learners the opportunity to receive input and produce output while on the go using their mobile devices, which is essential for language learning to occur because "active dialogue practice and sufficient immersion in language learning contexts are critical drivers of learners' communication competence and language proficiency" (Huang et al., 2021, p. 2). Thus, utilizing mobile text messaging presents an ideal opportunity to execute interactive, task-based communicative activities.

Lee's (2007) work exemplifies a social-constructivist approach for language learning tasks. In this study, fifth-semester college Spanish students engaged in one-to-one oral interaction through video conferencing with expert speakers.. The study aimed to create a collaborative and low-stakes environment for students and experts to construct meaning through task-based activities. Additionally, it sought to enhance students' language skills through audio and video synchronous interactions. The one-on-one chats between the dyads resulted in bringing up themes of pragmatic awareness in social context, pronunciation, lexical variation, and interpersonal relationships. Further, the use of scaffolding, which relied on individual knowledge and the expertise of more advanced speakers, played a vital role in co-constructing meaning and supporting the lower-level learner.

When developing a learning activity for mobile devices it is crucial to be prudent to

complex characteristics of mobile technology and design the tasks accordingly. For instance, Stockwell's (2016) ten principles for integrating mobile devices into learning (pp. 304-305) serve as an effective starting point. Although not all principles are listed here, the following were the ones which received top priority for this particular study:

1. Consider the affordances and limitations of both the mobile device and the environment in which the device will be used in light of the learning goals.

4. Strive to maintain equity, including catering for a range of mobile devices and provide for nonmobile alternatives[5].

6. Be aware of language learners' existing uses and cultures of use for their devices.

7. Keep mobile language learning activities and tasks short and succinct when possible, dividing longer tasks into smaller chunks.

9. Provide guidance and training to use mobile devices for language learning most effectively.

Communication Activities were designed for learners in the present study to engage in meaningful, target language communication following the suggestions given by Stockwell. The Communication Activities (CA) designed for this present study reflect more a communicative classroom activity than a true task with real life application in daily life outside of the classroom. Although the tasks were completed outside of the classroom, in a semi-structured, naturalistic environment, the task itself represented more a learning task for classroom work.

The objectives of these activities was to create a space where learners could practice their language skills in an environment that was quick-paced, low-stakes, highly interactive, and allowed for the use of a mode in which learners are very comfortable. This approach aimed to foster fluency, memory, retention, and muscle memory, while allowing learners to focus on

[5] The grayed out figures show tasks with no non-mobile alternatives.

communication without being overly concerned about grammar mistakes. The learning environment encouraged a fluid back-and-forth interaction, facilitating a seamless turn-taking sequence. The Communication Activities served as a foundation, a launch pad, for developing oral communication skills, preparing learners for potentially more high-stakes face-to-face interactions with native or more advanced speakers. This concept aligns with the idea proposed by Payne and Ross (2005) that STMC could potentially serve as a "preparatory activity for face-to-face (f2f) discussion) (p. 36). This approach further aligns with Abrams' (2003) suggestion that the "semispeech" quality of technology-mediated communication offers a "useful and important stepping stone for second language development" (p. 158).

Another objective of assigning tasks for learners to complete outside of class was to offer them flexibility in when and where they could engage in learning, enabling them to access various necessary reference materials (Stockwell, 2016), and fostering their learning autonomy. Similar to Nah, White and Sussex (2008), the learners in this present study extended learning outside of the classroom, thus assuming responsibility for completion of the activity, as well as the time and place of when they carried it out. This was intentionally designed this way to allow for flexibility, autonomy, and inclusivity, with the aim to increase motivation and agency in student learning. The specifics of the Communication Activities are found in Section 3.5.1 and Appendix B.

2.7 Conclusion

This review of the literature has focused on key aspects of research within the area of mobile-assisted language learning, highlighting specifically text messaging and the development of various language skills. Specifically, this dissertation study explores the effect of text messaging on L2 oral fluency. As discussed in Chapter 1 and this present chapter (Chapter 2), the theoretical justification is based on a sociointeractionist theory of second language acquisition

and acknowledging that the communication which occurs in technology-mediated communication environments uses a hybrid form of discourse.

As technology-mediated communication and technologies such as mobile phones (and other mobile devices) have evolved and become quite advanced, these evolutions have not only affected how language is used, but also created a new space for language use. This virtual or figurative space—technology-mediated communication—is varied in its features (e.g. text-based communication such as email or spoken discourse such as FaceTime or a hybrid of both, such as text messaging), and can be hosted on a plethora of devices (i.e personal computer, laptops, tablets, and mobile phones).

There are several reasons why mobile devices, especially mobile phones, and TMC modes such as text messaging, may be a compelling tool for language acquisition and language skill development. The main reasons reported in this chapter are the highly interactive and multimodal nature of a form of communication with affordances of both spoken and written discourse. As Abrams (2003) and Chun (1994) suggested over two decades ago, these types of hybrid digital communication spaces may be a useful and impactful "stepping stone for second language development" (p. 158). The advances in technology, pedagogy, and research methodology, and evolutions in communication and language behavior, keep TMC and text messaging in the forefront for research and application in language skill development.

In the following chapter we detail the methodology employed to conduct this dissertation research. Both quantitative and qualitative measures were employed in order to provide a triangulated and more holistic perspective of the data. The primary research questions are revisited, along with a detailed description of the participants, data collection measures, procedures and treatment.

CHAPTER 3: Methodology

3.1 Context of Study

This study was conducted at a large R1 university on the west coast which follows a 10-week quarter system. The study participants and treatment were part of Spanish 3, the final segment in the first year Spanish program, SPA (Spanish) 1-3. The main objectives for the first-year Spanish program are for students to develop basic proficiency in Spanish to utilize in real-life communication and develop a variety of language skills including reading, listening, speaking, and writing. They do this through practicing and engaging in Spanish in a diverse array of activities and assignments, such as reading activities, watching real Spanish-speaking videos and shows, and engaging in communication activities, both in production and comprehension. In these courses, students also develop competence in basic grammatical concepts and expand their knowledge on the different cultures of the Spanish-speaking world. The College of Letters and Science has a one-year language requirement for graduation which requires students to complete three sequenced quarters of a foreign language. This course series meets five days a week and engages in at-home homework activities and in-class interactive activities. The SPA 1-3 series is structured using the flipped model structure, where students first engage with target concepts such as grammar and vocabulary at home through homework, and then come to class to clarify questions and put into practice what they learned with peers.

Spanish 3 is a multi-section course and typically has approximately 6-8 sections and approximately 90-120 students enrolled per quarter. Spanish 3 utilizes a curriculum which blends both work from *Contraseña*[6] (a third-party language learning management system for learning Spanish), and in-house curriculum material designed by the Course Coordinator, along with the support of graduate teaching assistant (TA) instructors. Course homework is turned in or

[6] https://lingrolearning.com/

completed via Contraseña or Canvas.[7] Canvas is the university-wide learning management system (LMS) all courses on campus use for class communication, grading, and turning in homework and assignments. Table 1 shows a sample calendar for a typical week in SPA 3. As part of the SPA 3 course curriculum, the Communication Activities are found weekly on Thursdays, and they are completed as out-of-class homework assignments.

Table 1. Sample calendar for a week of SPA 3.

	Homework • (online)	In-class topic/activities (in person)
Monday	• Reading comprehension quiz • Vocabulary I & II	• Reading activity
Tuesday		• Vocabulary I & II: presentation & interaction
Wednesday	• Listening comprehension quiz • Grammar I	• Film viewing & comprehension workshop
Thursday	• Grammar II • Pronunciation • *Communication Activities	• Grammar I: presentation & interaction
Friday		• Grammar II + Review of Vocabulary I & II

3.2 Research Design

This mixed-methods study leverages both quantitative and qualitative methods and assessment measures in a semi-experimental design in an informal learning environment. The study was executed under semi-controlled conditions. Participants were tasked to complete specific graded learning assignments which they turned in as homework. The activities were completed outside of class time, on their own devices, were graded incomplete/complete, and were open-ended in the sense that the participants were required to complete a task, but how they

[7] https://canvas.ucdavis.edu/

completed the task (linguistically) was up to them. These learning activities are listed in the course calendar in table 1 as Communication Activities.

To measure fluency gains and learner perception of the activities, a cross-sectional semi-experimental study was conducted over two 10-week academic quarters (Fall 2022 (FQ22) and Winter 2023 (WQ23)) and administered across 8 sections of high beginning Spanish learners (FQ22 = 6 sections, n = 14; WQ23 = 2 sections, n = 6). During each quarter the participants were divided into two groups, one that carried out the Communication Activities via WhatsApp (the experimental group), and one group that carried out the Communication Activities via Zoom (the control group). Results were assessed using measurements of word complexity (total and unique words), speech rate, a scale of fluency and comprehension, as well as survey data and exit interviews across groups of learners and individual students.

WhatsApp was chosen as the texting technology for five primary reasons. First, WhatsApp was the leading communication platform for smartphone users globally in 2022 (Ceci, 2023b), was the most popular mobile messaging app in 2023 (Ceci, 2023a), and in a 2022 survey about WhatsApp usage among adults in the United States 31% of participants fell into the 18-34 percentile, which is the highest percentile of the four age categories. Second, WhatsApp is an encrypted messaging platform ensuring privacy on both ends of the message (sender and receiver). Third, the export message functionality is simple and streamlined, and offers users a simple way to submit the conversations to the researcher/instructor. Fourth, the platform is free of charge and available for download on all devices and operating systems, making it accessible to any learner with a smartphone. Lastly, WhatsApp is extremely popular among Spanish-speaking countries, which affords Spanish learners, such as the ones in this research study, another way to connect with and learn more about Spanish-speaking culture(s). For example, in 2022 the WhatsApp penetration rate among global messaging app users for

Argentina was 96% (ranked as the fourth most highly penetrated market at the time the data was collected), and Spain 92.2%, Mexico 87.1%, and the United States 41.2%, not far behind (Ceci, 2023c).

3.3 Research Questions Revisited

The primary interest of this study is to determine any effects of texting in L2 Spanish on adult Spanish learner's oral fluency at the high beginning level. The principal researcher predicts an influence of mobile devices and the interaction occurring during text messaging as an agent in facilitating interaction that is an essential component for second language acquisition to occur, as presented in Chapter 2. This study also took into consideration qualitative data that offered insight into learners' and instructors' perceptions of mobile devices used to facilitate semi-structured learning outside of the classroom in a more natural environment. This point will be discussed later in this chapter. The following research questions respond to the primary research concerns and justify the need for the experimental procedures executed in this research study:

1. What is the relationship between text messaging and oral fluency, as measured by 1) total words, unique words, and speech rate? 2) number and duration of pauses? 3) percentage of impediment of pronunciation in comprehensibility? 4) turn-taking?
2. What are the learners' and instructors' perceptions about 1) the relationship between their L2 texting behavior and their L2 oral fluency? 2) Language learning via a mobile device in a semi-formal learning environment? 3) Task design of the communicative activities?

3.4 Participants

The study participants were divided into two main groups according to the modality with which they performed the Communication Activities (CA): Texting (WhatsApp, Experimental (E) group) or speaking (Zoom, Control (C) group). The study group division was semi-experimental as each class section was randomly assigned either WhatsApp or Zoom. This resulted in four class sections utilizing WhatsApp and four class sections utilizing Zoom. During Fall Quarter 2022 the researcher was an instructor of one of the class sections, and during Winter Quarter 2023 the researcher was closely connected with and communicated frequently with the teaching team. This gave the researcher the ability to communicate and collaborate with, and train the instructors on implementing the CA. The more advanced beginner course was selected due to its high enrollment and language level. However, although the expectation was to have approximately 80 participants (which would have normally been possible due to course enrollment) several factors impacted the number of participants who completed all items necessary for the course.

There are four primary limitations which caused limited numbers of enrolled participants. First, the first quarter this study was executed, there was an academic worker strike on campus and the majority of the Spanish classes did not complete the full quarter, which resulted in a loss of approximately 5 weeks of classes, which negatively impacted assignments turned in and exams taken, including extra credit assignments. This resulted in the principal researcher needing to collect data the following quarter. Second, the principal researcher did not have direct control of the activities and study in the class sections, which most likely resulted in a lack of engagement and buy-in from the students not in her class. Third, approximately 90% of each course section completed the initial questionnaire and consent form on the initial visit for recruiting purposes, however because the speech elicitation tasks had to be done at home this

reduced the number of students who actually followed up on this task. These limitations are more fully discussed in Chapter 7. All participants in the selected class sections were offered the opportunity, however only 20 participants completed all necessary items to be included in the study. An outline for the participant group according to their treatment and academic term is below in table 2.

Table 2. Distribution of participants by treatment and academic term.

	Fall 2022	Winter 2023	Total
Text messaging (Experiment) Tool: WhatsApp	n = 10	n = 3	n = 13
Speaking (Control) Tool: Zoom	n = 4	n = 3	n = 7
		Total study participants	n = 20

3.4.1 The Experimental group

The experimental groups (E group) (n = 13) were semi-randomly selected within the two terms of the study, Fall 2022 and Winter 2023. While the course sections were selected at random (for experimental and control groups) by the main investigator, often students self-select into courses depending on factors such as time of day or known classmates. All students in the E group were asked to download WhatsApp[8]. Although students needed guidance in downloading the application WhatsApp, they did not need explicit training on utilizing the app given their familiarity with text messaging applications in general. Students were paired either randomly by the instructor or self-selected their language partner depending on the instructor's policies. Students then exchanged mobile phone numbers and kept the same language partner for the duration of the academic quarter. If there was an odd number of students in the class, one group of three was allowed. Instructors used a Google Sheet template to form and keep track of

[8] https://www.whatsapp.com/

language partners. See Appendix C for a sample student pairing sheet. Once language partners were determined all participants engaged in the weekly Communication Activities (weekly interactive communicative tasks). Eight weeks of treatment was selected because the study took place in a 10-week academic term, and week 1 and week 10 is when the pre- and post-tests were carried out. The Fall 2022 participants completed eight weekly Communication Activities (CA), and based on student feedback revisions were made for Winter 2023, which included a pre-quiz (which helped students prepare more for the assignments). Following were only seven CA. The weekly CAs were located in Canvas (the class' Learning Management System (LMS)). Each weekly activity included a prompt to respond to and instructions on how to turn in the activity. Once their activity was completed, participants turned in their text message exchange by exporting the chat into a .txt file and uploading it into Canvas. Figure 1 is an example of a WhatsApp chat carried out by the Experimental group responding to the prompt.

Figure 1. Sample WhatsApp task from E group in Fall 2022.

1. [9/28/22, 3:35:28 PM] Estudiante 2: Hola XXX! cómo estás
2. [9/28/22, 3:36:30 PM] Estudiante 2: ¿tú quieres completar nos contorno de podcast?
3. [9/28/22, 3:38:19 PM] 01: ¡Sí! Quáles son sus ideas para el podcast? Las tengo, pero estoy curioso sobre sus ideas.
4. [9/28/22, 3:40:30 PM] Estudiante 2: me gusta mucho el fashion, especialmente fashion elegante con vestidos, chaquetas, y zapatos
5. [9/28/22, 3:40:42 PM] Estudiante 2: Qué es tu ideas?
6. [9/28/22, 3:43:11 PM] 01: Tal vez...cuando empezamos nos podcast, ¿habla sobre fashion elegante? Un parte donde compartes sobre fashion elegante qué es más común o popular recientemente.

7. [9/28/22, 3:47:42 PM] Estudiante 2: yo creo que hablamos a fashion elegante en la historia.
8. [9/28/22, 3:49:34 PM] Estudiante 2: tenemos tendencias de la moda de década como 60s o 90s
9. [9/28/22, 3:51:06 PM] 01: ¡Me gusta la idea! ¿Primero, puedes hablar sobre fashion elegante que is reciente, y segundo podemos hablar tendencias de la moda como 60s o 90s?
10. [9/28/22, 3:51:43 PM] 01: ¿Te gusta la idea?
11. [9/28/22, 3:51:56 PM] Estudiante 2: ¡si! me gusta
12. [9/28/22, 3:52:19 PM] 01: Que bueno, ahora necesitamos tres más ideas.
13. [9/28/22, 3:52:56 PM] 001: Oh, tengo una idea similar. ¿Puedo compartirte?
14. [9/28/22, 3:53:33 PM] Estudiante 2: ¡si! por favor
15. [9/28/22, 3:54:07 PM] Estudiante 2: yo quiero escuchar tu idea
16. [9/28/22, 3:56:38 PM] 01: Mientras te gusta la moda elegante, me gusta la moda informal. Por la idea tres y cuatro, tal vez compartimos sobre las camisetas, mallas, y vaqueros más común y popular ahora, pero también cuáles fueron más común y popular en los 60s o 90s.
17. [9/28/22, 3:57:58 PM] Estudiante 2: ¡Que bueno! me gusta mucho su idea

3.4.2 The Control Group

The participants in the control group (n = 7) used Zoom as the modality to carry out the weekly Communication Activities. Zoom[9] was selected as the control group for four reasons. First, because this study is measuring a cross modality effect, the modality with which the control group carried out their communicative activities needed to be the opposite of the experimental group (which used writing, text messaging), so the control group needed to be the

[9] https://zoom.us/

modality of oral communication. Second, the university that the study participants attend has a license for the software Zoom, so the platform was freely available to all study participants. Third, most students have experience with and familiarity using this video conferencing platform as it is widely used for hybrid and remote courses, campus activities and events, and was the primary source of hosting class during 2020-2021. Fourth, Zoom afforded students a modality to engage in their CA at any time and any place they wanted, which was also available to the participants in the WhatsApp group. The same process for partner selection described above for the WhatsApp group was executed in the Zoom groups and the control group (Zoom) engaged in the same process of reading the weekly task on Canvas. However, instead of interacting via text messaging they logged on to a Zoom call and carried the conversation out orally, synchronously, and face-to-face. Once control group participants were finished with their task, they were instructed to turn in the link of the Zoom recording on Canvas. Some students turned in this link, and some students uploaded the .mp4 video recording. Figure 2 is an example of a Zoom chat carried out by the control group responding to the prompt.

Figure 2. Sample Zoom task from E group in Fall 2022.

1. Student 2: oh. Si tiene muchos amigas, puede ir a un baile o un museo
2. Participant 14: por supuesto, ella tiene muchas amigas, me gusta más el baile como el evento
3. Student 2: el baile, si
4. Participant 14: sí…y
5. Student 2: okay,
6. Participant 14:¿qué llevas? Como like como es un conjunto
7. Student 2: Para el baile, si si la profesora va a venir ahorita está muy frío, entonces un vestido con mayas
8. Participant 14: Sí
9. Student 2: también con para la baile
10. Participant 14: sí también. Si ella quiere bailar, no puede you know llevar como tacones altos. Like necesitas necesita zapatos, zapatos,
11. Student 2: zapatos ¿cómodos?
12. Participant 14: Yea, zapatos cómodos, sí cómodos ya es bueno uh…¿un vestido?
13. Student 2: ¿y mucha joyellería?
14. Participant 14: O sí, sí, sí, joyas
15. Student 2: joyas, joyas,
16. Participant 14: joyas, sí, aretes y un collar como hace bueno. También uh necesita un una bolsa un bolso.
17. Student 2: un bolso
18. Participant 14: Como su teléfono y los otros cosas.

19. Student 2: Mhm-mm.
20. Participant 14: Um
21. Student 2: y si va a un baile en el verano el mismo. Va a llevar la mismo no nomás. No los mayas porque no va a estar frío.
22. Participant 14:sí, sí. Pero el resto va a hasta el mismo. Y como el vestido like necesito necesitamos like un color o dibujo you know por todo el conjunto y [unintelligible] like ¿como negro o rojo? como los colores.
23. Student 2: mmm mmm negro se va con todo.
24. Participant 14:Sí, okay, negro es fácil so un vestido negro uh los zapatos de color, pues los zapatos. Negro también.

3.4.3 Instructors

There were a total of nine instructors in the study, seven in the experimental group and three in the control group. Because this study was carried out over two quarters with some of the same instructors, some instructors taught using both modalities or changed modes from one quarter to the next. Table 3 shows a breakdown of the instructors, academic term, and communication modality of the CA. In Fall 2022, there were six sections of the course level and all six sections were used for data collection (students and instructors). In Winter 2023, only two of the course sections were used for data collection from the participants, but all instructor data was collected from all sections.

Table 3. Instructors and their study modality (Zoom or WhatsApp) across the two quarters.

	Fall Quarter 2022 (FQ22)		Winter Quarter 2023 (WQ23)	
	WhatsApp	Zoom	WhatsApp	Zoom
Instructor 1	-	✓	✓	-
Instructor 2	✓	-	✓	-
Instructor 3	-	-	✓	-
Instructor 4	-	-	✓	-

Instructor 5	-	-	✓	-
Instructor 6	-	✓	-	✓
Instructor 7	-	✓	-	-
Instructor 8	✓	-	✓	-
Instructor 9	✓	-	-	-

All instructors were graduate teaching assistants. To account for continuity in course instruction and methodology, all instructors followed the same curriculum and had a course teaching supervisor that was responsible for designing the course syllabus, activities, and calendar. The course teaching supervisor and principal researcher collaborated on design, methods, and dates for implementing the weekly Communication Activities. In Fall 2022, the principal researcher provided an overview and brief training of the study and materials to the course instructors prior to the beginning of the quarter. In Winter 2023, the principal researcher created CA preparation materials to help both the student participants and instructors gain a clearer understanding of the purpose and design of the Communication Activities. These materials included two PDF infographics and a YouTube video, and are found in Appendix D. Although all instructors had access to the same training information, supporting materials, and communication with the primary investigator, differences in instruction exist, are taken into consideration, and discussed in more detail in Chapter 5. It should also be noted that Instructor 9, who taught an Experiment group class section in Fall 2022 is the principal researcher of this study.

3.5 Data Collection

Data was collected from five primary sources: 1) pre- & post-oral assessments, 2) language background questionnaire and demographic survey, 3) post-experience questionnaire, 4) communication activities, and 5) instructor experience questionnaires and exit interviews. The pre- and post-oral assessments were based on the oral fluency of the study participants. The student participants were given speech elicitation tasks to respond to orally. The speech elicitation tasks were the same for both pre- and post-tests. The full speech elicitation tasks are found in Appendix E. The participants recorded themselves speaking on their own audio recording devices at home and emailed their audio files to the researcher. The researcher converted all files to the mp3 format and saved the files in a password protected and secure Drive folder. These audio assessments enabled the researcher to assess gains or changes in fluency from the beginning of the academic quarter to the end of the quarter.

The language background questionnaire and demographic survey was administered via Qualtrics[10]. This questionnaire allowed the researcher to determine the linguistic background of all study participants, as well as general mobile phone behavior such as text messaging. The post questionnaire was also conducted via Qualtrics and provided insight into what participants thought of the treatment (the Communication Activities and their modality), as well as their own perceived development of language skills (speaking, writing, reading, listening) throughout the study.

In addition, analyzing Communication Activities allowed the researcher to explore and track turn taking across the activities throughout the quarter. The WhatsApp Communication Activities were downloaded as a .txt file, each line was anonymized and coded for the participant, and numbered. Each participation turn was counted to determine the number of turns

[10] The full questionnaire is found in Appendix A.

per participant. The Zoom Communication Activities were transcribed from audio to text using Microsoft Word's AI-speech-to-text transcriber, and then checked and revised by the principal researcher.

The instructor questionnaires and exit interviews offered a glimpse into the experience of the instructors including their experience teaching with the Communication Activities, different modalities, and their own perceptions on student engagement with the activities, as well as perceived skill development of the students. The questionnaire was administered via Qualtrics and the exit interviews were carried out via Zoom.

3.5.1. Assessment measures: quantitative analysis

The study treatment was done over the course of a 10-week academic quarter, thus it is likely there would be an average increase over time for all the study participants due to consistent practice, studying, and engagement with the material. The descriptive statistics used to analyze the following variables leverage a difference-in-difference model. Because the main point of the study is to assess any effect of modality across participants (Zoom vs. WhatsApp), a modality effect from the treatment would show up as a difference between modalities at the conclusion of the study that is not attributable to either the difference at baseline. Because each participant received a modality measurement (E group = WhatsApp and C group = Zoom) and all participants received points of time measurement (pre and post), this analysis selected a repeated measures ANOVA statistical test. For instance, each participant was measured four times (2 pre audio recordings and 2 post audio recordings) for the given outcome/dependent variable. This assessment was done with a linear mixed effect model using R[11]. The following dependent variables were included in the ANOVA for the audio recordings of the participants:

[11] https://www.r-project.org/

total words, unique words, speech rate (words per second), a 7-point scale of fluency, and the percentage of comprehension impeded by poor pronunciation (which is reflected as a 10-point scale). The measure of number of turns taken by participants was also accounted for in each of their Communication Activities (CA). Unless a participant did not turn in one of their required Communication Activities, each participant FQ22 had eight activities and WQ23, seven activities. All CA were counted for number of turns and included in the ANOVA. A more detailed account of the statistical analysis methods are explained in Chapter 4.

3.5.2. Assessment measures: qualitative analysis

The qualitative analysis explored the experience and perception of the student participants in depth, especially with regard to their perception of language skill development, task design and modality, and their overall experience. The qualitative analysis also analyzed similar topics from the instructor's perspective. As previously mentioned, the study participants totaled students n = 20 and instructors n = 9. The final week of the study, week 10 of a 10-week academic quarter, student participants completed an experience questionnaire via Qualtrics. The survey included questions about the participants' experiences with the Communication Activities, task design, mobile learning, and perceived language skill development. Students were also invited to complete an exit interview. The complete Student Participant Experience Questionnaire is found in Appendix F. Similarly, at the completion of the study the instructors also completed an experience questionnaire and were invited to participate in an exit interview. The complete Instructor Experience Questionnaire is found in Appendix G. Administering these surveys and interviews allowed the researcher to explore the following research questions: What are the learners' and instructors' perceptions about…

1) …the relationship between their L2 texting behavior and their L2 oral fluency?

2) …language learning via a mobile device in a semi-formal learning environment?

3) …task design of the communicative activities?

3.6 Experimental Procedures (Communication Activities)

As previously mentioned the two main components of this study were 1) second language (L2) oral fluency and 2) perception of mobile task design and language skill development. The quantitative measures were administered to all student participants in the study during weeks 1 and 10. The pre-treatment language background survey was completed in class during week 1, the final experience questionnaire was completed week 10 at home. Both sets of oral recordings (week 1 and week 10) were completed at home.

The treatment consisted of the Experimental Group executing weekly Communication Activities via text messaging using the WhatsApp application. The control group carried out the same activities in a face-to-face speaking situation using the video conferencing software Zoom. The principal researcher designed the Communication Activities based on the content in the course curriculum, which aimed to facilitate an interactive environment where learners use the target language structures being learned in class, as well as to create an environment which supported language creativity and learner autonomy. The tasks were listed in the course's learning management system (LMS), Canvas, as a weekly assignment. The participants read through the task and completed the task with their language partner via their assigned modality. The Communication Activities are found in Appendix B (Fall 2022) and (Winter 2023).

3.7 Summary

This chapter detailed the study's research questions, participants, groups, and quantitative and qualitative data collected and methods conducted to investigate what impact text messaging

may have on L2 oral fluency. An in-depth explanation and discussion about the data, statistical tests employed, and summary of results are discussed in chapters four and five.

CHAPTER 4: Quantitative Analysis & Results

4.1 Introduction

The primary objective of this study was to understand the effect of communication modality (texting) on spoken discourse, specifically oral fluency. To measure this, several assessments were conducted to more thoroughly understand the relationship between text messaging and oral fluency, as measured by total words, unique words, speech rate, repair of a communication breakdown, pauses, and incomprehensibility[12]. In this chapter, motivation for assessment types, data collection procedures, statistical analysis, and data analysis will be thoroughly explained.

A secondary goal of this study was to examine the perception that learners and instructors of Spanish have regarding mobile learning activities completed outside of the classroom, as well as the perceived benefits and drawbacks of these activities. An overview of learner and instructor quantitative results will be presented here and a more detailed look at the qualitative data, such as participant and instructor testimonials and five case studies, will be presented in more detail in Chapter 5.

The data for this chapter are organized as in the following order: 1) participant pre-language background questionnaire and demographic survey, 2) participant pre-/ post-oral assessments, 3) the data analysis of an Analysis of Variance (ANOVA) statistical test on total words, unique words, speech rate, fluency, and incomprehensibility, 4) participant post experience questionnaire, and 5) instructor surveys. Triangulating the data collection methods as such, including pairing various quantitative measures with an attitude and perception questionnaire, allowed the researcher to examine the relationship between text messaging and oral fluency in a more holistic manner.

[12] Although not included in this study, in future research this data will be analyzed for the fluency variable of pauses, including number and length of pauses

4.2 Participant pre-study language background questionnaire and demographic survey

In order to have a comprehensive understanding of who participated in the study and to understand the impact of items such as linguistic profile, gender, and comfort using digital tools, all participants filled out a questionnaire, which included questions about their language background, mobile phone use, and text messaging behavior, as well as general demographic questions. The questionnaire was administered via Qualtrics and students completed it in class during a visit by the principal researcher at the beginning of the quarter as part of study recruitment efforts. Table 4 shows the gender, language background, years of Spanish formally studied, and other languages spoken of the study participants.

Table 4. Gender and language background of study participants.

Gender				**How do you identify yourself in regards to your Spanish language background?**		
male	female	non-binary	other	Non-native Spanish speaker (L2 Spanish learner)	Heritage speaker of Spanish	Native speaker of Spanish
6	14	0	0	18	2	0

How many years have you been formally studying Spanish? (e.g. the number of courses/years you have taken Spanish up until now)						
No. of years	1	2	3	4	5	6	7
No. of participants	1	0	6	7	2	2	2

As outlined in the box in the bottom two rows, the majority of students reported having formally studied Spanish between three and four years. This is expected with this participant group due to the level of the course in which the study took place (Spanish 3), as participants may have taken Spanish in high school and placed into Spanish 3 upon entering University or started with Spanish 1 and moved into Spanish 3 at the university. All twenty participants reported English as

their dominant language, and other languages spoken among the group were Hebrew, Punjabi and Tamil. One student reported formally studying Hebrew for five years.

Because of the nature of this study, collecting information about cell phone usage, especially text messaging, was important. Table 5 shows information about the age at which participants received their first smartphone.

Table 5. Smartphone ownership age.

At what age did you receive your first Smartphone?					
Age	10	11	12	13	14
No. of participants	4	2	8	4	2

Assuming an estimated age of this group of participants based on their enrollment in the university and course level (~18-20 years of age), an estimated average number of years that this group of participants have owned a Smartphone when this study took place is approximately eight to nine years. Nineteen participants reported utilizing iPhone/iOS as their operating system, and one participant reported using Android. The average number of text messages that participants reported sending per weekday and per weekend day is found in table 6.

Table 6. Average number of text messages sent during a typical week.

Approximately, the average number of text messages sent on a typical…		
	…weekday.	**…weekend day (Fri., Sat. & Sun.)**
No. of messages	No. of participants	
0-5	1	0
6-10	2	2
11-20	5	2
20-40	9	10
40+	3	6

This group demonstrated a small increase in messages sent from weekdays into the

weekend. Table 7 shows the primary messaging application among the group. It is worth noting that before the start of this study no participant had previously been using WhatsApp and they were all new to the application and needed to download it prior to starting participation in the study. This point will be further discussed in Chapter 6.2.4 (Task design of the Communication Activities).

Table 7. Text messaging platforms and purpose.

What is your primary application for messaging?		**Do you use predictive text? (both in English or Spanish)**	
Message service	**No. of participants**	**Frequency**	**No. of participants**
iMessage	14	Yes (often)	7
WeChat	0	No (never)	2
SMS	1	Sometimes	11
WhatsApp	0		
Other	5		

Other: Discord, Snapchat, Instagram (x2), Messenger

Participants were also asked to report their main purpose of text messaging: 5 reported *informative*, 15 reported *social* and 0 reported *business* related purpose (which were the only three options from which to select).

4.3 Participant Pre & Post Oral Assessments

In order to measure the effect of the modality on their oral production, participants completed a speech elicitation task at the beginning and end of the study. The terms *pre* and *post* are utilized throughout this paper to refer to the speech elicitation task recording which were done at the beginning and at the end of the quarter. The timing of these tasks aligned with the first and last week of an academic 10-week quarter. As outlined in Chapter 3 each participant (n=20) responded to two tasks both before and after the experiment, which consisted of four audio recordings for each participant, for a total of eighty audio recordings. The audio files were

anonymized and coded according to participant number, E or C group, pre or post, and speech task (1 or 2). To gain a holistic perspective of fluency, the audio files were assessed for two factors of data: objective data (total words, unique words, and speech rate) and subjective data (aspects of fluency and percentage of comprehensibility impeded). Because the group of participants was relatively homogenous (e.g. dominant language, years studying Spanish, and language background identification) these aspects were not included as dependent variables in the statistical tests.

Researchers have pursued many variables as measures of fluency such as speech rate (words per minute), mean length of run, phonation time ratio, articulation rate, average number and length of pauses, amount of filled pauses, utterances, amount of filled pauses and filled pauses per T-unit, and stressed words per minute (Blake, 2009; Moneypenny & Aldrich, 2018), or false starts and other disfluencies (Derwing & Munro, 2013). This present study selected the five measures of fluency mentioned above because of accessibility regarding data collection instruments and the limited duration of study (10 weeks).

4.3.1 Total words, unique words, and speech rate

To obtain the total words, unique words, and speech rate the principal researcher transcribed the participant audio recordings using Microsoft Word's AI-speech to text tool and then reviewed and verified their accuracy. This allowed the researcher to see word count, calculate speech rates, and to have a full transcription of the speech production. In addition, to access unique words in the speech sample, the audio text transcriptions were uploaded into AntConc[13] (a free corpus analysis tool) which provided the number of unique words per speech sample. To obtain speech rate (words per second), the total number of words was divided by the

[13] https://www.laurenceanthony.net/software/antconc/

duration of the speech sample (in seconds). Total words, unique words, and speech rate were calculated using a repeated measures ANOVA test, using a linear mixed effect model in R. The results are discussed below.

Table 8 below shows the average number of total and unique words produced across groups. In regards to total words, the E group (experiment group using WhatsApp for the Communication Activities) showed gains across pre- and post-treatment speech tasks both collectively and separated by task 1 and task 2. In contrast, the C group (control group using Zoom for the Communication Activities) showed slight declines in their total words produced across time (pre and post treatment), both with task 1 and task 2 separated, as well as tasks combined. A similar result was also found in Kern (1995), who reported the group using text-based technology-mediated communication produced more average total words than the group in oral discussions, as will be discussed in Chapter 6.

Unique words showed a bit more variation across groups. Both the experiment and control group showed a slight decline in the use of unique words across time for task 1, but they demonstrated gains for the tasks combined. Particular differences are noted in pre- and post-unique words for task 2 where the experimental group showed a slight gain and the control group showed a slight decline. To complement the numerical display of this data in table 8, figures 3, 4, 5, 6, and 7 offer a more visual representation.

Table 8. Average number of total words and unique words produced by group in the pre and post treatment speech elicitation tasks.

Total words produced									
	Tasks separated						**Tasks combined**		
	Pre.Task1	Post.Task 1	**gain/ loss**	Pre.Task2	Post.Task2	**gain/ loss**	PreTask1&2	PostTask1&2	**gain/ loss**
E	216	235	19	180	194	14	198	214.5	16.5
C	240	211	-29	174	202	28	207	206.5	-0.5
Unique words produced									
	Tasks separated						**Tasks combined**		

	Pre.Task1	Post.Task 1	gain/ loss	Pre.Task2	Post.Task2	gain/ loss	PreTask1&2	PostTask1&2	gain/ loss
E	100	96	-4	80	87	7	90	91.5	1.5
C	107	106	-1	84	99	15	95.5	102.5	7

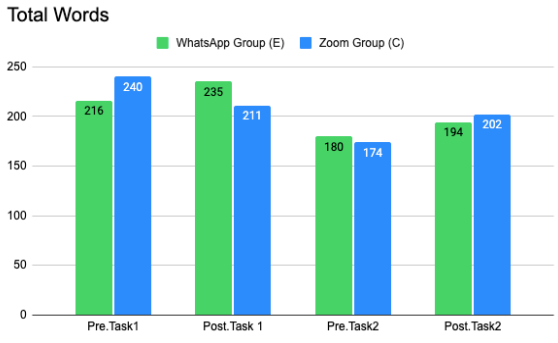


Figure 3. Average total words produced by groups separated by task and pre or post treatment.

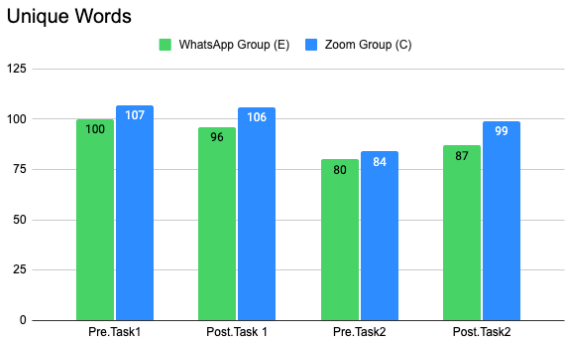


Figure 4. Average unique words produced by groups separated by task and pre or post treatment.

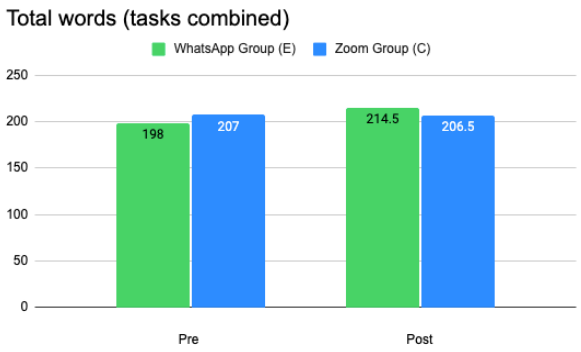


Figure 5. Average total words produced by groups with tasks combined shown across pre and post assessments.

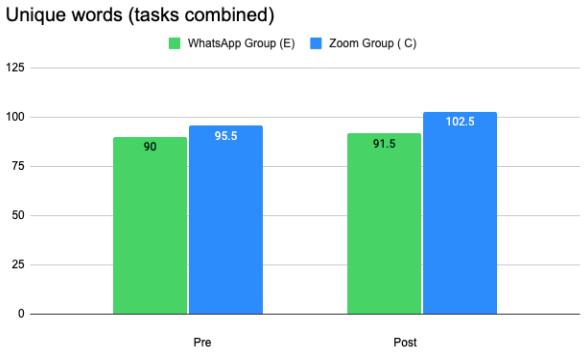


Figure 6. Average unique words produced by groups with tasks combined across pre and post assessments.

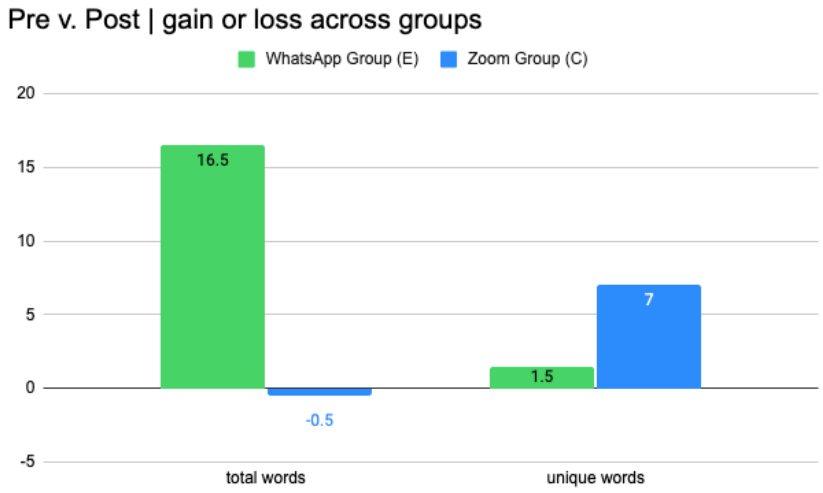


Figure 7. Total and unique words gains or losses across groups pre and post treatment.

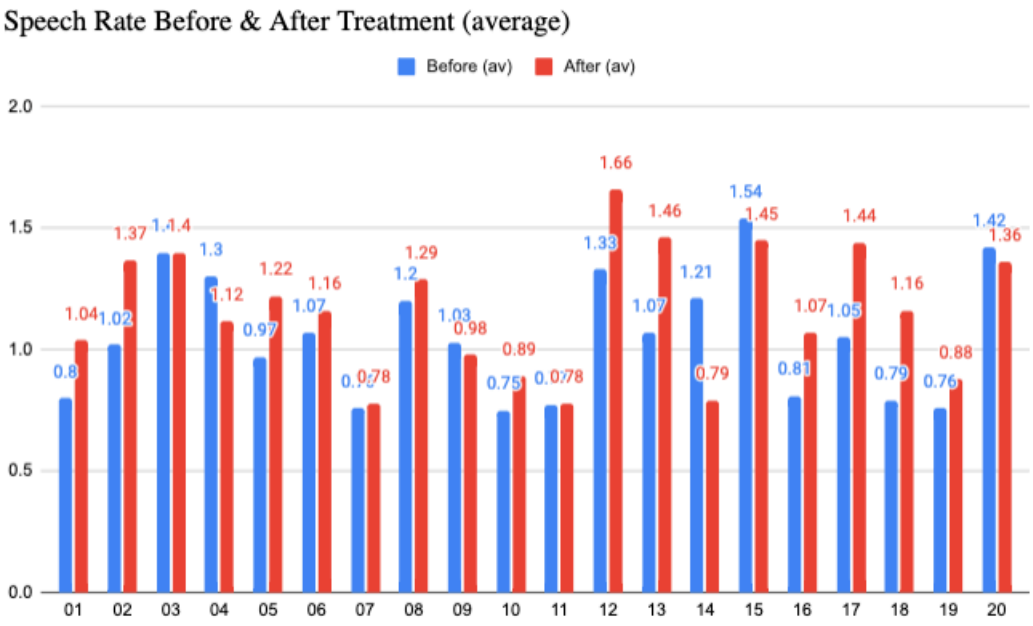
Table 9 displays the

average speech rate of all participants, measured in words per second, of the speech tasks they completed at the beginning (pre_av) and end (post_av) of the study. Figure 8 complements this data table by showing the data as a graphic visual representation.

Table 9. Average speech rate for both groups pre and post study.

WhatsApp group speech rate (words per second)			**Zoom group speech rate (words per second)**		
	Pre_av	Post_av		Pre_av	Post_av
01	0.80	1.04	14	1.21	0.79
02	1.02	1.37	15	1.54	1.45
03	1.40	1.40	16	0.81	1.07
04	1.30	1.12	17	1.05	1.44
05	0.97	1.22	18	0.79	1.16
06	1.07	1.16	19	0.76	0.88
07	0.76	0.78	20	1.42	1.36
08	1.20	1.29			
09	1.03	0.98			
10	0.75	0.89			
11	0.77	0.78			
12	1.33	1.66			
13	1.07	1.46			

Figure 8. Average speech rate as measured by words per second for all participants (both WhatsApp & Zoom group), before and after the study treatment. The values have been rounded to the nearest hundred.



Using the data found in table 9 and figure 8, the gains/losses between groups across the duration of the study was calculated. The average speech rate for the WhatsApp group in the pre test was 1.04 and the post test was 1.16 words per second which resulted in a score gain of +0.12 wps. The speech rate for the Zoom group in the pre test was 1.08 words per second and the post test was 1.17 in the post test which resulted in a score gain of +0.09 wps. The differences between groups is marginal and indicates that both groups slightly increased their speech rate across the 10-week study.

To investigate any effect between the two participant groups (E and C)[14] across time (pre and post study assessment) a linear mixed model repeated measures Analysis of Variance (ANOVA) was performed using the lmer () and anova () function in R. The two independent variables were 1) group and 2) time (pre and post study). The three dependent variables discussed here are 1) total words, 2) unique words, and 3) speech rate (words per second, wps).

[14] As a reminder, the E (Experimental) group utilized WhatsApp for the Communication Activities and the C (Control) group utilized Zoom for the Communication Activities.

The variables of 4) fluency (scale), and 5) percentage of comprehensibility impeded by pronunciation are discussed afterwards.

An ANOVA test reports an F-ratio, which corresponds to the p value Pr(>F) found in the tables below as produced by R. The F-statistic is the ratio of the mean squares of the treatment to the mean squares error. Generally, the larger the F value, the greater the variation between sample means relative to the variation within the samples, which indicates a high probability of evidence that there is a difference between the group means. Table 10 shows the F value and P value (Pr(>F)). A standard for assessing p values in social science research, such as second language acquisition (SLA), is a critical value of $p < .05$ (Guy, 2014), where a value less than .05 may indicate statistical significance.

To calculate effect size, the cohen.d () function was run in R for both Independent Variables (IV), time (pre and post) and group (E and C), as well as all Dependent Variables (DV) including total words, unique words, speech rate, raters perceived fluency and percentage of comprehensibility impeded. As a rule of thumb, Plonsky and Oswald (2014) suggest the following benchmarks for interpreting effect sizes in SLA: Cohen's d = .40 is a small effect, d = .70 a medium effect, and d = 1.00 a large effect. It is responsible practice in statistical analysis to compare effect sizes of previous studies which address similar variable relationships (Plonsky & Oswald, 2014), however due to the unique nature of this present study, to the principal researcher's knowledge there were no exact matches available for comparison of effect sizes at the time this study was conducted and written.

Table 10. Numerical summary for total words using an Analysis of Variance (ANOVA).

TOTAL WORDS					
	Sum of Squares	Mean sq	DenDF	F value	Pr(>F)
group	1.52	1.52	18	0.0009	0.9765
time_point	1184.08	1184.08	58	0.6995	0.4064
group:time_point	1403.08	1403.08	58	0.8288	0.3664

Results of the ANOVA for total words do not show any statistically significant results across group and time, as indicated in both the F value and P value ($p > .05$) columns. The effect size[15] (using Cohen's d) for total words resulted in time $d = 0.165$ and group $d = 0.012$, showing that, for this particular instance, time did not have a significant effect on the total words produced by both groups. Thus, results of the Cohen's d indicate a potential a small effect of time and a non-significant effect of for group for the DV total words.

To check assumptions and data models, the performance package in R, including observing the Homogeneity of Variance, and running check_model, check_heteroscedasticity, and check_normality on all DVs was used. Total words showed a relatively fitted model (flat and horizontal) for the homogeneity of variance, heteroscedasticity (assumption of equal (or constant) variance) detected a non-constant error variance, and normality showed that residuals were normally distributed. The small sample size[16] and great variation within the sample should be taken into consideration in these results.

[15] Larson-Hall (2016) recommends to ignore the negative sign as the author notes that is an arbitrary result of the mean that is listed first (p. 299). Thus for the remainder of this paper, any effect size reported as negative - will be reported as positive since this does not change the value in this context.
[16] 20 participants, 80 audio recordings, 4 recordings per participant

Table 11. Numerical summary for unique words using an Analysis of Variance (ANOVA).

UNIQUE WORDS					
	Sum of Squares	Mean sq	DenDF	F value	Pr(>F)
group	189.73	189.73	18	0.8380	0.3721
time_point	323.24	323.24	58	1.4277	0.2370
group:time_point	134.09	134.09	58	0.5923	0.4447

Similarly to total words, unique words did not result in any statistically significant values as indicated in the F value and P value ($p>0.05$) columns, as shown in table 11. The effect size for unique words also showed negligible (any effect is so small that it is unlikely there are meaningful or practical implications) results for time, where $d = 0.14$, which according to Plonsky and Oswald (2010) constitutes a very small effect as it relates to the pre- and post- time point in the study. However, the effect size for unique words and group was $d = 0.36$. Although still in the small category, this value falls further on the spectrum of showing potential effect. Checking for model assumptions (vignettes/check_model.Rmd), unique words resulted in a generally balanced Homogeneity of Variance plot, a small amount ($p<.001$) of heteroscedasticity detected, and a normal distribution of residuals, which points to a certain (although small) level of validity in the results.

Table 12. Numerical summary for speech rate (**w**ords **p**er **s**econd) using an Analysis of Variance (ANOVA).

SPEECH RATE					
	Sum of Squares	Mean sq	DenDF	F value	Pr(>F)
group	0.001393	0.001393	18	0.0496	0.826313
time_point	0.2044241	0.204241	58	7.2667	0.009177**
group:time_point	0.007441	0.007441	58	0.2647	0.608839

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The ANOVA results for speech rate show a statistically significant relationship across time (pre and post) for speech rate (as measured by words per second) ($p < 0.05$). This is shown

in table 12. This indicates participants in both groups showed gains in their words per second across the 10 weeks of the study. Speech rate showed effect sizes of d = 0.41 for time, which is on the higher end of the small category, thus may potentially confirm an effect. However, Cohen's d value was d = 0.09, which is negligible (very small). These results point to a possible effect for participants in both groups improving speech rate from the beginning to the end of the quarter.

With respect to model and assumption checking, a non-constant of variance (heteroscedasticity) was also detected for speech rate ($p<.001$). Additionally, it should be noted that there was a non-normality of residuals detected ($p = 0.046$). Thus, this particular model check resulted in not fitting the assumptions, and an effect cannot be claimed with absolute certainty.

4.3.2 Human rater perception on participants' fluency and comprehension impeded

Similarly, a linear mixed effect model in R was also used to perform an Analysis of Variance (ANOVA) for the ratings done by a crowd sourced group of human raters. The rating platform was a website created specifically for this research study and hosted the anonymized audio recordings of the participants' speech elicitation tasks in a virtual queue. The rating platform was open for three months, and a total of 82 total number of rater profiles and 364 total number of ratings of the audio recordings were collected for final analysis[17].

To gain a general understanding of who the group of human raters were, each rater was asked to submit simple demographic information. A complete list of the demographic questions asked to the raters is found in Appendix H, although it is important to note that not all the raters completed every field. Following is a general overview of the rater profiles. It should also be

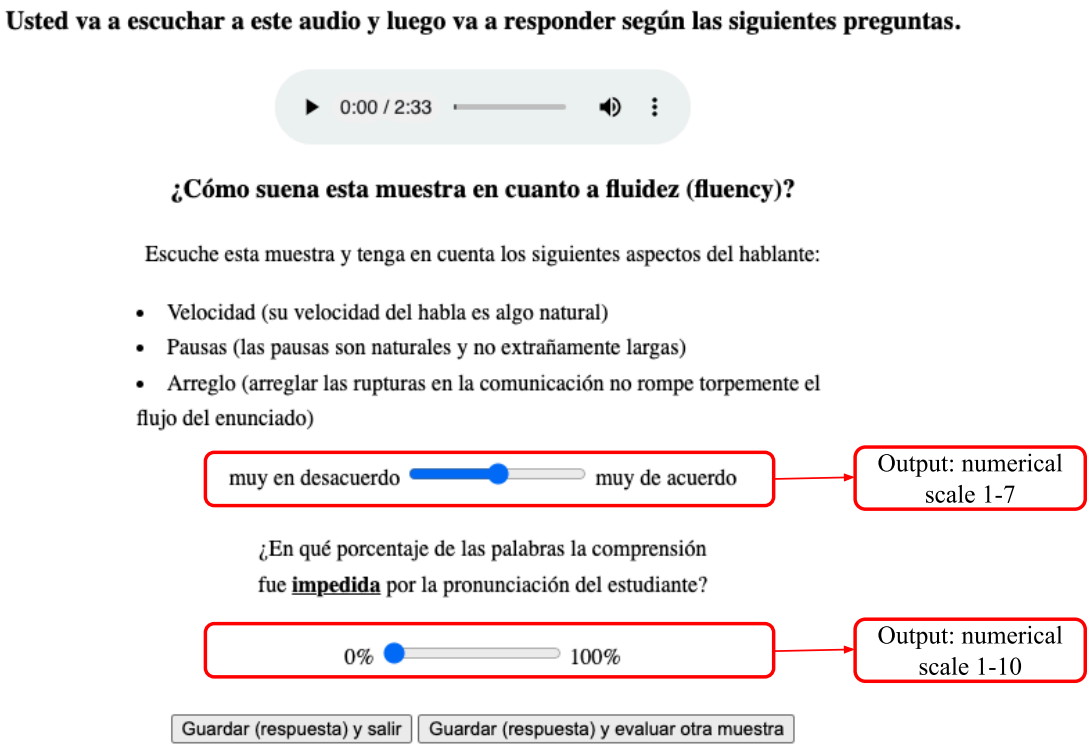
[17] A small number of test rater profiles and bot profiles were removed before final count and data analysis.

noted that the rating platform and question fields were entirely in Spanish and the English translation below in figure 9 is for purposes of this paper only.

In regards to profession, the majority of the raters self-reported being Spanish instructors/professors, followed by "other", and four raters reported being students. The majority of raters were in the 30-39 age group, followed by 50-59 and 25-29 years of age. 79% of raters self-reported their Spanish level as native speaker, 17% reported as near native, and 4% reported as an advanced speaker of Spanish. Most raters also reported their location. The majority of the raters reported being located in a variety of cities across the United States (n=20), and the largest minorities reported were Spain (n=11) and Mexico (n = 9). Other locations reported were Argentina, Chile, Colombia, Costa Rica, Ecuador, Guatemala, and Peru.

Raters were asked to listen to an audio recording and assess it for fluency and comprehension impeded. The variable for fluency asked raters to consider speed, pauses, and repair in their rating, and the variable for comprehension impeded asked raters to consider what percentage of the comprehension of the words was impeded by the student's pronunciation. The results and processes are presented in detail below. Figure 9 is a screenshot of the platform the raters used to access and rate the recordings. An English translation is presented below the image.

Figure 9. Rating scale for human raters to listen and rate audio samples.



How does this sample sound in regards to fluency?

Listen to the sample and take into consideration the following aspects of the speaker:

- Speed (their speed of speech is somewhat natural)
- Pauses (the pauses are natural and not strangely long)
- Repair (the repair in communication breakdowns do not awkward break the flow of the utterance)

Strongly disagree <> Strongly agree

What percentage of the words was comprehension prevented by the student's pronunciation?
0% <> 100%

Save (answer) and exit Save (answer) and evaluate another sample

The output of the strongly disagree to strongly agree Likert scale corresponded to a 7-point numerical scale (1-7), and the output of the 0%-100% scale corresponded to a numerical scale of 1-10. These numerical values were averaged across ratings for each participant and used to perform an Analysis of Variance (ANOVA). The findings of the ANOVA are presented below.

First, the results of the ANOVA from all raters are shown, which included 48 rater bio profiles and 364 total ratings. Then is a brief description of how the research team accounted for Interrater Reliability (IRR) and the process of removing five raters (after having been tagged as unreliable). Lastly, the results of the ANOVA with the unreliable raters removed are shown, which included 43 rater profiles and 241 ratings.

Table 13. Numerical summary for human rater's perception of fluency using an Analysis of Variance (ANOVA).

FLUENCY (scale 1-7 | rate, pauses, repair | all raters)					
	Sum of Squares	Mean sq	DenDF	F value	Pr(>F)
group	0.00079	0.00079	18	0.0012	0.9732
time_point	0.05711	0.05711	58	0.0841	0.7728
group:time_point	0.51029	0.51029	58	0.7516	0.3895

The ANOVA for rater fluency did not produce any statistically significant results as evidenced in the F and P values in table 13. To account for effect size, Cohen's d shows d = 0.11 for time and d = 0.01 for group, which also potentially confirms no effect of the time point (pre and post) or group, and how it affected how the human raters rated the participants' audio recordings on the fluency scale.

In checking assumptions and data models for rater's fluency, the Homogeneity of Variance check resulted in error variance appearing as homoscedastic (to have equal or constant variance) (p=0.885) and residuals appeared and normally distributed (normality, p = 0.121). Thus, in regards to this instance of rater's fluency the data appears normally distributed and the ANOVA and effect size results may be understood as credible.

Table 14. Numerical summary for human rater's perception of the percentage of comprehensibility impeded by pronunciation using an Analysis of Variance (ANOVA).

% OF COMPREHENSIBILITY IMPEDED BY PRONUNCIATION
(scale 1-10 | rate, pauses, repair | all raters)

	Sum of Squares	Mean sq	DenDF	F value	Pr(>F)
group	2.01770	2.01770	18	0.9123	0.3522
time_point	0.62827	0.62827	58	0.2841	0.5961
group:time_point	0.04829	0.04829	58	0.0218	0.8830

For the scale of percentage of comprehensibility that was impeded by pronunciation, no statistically significant results were produced, and effect size results are d = 0.12 for time and 0.26 (small) for group. This is shown in table 14. The Homogeneity of Variance data assumptions models check resulted in detecting both a non-constant error variance ($p = 0.040$) and a non-normality of residuals ($p<.001$). Accordingly, when interpreting this data point it should be taken into account that the differences between the observed values and the model's predicted values do not follow a normal distribution, and any effect may not be absolutely valid.

As noted above, five human raters were removed and the rater data was processed once again as a way to account for interrater reliability. The removal of these five raters was a result of 1) the processes the research team took to account for Interrater Reliability (IRR) in general, and 2) account for raters who potentially misunderstood the layout of the scales they were asked to complete or simply did not follow instructions carefully. The latter refers to a potential mismatch between the first and second scale the raters used to rate the audio recordings. The first scale (fluency) asked raters to use a Likert scale ranging from Strongly Disagree (on the far left) to Strongly Agree (on the far right), thus a positive result is high/all the way on the right. However, the second scale (percentage of impeded comprehension) asked raters to use a percentage sliding scale from 0%-100% where the positive result was 0% and the negative result was 100%. A

student who scores highly in fluency is typically expected to have a low score when it comes to impediments in comprehension. However, due to the way instructions were formulated, certain participants who rated the audio recordings attributed high scores to both fluency and impediments to comprehension. Figure 10 illustrates the anticipated trend: as fluency scores increase, scores for impediments to comprehension decrease. The scores that deviate from this trend, which are highlighted in a red box, can interfere with subsequent calculations, especially since they attribute high impediment scores to recordings that are deemed fluent. To isolate these raters, fluency scores which were greater than 3 and impediment exceeded 6 were filtered, then the unique rater ID was identified. Subsequently, all scores were removed from these particular raters to eliminate potential noise caused either by a) the instruction's effect or b) a rater simply not following the general trend of this group of raters for other reasons. After scores were removed from the five identified raters, the trend between fluency and impediment to comprehension remained consistent (figure 11), confirming that the removal did not skew the results.

Figure 10. Fluency and comprehension trend was impeded after excluding scores from the identified raters.

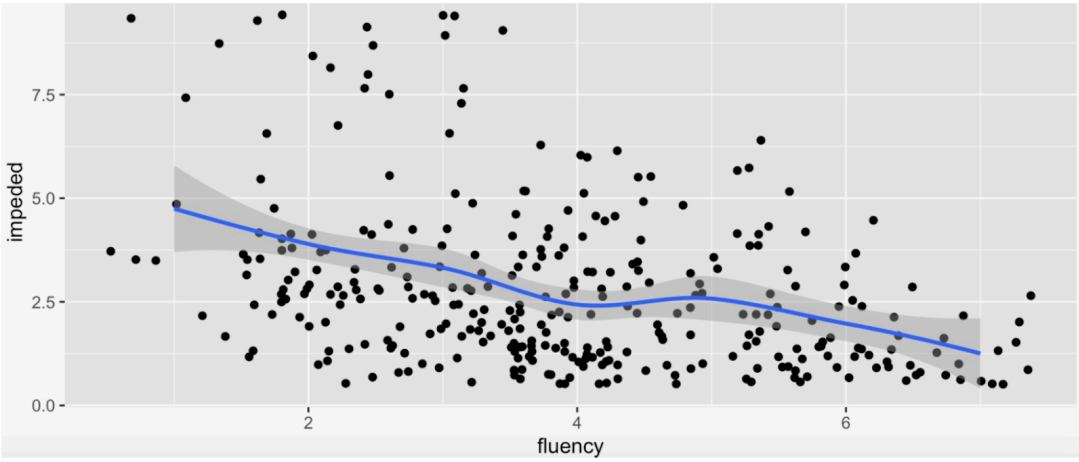
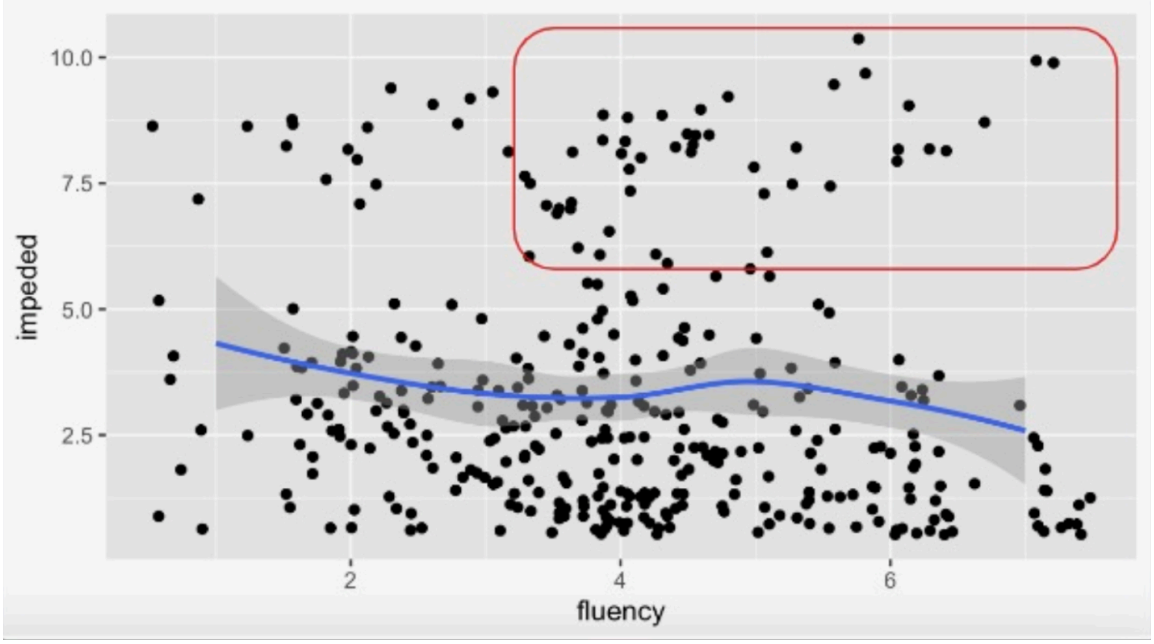


Figure 11. Anticipated fluency trend where if fluency scores increase, scores for impeded comprehension decrease.



Below, the results of an Analysis of Variance (ANOVA) and effect size (using cohen's d) are presented once again with the new data after the raters were removed.

Table 15. Scale of fluency as perceived and evaluated by human raters.

FLUENCY (scale 1-7 | rate, pauses, repair | raters removed)					
	Sum of Squares	Mean sq	DenDF	F value	Pr(>F)
group	0.5812	0.5812	18.986	0.4773	0.49800
time_point	0.1639	0.1639	55.295	0.1346	0.71510
group:time_point	3.6209	3.6209	55.295	2.9737	0.09021 .

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Notable in table 15 is the small effect which is observed in the interaction of groups and time ($p<.05$). This indicates there is a perceived group and time effect by the human raters in regards to fluency. It is worth calling attention to the results mentioned above in regards to speech rate ($p < 0.05$) when measured objectively, and its correspondence with this present data point. This alignment of these two data points may draw the conclusion that, after five were

removed, the raters as a whole were consistent and followed directions, and their ratings align with the objective speech rate data (words per second). Figure 12 below provides a closer look at the estimated marginal means (emmeans) of the rater's fluency scale across the E and C group. The raters appear to perceive a small decline (0.6) in the C group over the 10 weeks (pre = 3.92; post = 3.35) and a small increase (0.37) in the E group (pre = 3.75 and post = 4.12). As a reminder, these averages are from a 1-7 scale as reported by the human raters.

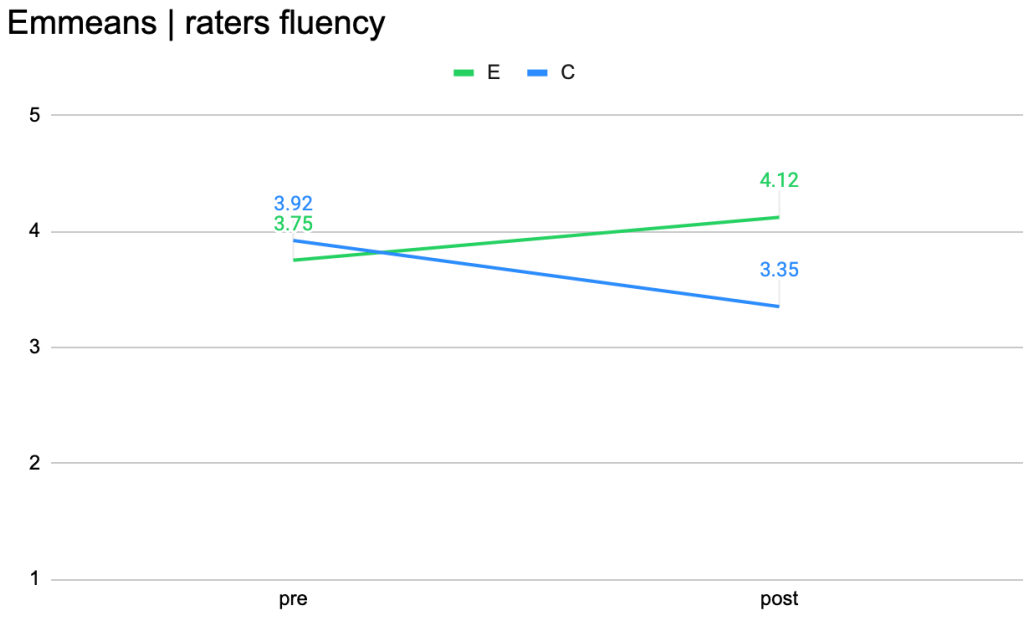


Figure 12. emmeans (estimated marginal means) across groups and time of the raters fluency scale (1-7).

After accounting for IRR, the effect size for the scale of fluency resulted in d = 0.05 for time and d = 0.18 for group, which are both in the negligible (small) scale of the continuum. Additionally, the Homogeneity of Variance assumptions check resulted in an alignment with expected and produced data distribution: error variance *is* homoscedastic (p=0.880) and the residuals appear to be as normally distributed (p=.244), which indicates that this data meets the assumptions of the models. Thus, it may be determined with some certainty that there is an effect

of group and time influencing how the raters perceive the participant's fluency; or, that the intervention over time is causing students in both groups greater perceived fluency.

Table 16. Scale of % of comprehensibility impeded by pronunciation as evaluated by human raters.

% OF COMPREHENSIBILITY IMPEDED BY PRONUNCIATION (scale 1-7 | rate, pauses, repair | raters removed)					
	Sum of Squares	Mean sq	DenDF	F value	Pr(>F)
group	0.14420	0.14420	18.397	0.1334	0.7191
time_point	0.00128	0.00128	55.178	0.0012	0.9726
group:time_point	2.44358	2.44358	55.178	2.2597	0.1385

With the raters removed, the ANOVA for percentage of comprehensibility impeded by pronunciation showed no statistically significant results as observed in table 16. Additionally, the effect size also produced insignificant results: d = 0.05 for time and d = 0.18 for group. Also with removing the five raters the Homogeneity of Variance model assumptions check resulted in a homoscedastic error variance (p=0.201), although there was a slight detection of non-normality in residuals (P<.001). Although the value is very small, when there is deviation in the data points that indicates that the output model doesn't predict the data model according to model assumptions, and some data like p-values may be inaccurate or misleading.

4.3.3 Comparisons: speech rate & human perception of fluency

Figures 13 and 14 below show the comparison of speech rate (an objective measure of fluency) and perceived fluency by the raters (a subjective measure as determined by human raters). As previously stated, the instructions asked the raters to consider speed, pauses, and repair, while the objective data is only a measure of words per second (speech rate). While these different measures cannot be compared in any statistical way, the general trends in measures of fluency as determined between objective data points and human raters is an interesting

discussion point. In general, the box plots below show that when calculated by speech rate both the C and E groups started in the same place (approximately 1 word per second) made some gains and ended up in roughly the same place (approximately 1.2 words per second). However, when observing figure14 the human raters perceive the C group (Zoom) to have declined in fluency over the course of the academic term, while they perceive the E group (WhatsApp) to have stayed equal to where they started. Although the differences are not statistically significant, the comparison between the subjective data and the human perception is worth highlighting as a way to compare similar data.

As shown in figure 13, in the speech rate data both the WhatsApp and Zoom group showed similar (small) gains across the pre and post assessments, starting in the same place at approximately 1 word per second and moving to approximately 1.4 words per second after 10 weeks. In the scale of fluency (1-7), figure 13 shows the human raters also perceived the participants in both groups to be starting out at the same level. In contrast to the speech rate data for the post test, the raters perceive a decline in the Zoom group and a no movement in the WhatsApp group. One aspect which may have contributed to this difference is the methods of counting the words. In the speech samples the filler words *um* and *uh* (for example) were counted as a word. So, a student producing a large total number of words may have produced several of these filler words mentioned above, which in the objective data would show they had a high word count, while a human rater may have perceived these fillers as a hindrance or low marks of fluency.

Figure 13. Box plots of speech rate as calculated by words per second.

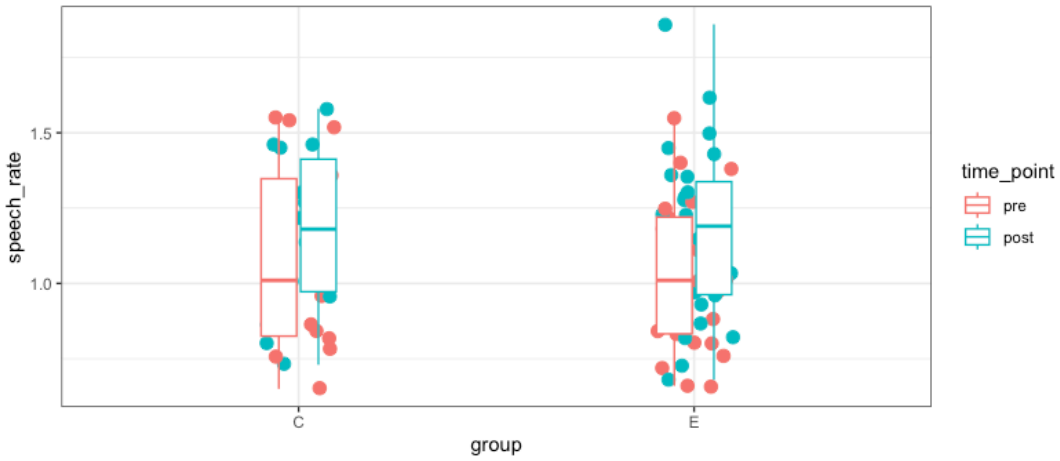
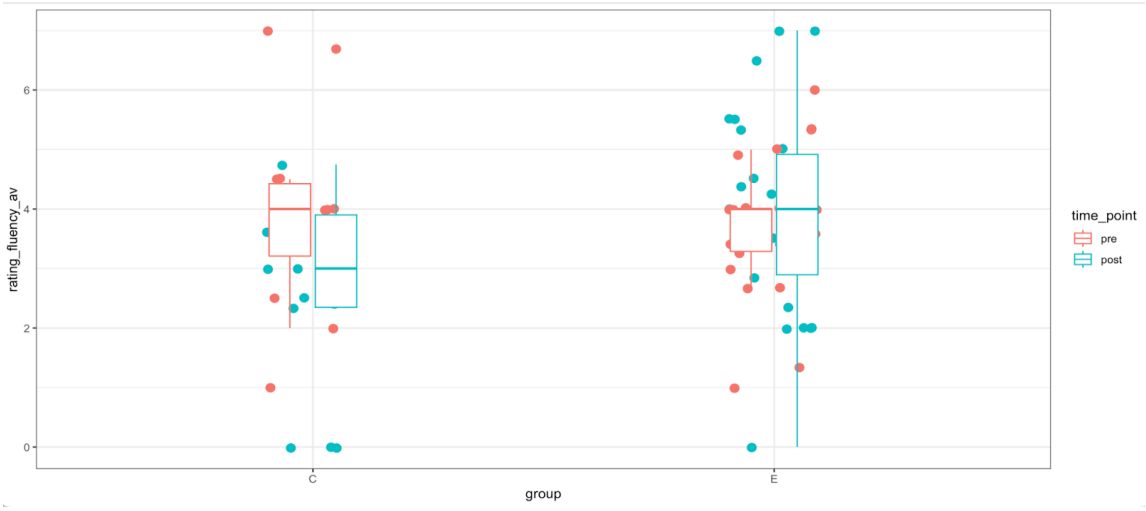


Figure 14. Box plots of fluency as calculated by human raters on a scale of 1-7.

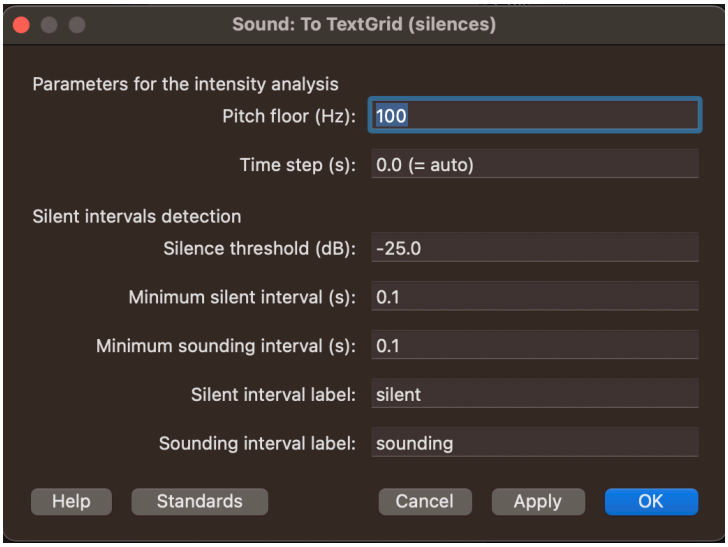


4.3.4. Pauses

To assess the number of pauses in the participant's pre and post speech tasks, the freeware program for acoustic analysis of speech called Pratt[18] was used. Using the settings found in figure 15 in the TextGrid (Silences) the principal researcher collected data for the number of pauses and the total pause duration (seconds) of the combined pauses in the audio recordings (speech task).

[18] https://www.fon.hum.uva.nl/praat/

Figure 15. Parameters used in Pratt to collect pause data.



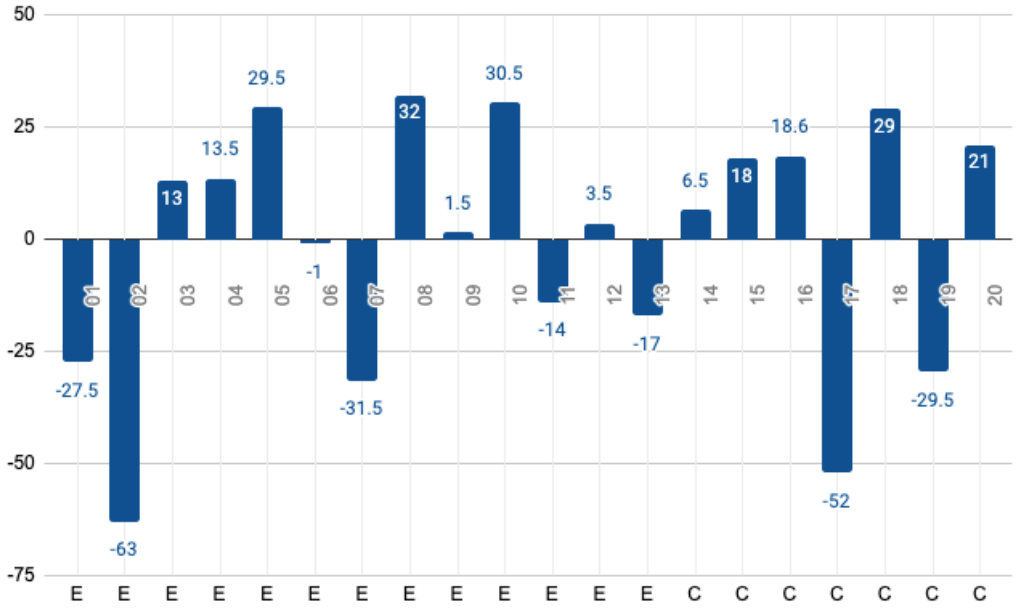
As shown in table 17, the WhatsApp group showed more decreases in total number of pauses (46% of the group) than the Zoom group, which showed only two participants decrease in their pauses. Although participants 04 and 10 in the WhatsApp group also showed a significantly high increase in pauses, increasing the total number of pauses by 13.5 and 30.5 respectively. This data is further represented visually below in figure 16.

Table 17. Increase or decrease in average number of pauses between pre and post study speech tasks. A decrease in pauses may indicate gains in fluency.

group	participant ID	increase/decrease in # of pauses over time	group	participant ID	increase/decrease in # of pauses over time
E	01	-27.5	C	14	+6.5
E	02	-63	C	15	+18
E	03	+13	C	16	+18.6
E	04	+13.5	C	17	-52
E	05	+29.5	C	18	+29
E	06	-1	C	19	-29.5
E	07	-31.5	C	20	+21
E	08	+32			
E	09	+1.5			
E	10	+30.5			
E	11	-14			
E	12	+3.5			
E	13	-17			

Figure 16 below allows trends to be seen in the finite numerical data. Curiously, the two C group participants declined in pauses, participants 17 and 19, show similar numbers to two participants in the WhatsApp group who also declined in pauses, participants 02 and 07, respectively. Due to the small number of study participants, specifically an unbalanced and lower number of Zoom participants (7), and no obvious distinctive trends, these results do not seem to point towards anything too significant. The indications of these results are further discussed in Chapter 6.

Figure 16. Increase or decrease in average number of pauses between pre and post study speech tasks. A decrease in pauses may show gains in fluency.



To find out the percentage of the total speech time which consisted of pauses, the principal researcher used Pratt to extract the number of pauses in the audio file, concatenate the silent files, query the total time of that file, and analyze with the total time. This information is shown in table 18. The WhatsApp group showed a higher percentage of learners who decreased their total pause time (54%) than the Zoom group (29%). Although the numbers are small, more than half of the WhatsApp students lowered their pause time which may be an indicator of improved fluency. The same data is visually represented in figure 17.

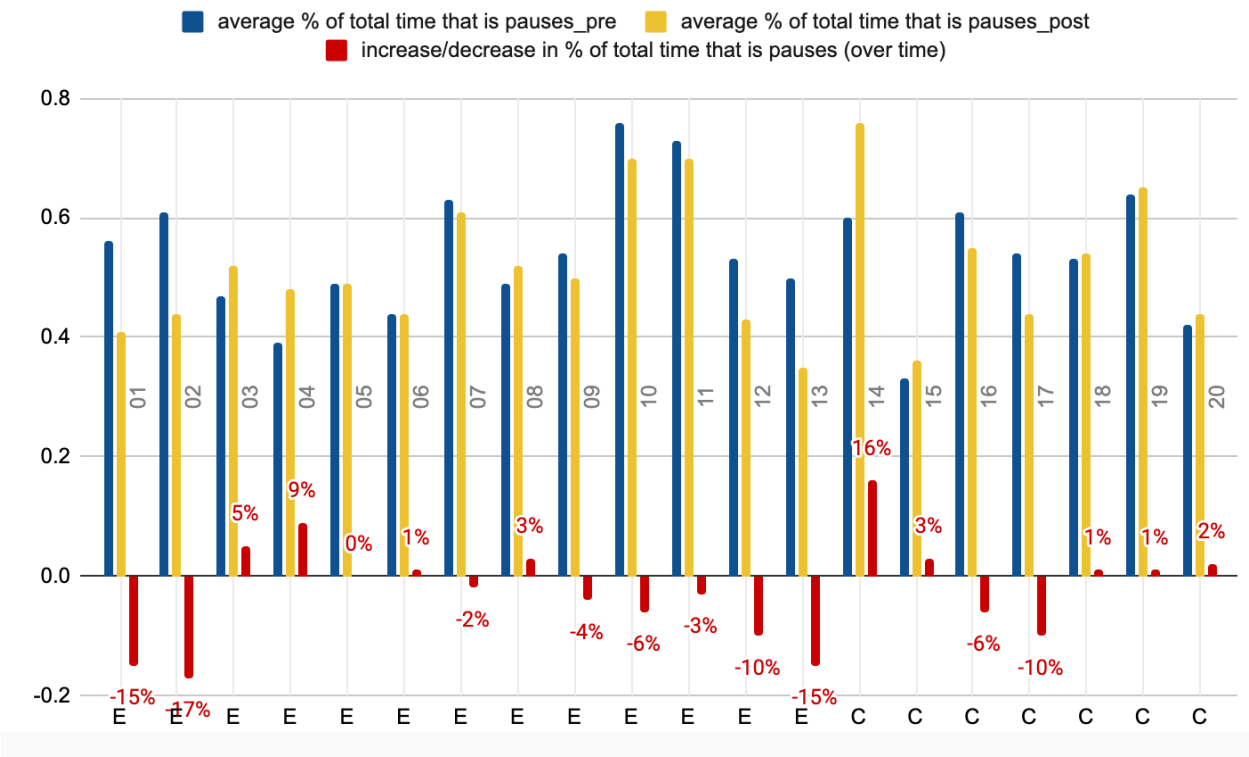
Table 18. Increase or decrease in percentage of total speech time that is pauses. A decrease in total percentage may indicate gains in fluency.

group	participant ID	average % of total time that is pauses_pre	average % of total time that is pauses_post	increase/decrease in % of total time that is pauses (over time)
E	01	56.00%	41.00%	-15%
E	02	61.00%	44.00%	-17%
E	03	47.00%	52.00%	5%
E	04	39.00%	48.00%	9%

E	05	49.00%	49.00%	0%
E	06	44.00%	44.00%	1%
E	07	63.00%	61.00%	-2%
E	08	49.00%	52.00%	3%
E	09	54.00%	50.00%	-4%
E	10	76.00%	70.00%	-6%
E	11	73.00%	70.00%	-3%
E	12	53.00%	43.00%	-10%
E	13	50.00%	35.00%	-15%
C	14	60.00%	76.00%	16%
C	15	33.00%	36.00%	3%
C	16	61.00%	55.00%	-6%
C	17	54.00%	44.00%	-10%
C	18	53.00%	54.00%	1%
C	19	64.00%	65.00%	1%
C	20	42.00%	44.00%	2%

Figure 17 provides a visual representation of the participants' total pause time in the pre and post recordings (taken as an average from two speech tasks), and the increase or decrease in percentage of pause time. Ten participants decreased in the percentage of pause time (8 in the WhatsApp group and 2 in the Zoom group). Attention should be drawn to the participants who actually showed an increase in pause time because, with the exception of one participant (14), the increases are all low ranging from 1% to 9%, with an average of only 4.5%.

Figure 17. Increase or decrease in percentage of total speech time that is pauses. A decrease in total percentage may indicate gains in fluency.



The individual speech tasks also varied in how they influenced the number of pauses as shown in table 19.

Table 19. Average number of pauses per task compared across pre and post study speech tasks.

	Average total pauses	**Average pauses PRE study**	**Average pauses POST study**
Task 1 - respond to a prompt (free response)	155.22	164.90	145.55
Task 2 - Picture Narration Task (narrate a wordless cartoon strip)	137.87	129.15	146.60

When observing the average number of pauses across tasks, collectively the study participants showed a decrease in pauses for Task 1 (prompt response) (-19.35) and an increase in pauses for Task 2 (Picture Narration Task) (+17.45). The influence of task design on monologic and

dialogic production is further discussed in Chapter 6.

Turn Taking

As a means to evaluate a possible correlation or relationship between the level of engagement in the individual Communication Activities (CA) such as the number of turns taken by each participant, all CA which were completed by study participants were counted for number of turns taken[19].

Table 20. Total number of turns taken by each participant in their individual dialogues for the corresponding Communication Activities.

		# of turns taken by participant in each conversation											
Group	**ID**	**8.1**	**8.2**	**11.1**	**11.2**	**12.1**	**12.2**	**13.1**	**13.2**	**14.1**	**14.2**	***Consejos Finales* / Final advice**	**Average # of turns**
E	01	X	X	17	7	13	14	9	10	10	14	X	11.75
E	02	X	X	7	6	5	8	5	7	4	9	X	6.38
E	03	X	X	7	7	7	7	7	7	5	16	X	7.88
E	04	X	X	7	7	7	8	7	7	5	17	X	8.13
E	05	X	X	2	2	2	9	5	5	3	12	X	5
E	06	X	X	2	2	2	8	6	5	3	11	X	4.88
E	07	X	X	22	19	24	25	5	7	11	28	X	17.63
E	08	X	X	2	2	2	14	3	13	1	NA	X	5.29
E	09	X	X	4	2	3	12	2	5	3	NA	X	4.43
E	10	X	X	8	NA	13	6	8	11	6	NA	X	8.67
E	11	12	4	X	X	X	X	5	10	2	4	3	5.71
E	12	7	4	X	X	X	X	1	3	2	2	1	2.86
E	13	6	14	X	X	X	X	4	7	4	17	2	7.71
C	14	X	X	42	23	36	39	20	32	NA	43	X	33.57
C	15	X	X	9	9	9	28	2	3	1	NA	X	8.71
C	16	X	X	7	2	3	15	5	6	3	NA	X	5.86
C	17	X	X	2	1	1	15	1	5	1	NA	X	3.38
C	18	27	20	X	X	X	X	12	37	21	45	35	28.14

[19] Utterances were also accounted for and may be explored in future research.

C	19	27	20	X	X	X	X	13	38	22	45	35	28.57
C	20	53	30	X	X	X	X	7	16	18	45	15	26.29

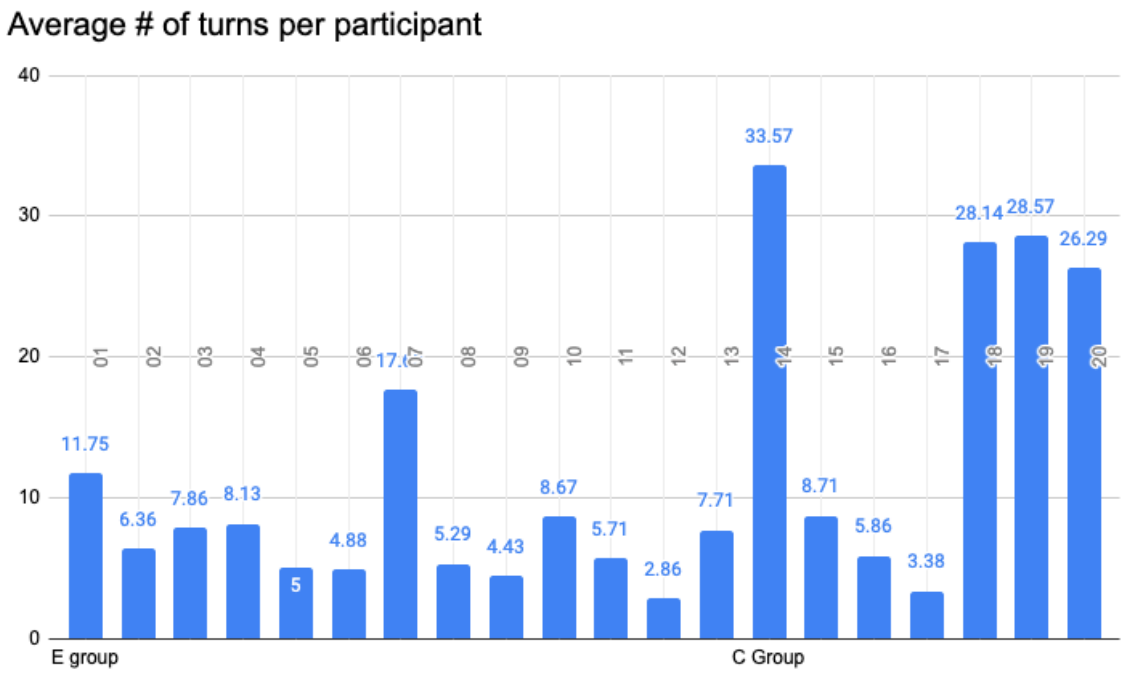
X = this individual/group was not assigned this activity for that particular quarter.
NA = this activity was not completed by the participant.

The title of each Communication Activity is below:

- 8.1 *¿Qué comiste ayer?*
- 8.2 *¿Cómo fue el restaurante?*
- 11.1 Fashion
- 11.2 - Choosing an outfit
- 12.1 - Ecotourism practices
- 12.2 - Past experiences
- 13.1 - Story chain
- 13.2 - Role Play *(una entrevista con Finita)*
- 14.1 - Opiniones about art
- 14.2 - What piece of art?
- *Actividades de comunicación final consejos* / Communication Activities final advice

The average number of turns for the WhatsApp group was 7.40 across all activities and between all participants, while the Zoom group was 19.21 across all activities and between all participants. Figure 18 below shows the average number of turns taken by participants across the activities completed over the 10 weeks of the study.

Figure 18. Average number of turns by participants across all Communication Activities.



The data also brings awareness to the Communication Activities which produced the highest and lowest average number of turns. CA *#12.2 Past Experiences* produced the highest number of turns on average in the WhatsApp group and the CA *#14.2 What piece of art?* produced the highest number of turns on average for the Zoom group. The lowest number of turns produced in the WhatsApp group was in the final advice activity[20] (two turns on average) and the activity *11.2 Choosing an outfit* produced the lowest number of turns in the Zoom group, with an average of 8.75 turns. Interestingly, *11.2 Choosing an outfit* was the second lowest turn taking production in the WhatsApp group with an average of 5.6 turns. As a reminder, the full Communication Activities are found in Appendix B for reference. The importance and impact of task design on learner production and engagement will be further discussed in Chapter 6.

A salient observation in the turn taking data is that the students with the higher number of turns typically were engaging in unscripted, more spontaneous dialogues. For instance, this is observed in the Zoom conversations through turns and utterances where students work through sentences, making mistakes, and producing discourse markers such as “um” and “uh” and vocal moments of thinking such as “mmm”, as well as short affirmative utterances of “sí”. Two examples are shown in the dialogues 1 and 2, in figure 19 In the WhatsApp conversations these types of discourse markers, fillers, or repair may be noted as students following up an utterance with a repair as indicated with an asterisk (see example in dialogues 3 and 5 in figure 20), or a continuation of a turn with several utterances in a row (as seen in dialogues 1, 4 and 5 below).

Figure 19. Zoom dialogues showing discourse markers and repair.

Dialogue 1.	Dialogue 2.
• Estudiante 2:Um sí. Creo que la los la lista para like Ecoturismo	• 18: ¿Cuándo se terminó la obra de arte?

[20] It should be noted that only three participants are included in this average.

• 14: mm-mmm Estudiante 2:es um bien, bien y muy popular no más porque ahora like celebrities le gusta viajar en la naturaleza y- • 14: Sí • Estudiante 2: Y también en los noticias y en la escuela • 14: Mmm-mmm • Estudiante 2: se hablan mucho para o se habla mucha por el salud, salud de la mente • 14: Yea como viaja sin deja un helado I don't know esta palabra, pero- • Estudiante 2:Mmm • 14: like- • Estudiante 2:Mmmm • 14: Dejar like sí a footprint con esto • Estudiante 2:mmm-mmmm sí • 14: Yea • Estudiante 2:Nadie quiere hacer algo mal cosas mal • 14: Cosas mal en la lista. • Estudiante 2:Ahhh huhhhh • 14: Uhh nadie • Estudiante 2:No no no	• 19: Oh, en en uh die no diecin-n-diecenueve uh uh mmmmm do you know how to say one hundred? I'm sorry • 18: Umm cien or something like that [self talk] • 19: Diecinueve cien • 18: Okay • 19: Y treinta • 18: Um ¿la obra de arte responde a un movimiento artístico, cultural o político en particular and cuál? • 19: Mmm mm. Es de un movimiento artístico I think. Uh es un artista uh famosa famoso. • 18: Mmm Ummm ¿De qué está hecha la obra? ¿Y cuáles son algunas de las técnicas que utilizo al artista para crear la obra? • 19: Uhhh uhhh Es uh la artista usa pinturas y más um técnica de um de abstracto um tengo muchos shapes uh how do you shapes again? It was uhhh- • 18: I don't I don't know know • 19: I don't know either uhh sharp shapes muchos muchas sorry

Figure 20. WhatsApp dialogues showing discourse markers and repair.

Dialogue 3.	Dialogue 4.	Dialogue 5.
• 07: Para los zapatos, ella puedes llevar tacones altos. • Estudiante 2: sí sí • Estudiante 2: también una bolso negro • Estudiante 2: un* • 07: Sí, con flores	• 07: ooo, ¡me gusta la idea! • 07: Y, ella necesita una chaqueta, ¿sí? • 07: Creo que la chaqueta necesita pelo • 07: como • 07: <Media omitted> • Estudiante 2: ah sí eso muy elegante	• Estudiante 2: si, que bueno idea • Estudiante 2: pero, no tenemos un episodio pasado, ¿no? • Estudiante 2: per próximo episodio • Estudiante 2: pero* • 01: Oh! Es correcto. Próximo episodio, sí.

Both in the WhatsApp and Zoom conversations which appeared to have been pre written

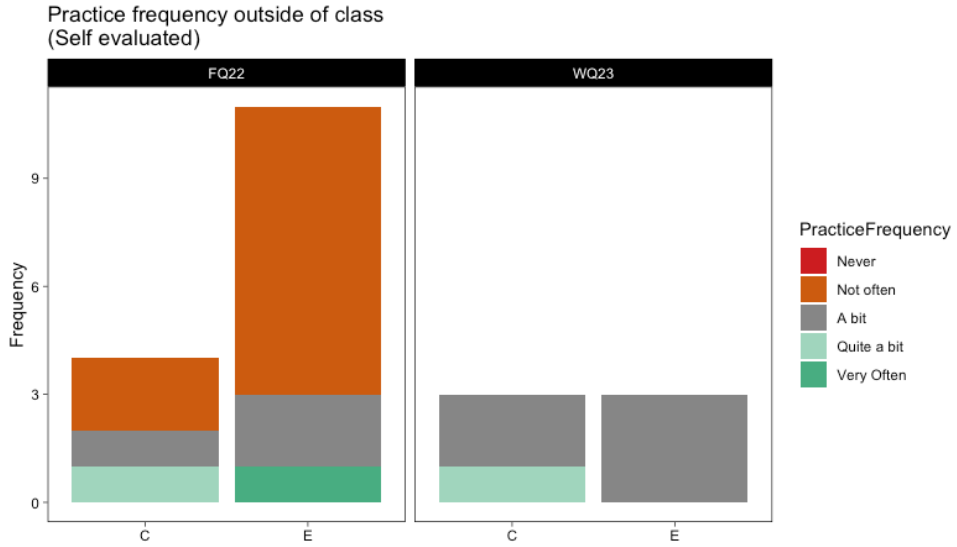
or scripted before turning in the final version typically had a lower number of turns. This point will be further explored in Chapter 5, and detailed in the case studies section, specifically regarding study participants 02, 07, 09, 14, and 18 & 19. In future studies, the number of turns and utterances could be included as a dependent variable in a correlational analysis between mode (Whatsapp or Zoom) and time (pre- and post-).

4.4 Participant Post experience questionnaire

Study participants also completed a post study questionnaire with the goal to understand their experience with the Communication Activities, language partners, and overall experience. The questionnaire was administered via Qualtrics and consisted of 14 questions. The full experience questionnaire is found in Appendix F. Following are data collected from this questionnaire in both quantitative measurements, with a few supporting learner comments. However, the qualitative information is further explored in Chapter 5 which discusses themes extracted from the open-ended questions and direct testimonials in a more in depth manner.

To begin, figure 21 shows how the participants self-reported how often they practiced their oral communication outside of the class. The majority of the participants (n=8, E Group Fall Quarter 2022) reported not often, and one participant from the E group in Fall 2022 reported very often.

Figure 21. Frequency distribution for how often respondents practiced their oral communication outside of the classroom.

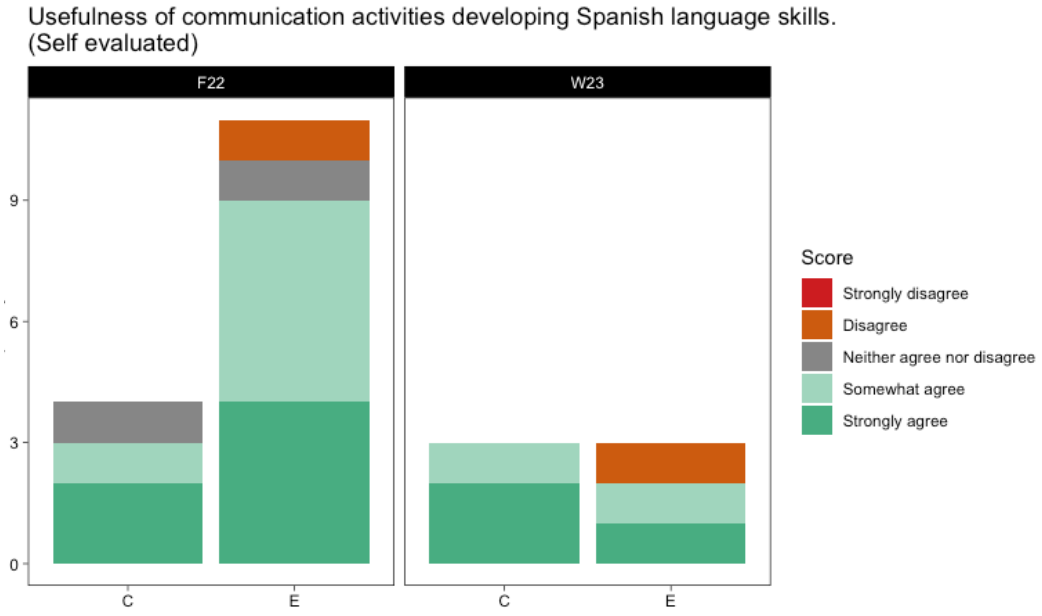


When asked what methods or modes did students use to practice the speaking skills outside of class participants largely reported talking with Spanish-speaking roommates, friends, and family. For responses that did not indicate practicing with other students, participants made comments about speaking out loud to themselves, such as "*Talking to myself in the mirror to prepare for questions that could be asked on the final"*, and "*When I studied the vocabulary words, I would say the words out loud to help my pronunciation. But besides that, I didn't speak Spanish outside of class.*", and "*I would say sentences out loud sometimes during Contraseña assignments if I felt like it.*"

Students were also asked to rate the usefulness of the Communication Activities (CA), which is reported in figure 22. As the majority of the students in the study were in the E group in Fall 2022, that also shows the highest number of students reporting *somewhat agree* on the usefulness of the Communication Activities (n=5), and four students in the same group reported Strongly Agree as the usefulness of the CA. Although the sample size is small, it is worth noting that no students in either Zoom group (Fall or Winter quarter) reported Disagree or Strongly

Disagree, and two students in the E group reported Disagree in regards to how useful they found the activities.

Figure 22. Distribution for how useful the participants found the Communication Activities.



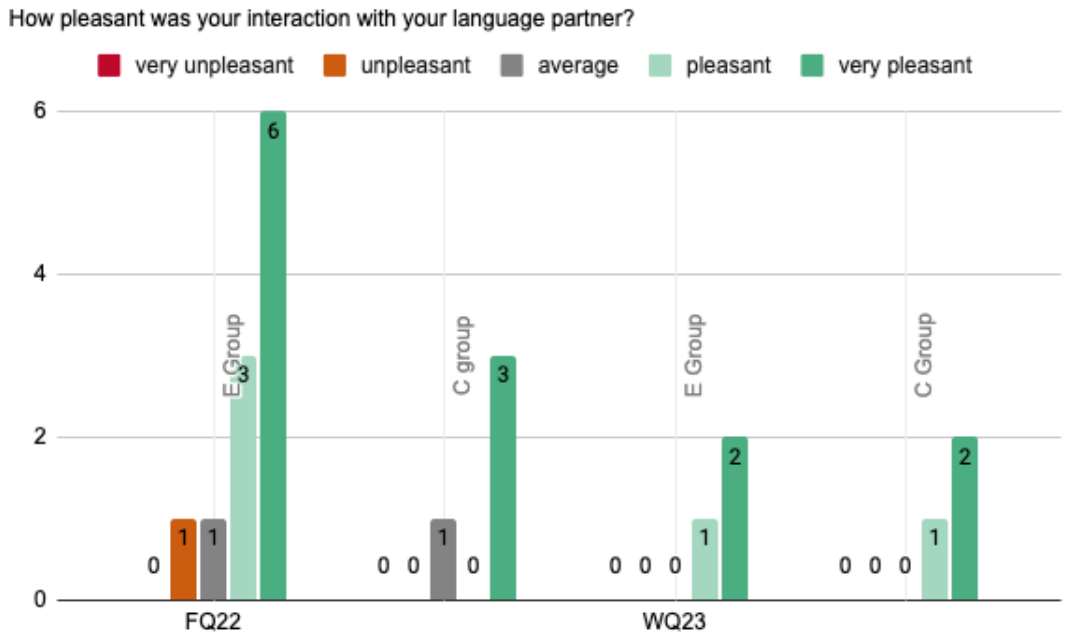
General themes extracted from the experience questionnaires will be discussed in more detail in Chapter 5, however it is also necessary to include supporting testimonials about each of these questions to support the graphical data. Students shared several reasons why they found the CA either useful or not useful. For example, students in the WhatsApp group (E group) commented on factors such as enjoying the usefulness of the activity contributing to their grade and connecting with another person in the class, "*They helped my grade which I appreciated. And it was nice to connect to another student. I just didn't feel as if I learned much from them*", and others commented on how the WhatsApp activities supported writing development, "*The activities went okay. I think it was useful to practice texting in Spanish with other people. Any writing practice is helpful. And I found most of the prompts straightforward and interesting*".

In the Zoom group (C group), several participants made comments about how the activities were useful in speaking and listening skill development, "*My speaking and listening*

skills improved a lot because of the weekly communication activities. It was a low-pressure activity that allowed for us to be completely spontaneous and try to have a normal conversation in Spanish, helping with researching new vocab and applying class knowledge." and "*The activities were really helpful because they forced you to speak Spanish aloud and they helped me remember and learn the vocabulary. I practiced speaking the most because I wanted to get better at it and to be able to apply the new vocab and grammar concepts*."

Also essential in understanding a participant's experience with the Communication Activities (CA) is how their interaction and collaboration was with their language partner. Thus, participants were asked to rate how *pleasant* and *useful* their experience was with their language partner and to expand on their answer, which is represented in figure 23.

Figure 23. Participant rating of how pleasant the interaction was with their language partner.



Although six participants reported that the interaction with the language partner was very pleasant in the E group during Fall 2022, it should be noted that this is likely because the majority of the students from that quarter were in the principal researcher's class, and may have

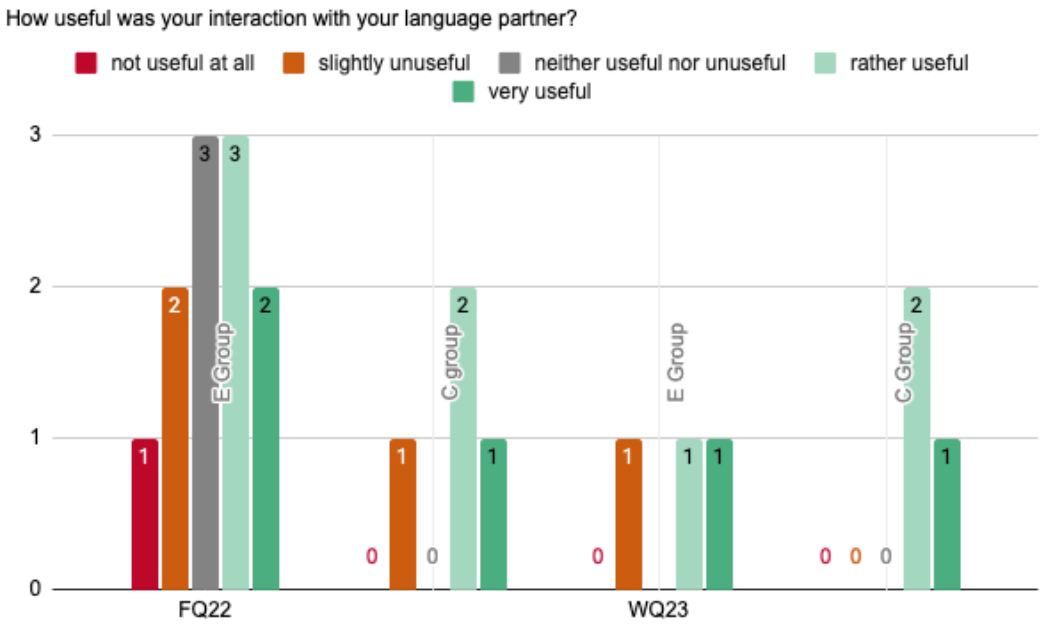
benefitted from an instructor who had more involvement in the activities and a higher level of knowledge about the design and motivation for the CA activities, and may have been able to support the student's in a different or more detailed manner. Also interesting to observe is that in Winter 2023 all participants (n=6) reported either Very Pleasant or Pleasant. The principal researcher was not an instructor in the classes in which the study took place during Winter Quarter 2023. Additionally, participants may have benefited from training materials which were designed to support the students' engagement in the activities for Winter 2023. These materials were a result of the first quarter administering these activities and consist of an introductory video and two infographics which are found in Appendix D.

Participant testimonials supporting the question above were starkly positive or negative. For example, in regards to the former, participants enjoyed getting to know their partner and contributing to each others' success along the way: "*My partner and I became pretty good friends and I really enjoyed working with her.*" (E, Fall 2022), and "*I became good friends with my Spanish partners. We encouraged each other and asked each other questions.* " (C, Fall 2022), and "*It was fun getting to know my language partner almost completely in Spanish, and nice to have a friend to practice with*." (C, Winter 2023). Themes which emerged in those that did not have the most pleasant experience centered mostly around the lack of participation of one of the partners "*One of my partners would not respond and would take forever. The other one responded but did not put much effort. The communication over WhatsApp was very annoying and I do not think it was beneficial at all*" and the logistics of coordinating the conversation, "*Because I had two partners, it made it a little more difficult. I had to not coordinate with only one person, but two. We also did double the work. They were nice and understanding, but I felt annoyed sometimes.*"

In regards to the question about how useful was the interaction with the language partner,

the results showed similar patterns as above. For example, the majority of the responses came from the E group in Fall 2022 with a large number of participants reporting either rather useful or neither useful nor unuseful. One participant reported the interaction to not be useful at all, as shown in figure 24 below.

Figure 24. Participant responses to the usefulness of interacting with the language partner.



Direct participant quotes complement the graphs above by calling attention to specific details of the participant's experience. For example, students who did not find the interaction useful comment about topics such as the activities being tedious "*It did not help me learn the language at all and was just super tedious*" (Fall quarter 2022, E group) or there seemed to be a perception about redundancy in content or interaction, "*The interaction was slightly unuseful because I already learned most of the information from previous years in high school and the only new thing I learned was incorporating new vocabulary into my oral sentences.*" (Fall quarter, C group).

Because this present study explores oral fluency, a characteristic of overall oral proficiency, the principal researcher included a variety of data points and data triangulation to

complement each other. For example, in addition to the finite fluency features discussed above, participants were also asked to self-report their proficiency scale according to the American Council on Teaching of Foreign Languages (ACTFL)'s proficiency guidelines[21], before and after the study. In the United States ACTFL conceptualizes proficiency levels using the Oral Proficiency Interview proficiency scales, and it was thought appropriate to utilize the ACTFL in this study on oral production.

Discussions about the validity of self-assessments are mixed, as are the purposes for leveraging them. For example, with respect to the former, some scholars advise that self-reports may be unreliable because participants may not understand the entries, may not be able to match with their own behavior, and may be distracted upon completion of the assessment (e.g. with vocabulary self-assessments, Ramirez-Gomez, 2015). This may have been the case with students completing the ACTFL proficiency level question, especially if this was the first time they had seen this information. Although a link explaining the scale and the levels was included in the questionnaire, it is likely that the students did not read the supplemental information and simply selected one of the choices and quickly moved on.

However, advantages of self-assessment can include providing feedback to the instructor, indicating a good learning activity, fostering student autonomy, and ensuring that student opinions and judgements are protected (Mohamed Jamrus & Bakar Razali, 2019). Read (1993) suggests that there are some contexts where self ratings are practical and valid measures of assessment, although this is particular to vocabulary assessment, and most testing situations should not rely on verified self reporting. Additionally, Benton, Duchon & Pallett (2011) assert that students tend to report more progress when the instructor identifies or calls attention to specific learning objectives, and the validity of the self-reports may depend on how much the

[21] https://www.actfl.org/resources/actfl-proficiency-guidelines-2012/spanish

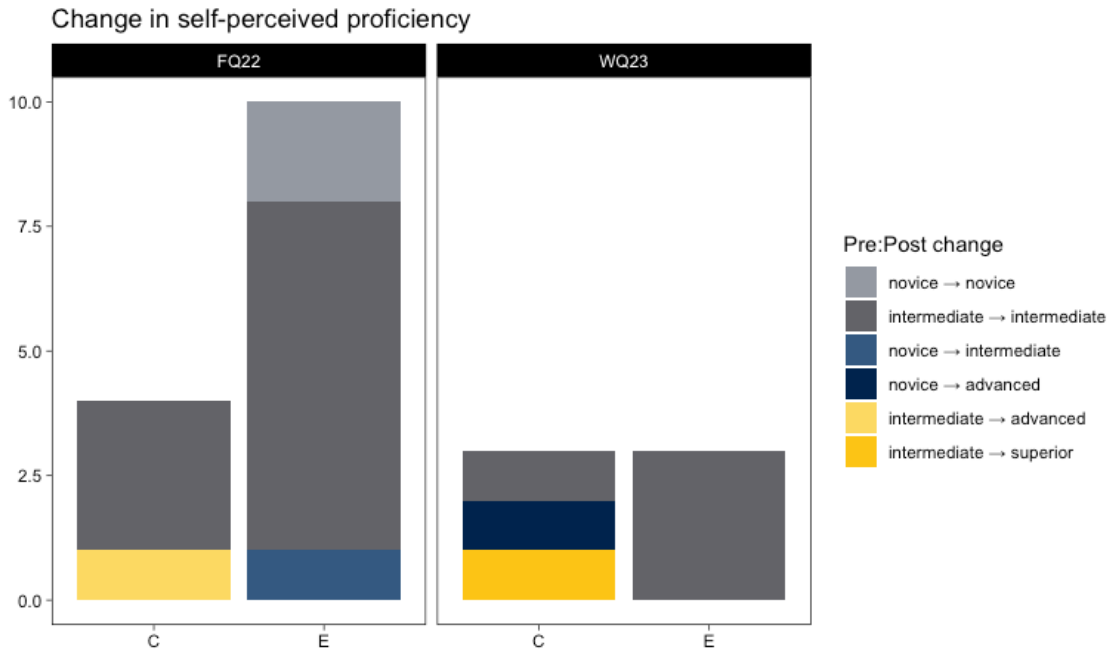
instructors identify and highlight the learning objectives. In the case of this dissertation study, the self-reports were not coupled with specific learning objectives, but rather used to triangulate data and explore potential correlations across various data points, which Hulstijn (2015) indicates as a method to explain variance in dependent variables. Although running an Analysis of Variance on the students' subjective self-report data and the objective data (e.g. total and unique words and speech rate) was not done in this study, which is something to be explored in the future. These self-assessment points were collected to reflect their credibility as assessment measures. They can enhance validity by combining them with other quantitative and qualitative data as suggested by (Bruton, 2009), who proposed using correlation analysis between self-reported responses and demonstrated knowledge (p. 33) to bolster the credibility of student self-assessments. Again, the short duration of this study (10 weeks) makes it nearly impossible to provide evidence of substantial oral proficiency gains, which is reflected in table 21.

In this study, 70% of students reported no change in their proficiency level across the quarter, assessing their level as Intermediate (coded as the number 2) both in the pre and post survey. The fact that the majority of the students self-reported their expected level (Intermediate 2) based on the course in which the study took place, and reported no change across 10 weeks is an indication of the reliability of the instrument in itself. The few outlier responses on the scale (e.g., participants 18 and 19) most likely did not thoroughly read and/or understand the question. However, it can be stated with confidence that the majority of the students in this study reliably completed the scale and thus contributed valid information to the study. The results are below in table 21 and visually represented in figure 25. The four scale points were coded with a corresponding number for easing graphing and plotting purposes: novice = 1, intermediate = 2, advanced = 3, and superior = 4.

Table 21. Participant ACTFL proficiency self report before and after treatment.

Participant number	Quarter	Group E = Whatsapp (Treatment) C = Zoom (Control)	**Pre**	**Post**
01	FQ22	E	2	2
02	FQ22	E	2	2
03	FQ22	E	2	2
04	FQ22	E	2	2
05	FQ22	E	2	2
06	FQ22	E	2	2
07	FQ22	E	1	1
08	FQ22	E	2	2
09	FQ22	E	1	1
10	FQ22	E	1	2
11	WQ23	E	2	2
12	WQ23	E	2	2
13	WQ23	E	2	2
14	FQ22	C	2	2
15	FQ22	C	2	2
16	FQ22	C	2	2
17	FQ22	C	2	3
18	WQ23	C	1	3
19	WQ23	C	2	4
20	WQ23	C	2	2

Figure 25. Participant ACTFL proficiency self report before and after treatment.



In figure 25 above, the y-axis represents the number of participants in that category. The x-axis represents each of the groups, Control (Zoom) and Experiment (WhatsApp) across both academic quarters, FQ22 (Fall quarter 2022) and WQ23 (Winter Quarter 2023). The majority of participants reported no change during the quarter, consistently reporting intermediate both the beginning and end (Fall 2022, E group, n = 7 and C group n = 3). For Winter quarter 2023 consistency of intermediate both at the beginning and the end of the experiment was n=3 (E group) and n=1 (C group).

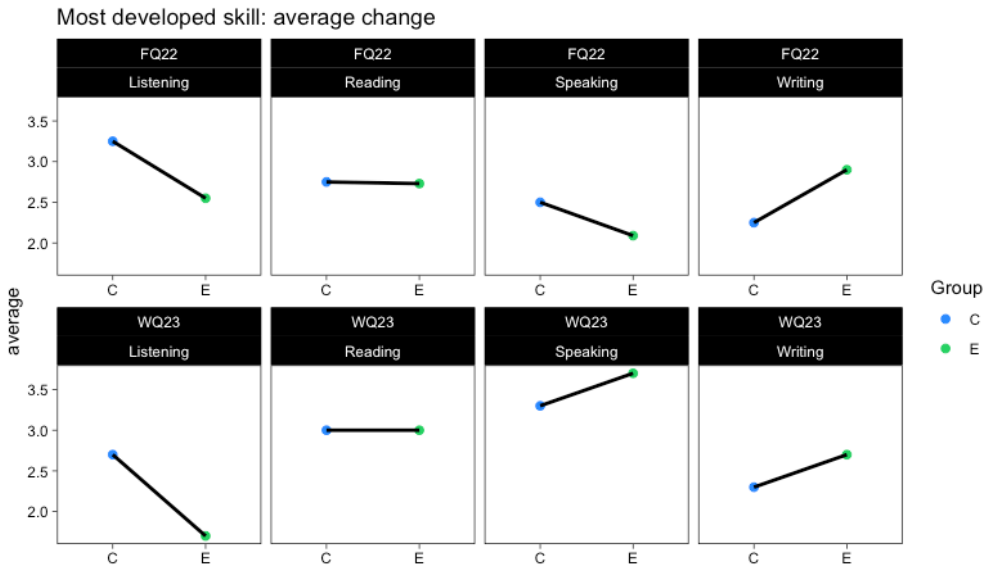
Perhaps one of the most salient data points comes from the question "Which language skill would you say you practiced and/or developed most over this academic term? Please rate them in terms of the "most developed" (4) to "least developed" (1). You must select only ONE number for each skill". Participants were instructed to rank each language skill using only one numerical point of ranking 1, 2, 3 or 4. However, these instructions were not followed by all of the participants, and many selected the same number for different skills. So, instead, the average

was taken for skill across participants between groups. This data is represented both in table 22 below and in figure 26 below. The top row of figure 26 represents Fall Quarter 2022 and the bottom row represents Winter Quarter 2023. Each plot shows the difference in self-reported averages of the C group (Zoom) and E group (WhatsApp). Furthermore, each language skill is represented individually: listening, reading, speaking, and writing.

Table 22. Average (1-4) of participant self report separated by group and academic quarter, reporting on what skill they think they developed most over the quarter.

quarter	group	reading	listening	writing	speaking
FQ22	E	2.73	2.55	2.9	2.09
FQ22	C	2.75	3.25	2.25	2.5
WQ23	E	3	1.7	2.7	3.7
WQ23	C	3	2.7	2.3	3.3

Figure 26. Averages (1-4) of participant self-report of most developed skill at the end of the academic quarter.



Because this self-assessment data included two factors, group (E and C) and quarter (Fall 2022 and Winter 2023) an Analysis of Variance (ANOVA) was also performed to account for any time and/or quarter effect, while still providing insight into the question of a potential group effect. Thus, R was used to run an lm() and anova() function on the four dependent variables: reading, listening, writing, and speaking. The results are shown below in table 23. As a reminder, this

assessment was an average taken from a scale of 1-4.

Table 23. Results of ANOVA for the means calculated of the participant's self-reported perceived most developed skill.

	Sum Sq	Mean Sq	F value	Pr(>F)
reading				
group	0.0352	0.03516	0.0438	0.8369
quarter	0.3124	0.31238	0.3890	0.5416
group:quarter	0.0025	0.00246	0.0031	0.9566
listening				
group	2.1808	2.18077	2.3926	0.1415
quarter	2.1244	2.12442	2.3308	0.1464
group:quarter	0.0615	0.06148	0.0674	0.7984
writing				
group	2.8484	2.84835	**5.9315**	0.02694 *
quarter	0.2943	0.29427	0.6128	0.44517
group:quarter	0.3740	0.37404	0.7789	0.39054
speaking				
group	1.3736	1.3736	1.0351	0.32411
quarter	7.5362	7.5362	**5.6788**	0.02991 *
group:quarter	0.8568	0.8568	0.6456	0.43345

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The ANOVA for receptive skills, reading and listening, do not show any statistically significant results, both reporting $p > 0.05$. However, both productive skills showed statistically significant results with $p < 0.05$ for writing ($p=0.03$ for a group effect) and for speaking ($p=0.03$ for a quarter effect). So, to explore a potential effect further a post hoc emmeans() function was processed and results are in table 24.

Table 24. Estimated marginal means for writing and speaking across quarters of data collection. Scale 1-4.

emmeans			
quarter		**writing**	**speaking**
Fall 2022			
	E	**3.20**	1.90
	C	2.25	2.50
Winter 2023			
	E	**2.67**	**3.67**
	C	2.33	**3.33**

As shown in table 24 #, across both quarters the emmeans for writing for the E group are slightly higher than the C group, which indicates that collectively the group using WhatsApp for their Communication Activities perceived writing skills to be their most developed skill over the quarter (as compared to the other three skills). Additionally, for speaking the E and C group in Winter quarter 2023 reported developing their speaking skills more than the other three skills. Therefore, regardless of Communication Activity modality (Zoom or WhatsApp) speaking appears to be the most developed skill during Winter quarter, as perceived by the learners.

Consistently across quarters, the Zoom group self-reported developing listening skills about 1 whole point more than the WhatsApp Group. No statistically significant differences were reported across groups in regards to reading, although in Winter 2023 both groups reported an increase of about .3 from Fall 2022. With respect to speaking, the E group average was .41 below the C group, while in the Winter quarter, the E group average was .4 higher than the C group. Writing showed consistency of the WhatsApp group's self-perception of developing more writing than the C group, where the E group reported an average of .65 higher than the Zoom group in Fall, and .4 average higher than the Zoom group in Winter.

4.5 Instructor surveys

This study involved nine instructors, some who taught in both quarters the study was run. Following is a brief explanation of the instructors in the study, as well as numerical and graphical data regarding the instructors, and in Chapter 6 a more thorough explanation of their experience in the study is presented. Table 25 shows a breakdown of the instructors and their engagement with either the C group (Zoom) or E group (Whatsapp) for the Communication Activities.

Table 25. Breakdown of instructor across treatment modality and academic quarter.

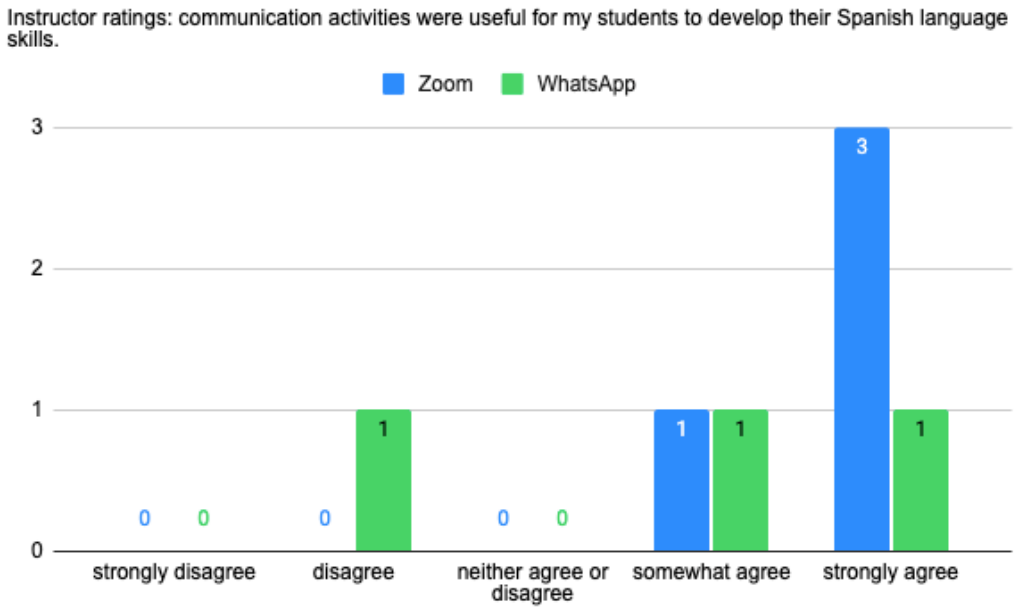
	FQ22		WQ23	
Instructor ID	WhatsApp	Zoom	WhatsApp	Zoom
*1	---	✓	✓	---
2	✓	---	✓	---
*3	---	---	✓	---
4	---	---	✓	---
*5	---	---	✓	---
*6	---	✓	---	✓
*7	---	✓	---	---
8	✓	---	✓	---
9	✓	---	---	---

Five instructors completed the post-study experience questionnaire and three were available for Exit Interviews. Two of the five instructors taught in both quarters and completed an individual survey for each class. The following results below refer to 7 different courses, 3 classes using WhatsApp (E group) and 4 classes using Zoom (C group). The instructor questionnaire was completed via Qualtrics. The full questionnaire is found in Appendix G and results are presented below. A more thorough exploration and discussion of the instructor's comments and Exit Interview responses is detailed in Chapter 5. Asterisks above in table 25 indicate which instructors filled out the experience questionnaires for their class(es). Note that instructor nine is

the principal researcher for this study and did not complete an experience questionnaire as it may have resulted in unintentionally biased information.

Instructors were asked to rate their students' engagement level on a three point scale: high, moderate, and low. Six classes were reported to have moderate engagement, and one class had high engagement (WhatsApp group during Winter Quarter 2023). Similarly, figure 27 below shows the instructor rating of the usefulness of the Communication Activities broken down by if the instructor was teaching a class in the Zoom or WhatsApp group. One instructor in the WhatsApp group (Winter 2023) noted Disagree, and three instructors in the Zoom group noted Strongly Agree (2 Fall 2022 and 1 Winter 2023).

Figure 27. Instructor ratings on usefulness of Communication Activities.



In the preceding question, instructors commented on items such as allowing students to practice their informal oral communication, "*I really liked them. I think it gives students the opportunity to practice oral communication.*" (Zoom) and "*They went great. Students were happy to have a space where they could practice speaking Spanish outside of the class.*" (Zoom). While instructors in the WhatsApp group commented more on aspects of writing or grammar practice,

"*I think that the use of WhatsApp to do the Communication Activities has been a big help to review grammar that we saw in class (preterite vs. imperfect)*[22]" and "*This quarter had a significant amount of writing activities (resumenes talleres de lectura, final writing assignment, etc.). Therefore, students had plenty of opportunities to practice their writing and I don't think they put that much effort or time in the actividades de comunicación.*" Additionally, similar to what was previously noted with the student data, instructors noted the impact that the effort put in by the part of the students impacted the experience as well, "*Although they all did the activities, there was a lot of variation in how much effort different pairs would put into them, both in time spent overall and in how much they tried to speak in Spanish*." (C group).

Although the pool of instructor feedback is small, below shows a table of main points highlighted regarding advantages and disadvantages of the Communication Activities. Following are supporting comments.

Table 26. Instructor-reported benefits and disadvantages of the Communication Activities.

Benefits		**Disadvantages**	
WhatsApp (E Group)	Zoom (C group)	WhatsApp (E Group)	Zoom (C group)
● Language practice in a low-stress environment ● Review grammar in informal setting ● Make connections with classmates	● More oral practice outside of class ● Language practice in a low-stress environment ● Confidence building ● Easy for instructor to monitor progress	● Added more work and students felt overwhelmed by in-home work (1) ● Expectations of asynchronous/synchronous conversation between students ● Rehearsed/not spontaneous conversation	● Some students do not feel comfortable being on camera ● Discrepancies in effort ● Logistics of scheduling ● Assessment (2)

(1) Instructors both in the Zoom and WhatsApp group made comments about students

[22] This is the author's translation of the original comment which was left in Spanish. Original quote: "Creo que la utilización de Whatsapp para hacer esta actividad comunicativa ha sido de gran ayuda para repasar la gramática que veíamos en clase (pretérito vs imperfecto)".

feeling overwhelmed with a lot of homework, although that was not necessarily specific to the WhatsApp activities.

(a) "*Through the quarter students complained that they had too much work to do at home. However, they gave that feedback as a whole and not specific to the Communication Activities."* (C group)

(b) "*Sometimes they were overwhelmed with several another activities from the Spanish course*" (E group)

(2) For grading and assessment, the instructors were guided to review the activity and provide general feedback and grade them on complete/incomplete. This had benefits as well as drawbacks. As a benefit, the grading protocol allowed for easy grading for the instructor and for students not to worry about producing perfect language (which was one of the main points of the activities). However, this also awarded the same amount of points to students who put in very little effort and to those who put in a great deal of effort. An instructor notes that "*I think if I had to evaluate this kind of exercise more formally I would have a hard time assessing what I need to evaluate specifically.*" (C group).

In an exit interview with instructor #7 this topic came up and the instructor suggested that requesting a minimum of time or length of conversations (such as lines/utterances produced by each student) might be helpful.

A common theme among both instructor and student data is that of how these types of activities, regardless of modality (Zoom or WhatsApp), provided students with opportunities to practice the language in a low-stakes, low-stress environment which is seen as a positive aspect in this context. SLA research has consistently called attention to the impact that affective variables can have on learners acquiring and developing language skills (Mitchell, Myles &

Marsden, 2013), which falls in line with what some scholars have framed as "willingness to communicate" (Chapelle, 2001). A low-stress learning environment where learners feel comfortable to practice in the target language, such as the Zoom or WhatsApp Communication Activities, is a consistent component of the general technology-enhanced language learning (TELL) conversation and increasingly being reported as an essential affordance of technology-enhanced and online language learning (Blake & Guillén, 2020; Ziegler & González-Lloret, 2022).

Another theme common in both groups (WhatsApp and Zoom) which emerged in the instructor data was the constant reminder to students to not read from a script prior to (Zoom) nor pre-write a script for WhatsApp. While preparation, such as script writing, for communicative activities is often part of a pre-task phase and can be helpful for learners, in this particular study, learners were asked not to pre-write dialogues or scripts to read during their conversations, but rather to engage in the task as spontaneously as possible. At first the students seemed to find it necessary to rely on scripts and perfect language use, however instructors (and students) made comments about once they realized they didn't need to be perfect, they relaxed and engaged in more (semi) spontaneous conversation over the rest of the academic quarter.

Interestingly, during an Exit Interview with a student in the WhatsApp group the student admitted that he and his language partner had two separate active WhatsApp conversations, one in which they would discuss what they were going to write about and then another in which they would carry out the conversation and then turn that conversation (.txt file) in as their homework. Although this additional practice most likely benefited the learners, the activities were designed for learners to engage in the task (communicative dialogue) without pre planning or writing a script. The aim was for the students to focus on the process of the language and for the instructors to have a window into the process of the language use, not for the students to produce

a final perfect activity. Perhaps this could be clarified more as the instructors present the information at the beginning of the quarter, and perhaps even clarify it by showing some examples of previous students' activities. Table 27 presents an overview of the type of feedback instructors provided students.

Table 27. Feedback given by instructors.

WhatsApp (E Group)	Zoom (C Group)
• Reminders not to prewrite a script and to carry out as much a spontaneous conversation as possible • Confirmation of completing the activity	• Specific linguistic comments • Reminders not to read from a script and to carry out as much a spontaneous conversation as possible • Action-oriented feedback on what to work on for next week • Specific feedback related to the students' conversation

Although the instructor feedback is limited due to the number of instructors who completed the experience questionnaire, it is interesting to observe that the instructors in the Zoom group seemed to be focusing on providing specific, actionable feedback, which they left through writing in Canvas.

- [My feedback was] "*General, but detailed in the sense that I would tell them what they will need to focus on for the next week (ej. pronunciation, gender/number agreement, sentence structure...). I also made sure to point out the things they did well.*" (C group)
- "*I tried to emphasize and insist on students having spontaneous conversations. If I noticed they were rehearsing or reading, I told them to relax and just speak to their best ability. I had to repeat this multiple times as feedback on Canvas and in-class. Besides this, I gave specific feedback (on Canvas) on conversation content. It was important to me to let the students know that I was actively watching the videos and caring about the work they did. If I noticed grammar/vocabulary/pronounciation issues I refrained from writing the feedback on Canvas and spent some time in class going over some of these*

things (as a class in general and not targeted to a specific student)." (C Group)

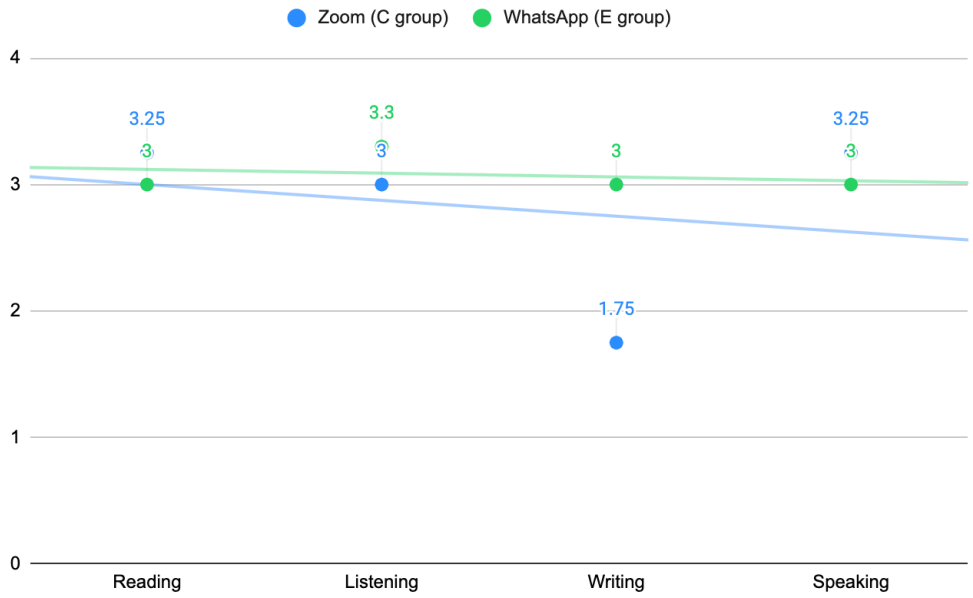
- "*I insisted on them having spontaneous conversations but I found that students had a harder time doing that on Whatsapp than on Zoom (written vs oral). It was easier for me to spot grammatical issues in writing but I gave feedback on this in class."* (E Group)

Similar to the students' experience questionnaire, instructors were also asked to rate on a scale from 1-4 what skill they believed their students had developed most over the quarter. Also similar to the students, the instructors did not fully understand the instructions in the question and gave the name numerical ranking to more than one skill, so an average of their selections was taken. This data is shown below in table 28 and represented visually in figure 28.

Table 28. Average of instructors ratings on a scale from 1-4 of what skill they believe their students developed most over the course. 1-least developed, 4-most developed.

Which of the language skills do you think your students practiced and/or developed most over this academic term?				
	Reading	**Listening**	**Writing**	**Speaking**
Zoom (C group)	3.25	3	1.75	3.25
WhatsApp (E group)	3	3.3	3	3

Figure 28. Average of instructors ratings on a scale from 1-4 of what skill they believe their students developed most over the course. 1-least developed, 4-most developed.

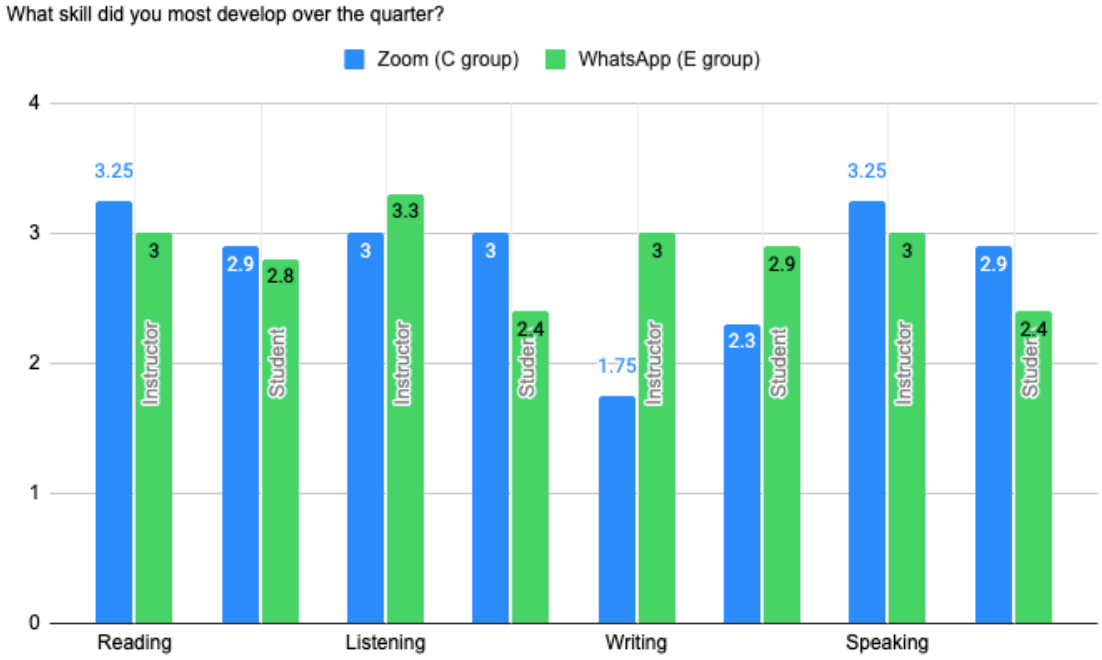


Other than the differences in perceived skill developed of writing there is not much variation in the responses of the instructors in regards to what skill they believe their students developed most over the 10-week quarter. It should be remembered that only five instructors submitted the questionnaire, which corresponds to seven courses. It is interesting to note that the WhatsApp instructors reported a low average for skill development for writing, which is the opposite of how students in the WhatsApp group reported developing writing skills. As noted previously, students in the WhatApp group (across both quarters) reported an average of 2.9 (on the 1-4 scale), and as we see writing from the WhatsApp instructors is reported as an average of 1.75. Comparisons across student and instructor reported perceived skill development are shown below in table 29. This same data is also represented visually in figure 29 below.

Table 29. Students and instructors self-report of what skill they perceived the students to have developed most over the academic quarter. The numbers are an average based on a scale of 1-4. 1 being least developed and 4 being the most developed.

	Reading		**Listening**		**Writing**		**Speaking**	
	Instructor	**Student**	**Instructor**	**Student**	**Instructor**	**Student**	**Instructor**	**Student**
Zoom (C group)	3.25	2.9	3	3	1.75	2.3	3.25	2.9
WhatsApp (E group)	3	2.8	3.3	2.4	3	2.9	3	2.4

Figure 29. Students and instructors self-report of what skill they perceived the students to have developed most over the academic quarter. The scale was 1-4. 1 being least developed and 4 being the most developed.



With a few exceptions, students and instructors seem to be in alignment of the skills they perceive to be mostly developing, although a few discrepancies are found in the ratings. For example, instructors in both groups rated reading higher than students in both groups, instructors in the E group rated listening higher than students, and instructors in both groups rated speaking higher than students. Interestingly, writing showed a bit of variation. Additionally, students in the Zoom group rated writing as .55 higher than instructors in the Zoom group, and both instructors and students in the WhatsApp group rated writing almost the same, instructors 3 and students 2.9. It is necessary to remind readers that the student data comes from an average of data from n=20 and the instructor data is an average of only five instructors.

4.6 Summary

Chapter 4 has highlighted the descriptive statistics and data analysis and methods for 1) participant pre- and post-oral assessments, examining measures of fluency such as total words,

unique words, speech rate, and speed, pauses, and repair, and percentage of comprehension impeded, 2) interrater reliability, 3) the experience questionnaire, and 4) instructor experiences. Additionally, this chapter offered a look at the student and instructor profiles who participated in the study.

Overall, the findings in this chapter do not call attention to any statistically significant results. The group of twenty participants in the study were relatively homogenous, 18 were L2 learners of Spanish and 2 were heritage speakers, and all participants reported using English as their dominant language. Additionally, with the exception of one student who had previously studied Hebrew, all participants had not studied any other languages formally.

The numerical averages and ANOVA on the objective data (total words, unique words, and speech rate) resulted in no statistically significant differences, with the exception of speech rate improving in both groups. The averages of words per second across both groups showed an increase across the 10 weeks, and the ANOVA showed an effect with time, pointing towards the 10 weeks of the language practice (including this research study) helping all learners increase their speech rate. This is to be expected in a study which uses intact language classes which require daily in-person class work and daily homework, thus a constant engagement with the language throughout the 10-week duration of the study. It is worth highlighting here that the fact both the WhatsApp and Zoom groups increased their speech rate highlights that the WhatsApp group was not hindered by their modality of language practice, and stayed on par with the group that practiced their language in the same mode in which they were assessed (face-to-face speaking). For total words, the WhatsApp group showed a slight increase over the Zoom group, although the ANOVA showed no statistically significant results when testing for group, time, or an interaction effect of group and time. For unique words, the Zoom group showed a slight increase over the WhatsApp group, although the ANOVA showed no statistically significant

results when testing for group, time or an interaction between group and time.

Regarding the subjective data, the perceptions of the human raters rating the participants on scales of fluency and comprehensibility impeded, there was no statistically significant differences in comprehensibility impeded in the ANOVA. However, the ANOVA did show an interaction effect (group and time) on the fluency scale, which indicates a possible impact of group difference over the 10 weeks. Curiously, although the words per second show a slight increase across both groups, the human raters seem to perceive the WhatsApp group as staying consistent in their fluency (as measured by speed, pauses, and repair) and the Zoom group declining over the course of the study.

Turn taking in the Communication Activities also provided insightful comparative data. First, on average participants had more turns when engaging in an unscripted, spontaneous conversation, which was true for both WhatsApp and Zoom groups. Second, the Zoom conversations showed a higher number of turn taking, which is to be expected as the face-to-face participants worked through discourse markers or vocal disfluencies (filler words) such as ‘um’ and ‘uh’s. It is necessary to remind readers that this data is only from 7 Zoom participants in the study. Lastly, task design, especially the objectives of the task, seem to influence the number of turns participants take (and most likely impact other experience and engagement factors as well).

Lastly, some basic data was presented about the participants’ overall thoughts regarding the usefulness of the communication activities and the interaction with their language partner. Overall, both learners and instructors consider the experience to be useful and pleasant, however there were exceptions in both cases, and some learners' experiences were highlighted as not pleasant or useful. The participants’ self-assessment of their level of proficiency using the ACTFL scale pointed towards a valid measure of assessment as the majority of participants indicated their intermediate level and no change across the 10 weeks. Also in the self-report data

students in Fall 2022 WhatsApp reported writing as their most developed skill, while the Zoom group reported listening. For Winter 2023, both the C and E group reported speaking as their most developed skill. Running an ANOVA on this self report data resulted in a group effect for writing and a quarter (time) effect for speaking. The former indicates that the group difference potentially made them more aware of a perceived increase in writing skills, while there was a difference in the perception of speaking skills across Fall 2022 and Winter 2023. This data calls attention to a student's awareness of increased production skills, whereas receptive skills may not have been as noticed (or developed) for the students.

Overall, instructors found the experience to be useful, as it pertains to the Communication Activities and language partner interaction. Although this section briefly presented an overview of the benefits and disadvantages of this experience, as noted by instructors, Chapter 5 presents this data in more detail. In regards to the most skill developed, instructors in the C group perceived speaking and reading (tied) as the most developed, and reading, writing, and speaking received the same ranking from instructors in the WhatsApp group. This chapter also discussed the differences and similarities of instructor versus student self reporting on skills developed.

Chapter 5 examines the results and analysis of the qualitative portion of the data collected, including presenting emergent themes from the experience questionnaire, more student and instructor testimonials, and five case studies. A more detailed discussion on the data from both Chapters 4 and 5, including indications of the findings, is presented in Chapter 6.

CHAPTER 5: Qualitative Analysis & Results

5.1 Introduction

This chapter is dedicated to the analysis of the qualitative data collected from the student participants and instructors. Here, we present a deeper look at the emergent themes from the students' experience questionnaire and participant and instructor exit interviews. This exploration delves deeper into the discussion of the effect of modality (writing on WhatsApp v. speaking on Zoom) on L2 oral fluency, by adding personal narratives from the students' and instructors' perspectives about the effectiveness and likeability of this innovative approach to leveraging mobile devices to take learning outside of the classroom in a more naturalistic setting.

Included in this chapter are five case studies that highlight the learning circumstances of certain participants. These particular participants were selected due to a variety in their language background profile, interesting patterns in gains or losses in fluency variables, or willingness to complete an Exit Interview. As previously stated, the main objective of the following data addresses the following qualitative research questions:

1. What are the learners' and instructors' perceptions about…
    a. …the relationship between their L2 texting behavior and their L2 oral fluency?
    b. …language learning via a mobile device in a semi-formal learning environment?
    c. …task design of the communicative activities?

As reviewed in Chapter 2, participants have expressed their clear opinions about their perceptions of the frequency of the messages, motivation, effectiveness, and feasibility of the tool and experience for their language learning. In general, results show that study participants enjoyed the experiences and demonstrated an overall positive attitude (Cavus & Ibrahim, 2009; Kim, 2011; Li, Cummins & Deng, 2017; Kennedy & Levy, 2008; Lin & Yu, 2017; Tabatabaei &

Goojani, 2013), citing reasons such as how the activities or content was useful and effective (Li, Cummins & Deng, 2017), interesting, motivating, beneficial (Lin & Yu, 2017), and enjoyable (Dolores Castrillo et al., 2014). Although students reported some drawbacks of language learning via text messaging such as messages being sent too frequently (Kim, 2011), other students wanted interaction or the ability to respond to the push messages (Cavus & Ibrahim., 2009; Kennedy & Levy, 2008). Some of the disadvantages reported were technical issues including the small size or display issues of the screen on the mobile phones (Hayati, Jalilifar & Mashhadi, 2013; Lin & Yu, 2017), slow speed of the mobile device (Lin & Yu, 2017) or simply not enjoying the experience (Lu, 2008).

The following chapter builds on the previous research noted above, particularly in the realm of text messaging as a mobile method of learning compared with face-to-face conversation. Specifically, we focus on task completion, communicative interaction, spontaneous communication, turn taking, and overall engagement.

5.2 Participants revisited

Specific participant details were outlined in Chapter 3, however to clearly contextualize the content discussed in this chapter, we now provide a brief summary of the participants in question. The participants were made up of twenty undergraduate students in a high beginning Spanish class at a large research university on the West Coast of the United States. Fourteen participants reported their gender as female and six as male. Eighteen participants self-identified their Spanish language learner status as non-native Spanish speakers (L2 learner) and two as Heritage Speakers (HS) of Spanish. The majority of the students (n=13) reported having studied Spanish formally between 3-4 years. All participants reported their dominant language as English and all participants completed the post-study experience questionnaire and one student

participated in an Exit Interview (which was carried out via Zoom).

5.3 Participant post experience questionnaire - emergent themes

At the end of the study (10-week academic quarter) participants completed a questionnaire which consisted of 14 questions. The questionnaire was emailed to the students via the instructor and executed via Qualtrics. As previously noted, the full questionnaire is found in Appendix F. The aim of the questionnaire was to gain a deeper insight into the experience of the participants, individually and collectively, in order to potentially draw some overall conclusions.

The Grounded Theory Method (GTM) (Glaser & Strauss, 2009; Urquhart, 2013) was used to analyze the questionnaire results and extract emergent themes from the survey results. In this method of data analysis, researchers discover theory from data, systematically obtained and analyzed (Urquhart, 2013). The following is an examination of the qualitative results using an open coding methodology (Urquart, 2013) of GTM where the principal researcher reviewed, coded and organized data in two main phases. First, we analyzed each question on the post-treatment survey, noted common themes, and tagged them according to aspects of language learning such as grammar, vocabulary, in-class work, homework, and technology. Second, based on these findings, we determined overarching themes, which are presented in detail in Section 5.3. Third, we reviewed the participant testimonials once again to add specific comments to support the themes. The first pass of data includes a coding of 50+ finite categories, and then in the second pass, the data was coded in more general emergent themes. The second phase of coding related more to a Glaserian strategy where the categories that emerged were focused only on the core topics of the study itself. Because the participant pool was small (n=20), the researcher was able to read all data submitted by the participants, such as direct quotes and proceed coding the participant testimonials and responses accordingly.

From this process, five prominent themes emerged across all participants (including both the Zoom and WhatsApp group): the treatment allowed 1) more opportunities to practice the Spanish language outside of class, 2) more opportunities to engage in the language in a low-stress, low-stakes environment, 3) easy social connection and community building with the language partners, 4) increased impact of the partner connection, and 5) brought to light the importance of clear task logistics and intentional task design. These themes will be discussed in further detail below and include testimonials from participants as direct supporting evidence.

5.3.1 More opportunities to practice the Spanish language outside of class

Participants in both groups and quarters enjoyed the opportunity to practice the Spanish language outside of class. Participants highlighted several aspects of language use including speaking and the opportunity to apply concepts learned in class, like vocabulary and grammar, in a (semi) real-life context. For example, students in the Zoom group commented that "*The activities were really helpful because they forced you to speak Spanish aloud and they helped me remember and learn the vocabulary*", "*I learned…incorporating new vocabulary into my oral sentences*." and "*I was able to expand my learning from in class*." Additionally, students in the WhatsApp group also enjoyed that they "*were able to speak outside of class in spanish*", although it is uncertain if this student is referring to their text message engagement or if the two students met up outside of class to practice.

One sub-theme connected to outside-of-class practice centered on being able to apply concepts learned in class to real-world situations. For example students cited that "*The communication activities were useful in applying the grammar and vocabulary that I learned in Contraseña and applying them to the real world.*" (WhatsApp, Fall 2022) and "*These activities mostly helped with vocabulary and grammar related to Spanish*" (Zoom, Fall 2022). Students

also seemed very aware of their own language skill development, and how those skills ranged across quarters and groups. For instance, several study participants commented about THE practice of grammar and vocabulary, and others explicitly noted developing production and receptive skills, such as "*I practiced speaking and reading the most*." (Zoom, Fall 2022).

A curious comment about the lack of immediate corrective feedback insinuates that one student perceived that their speaking skills did not develop: "*My partners and I were able to communicate and understand each other well, but my speaking skills did not develop because I made mistakes with grammar structure and there was no instant discipline or feedback to help me prevent making the same mistakes again*." (Zoom, Fall 2022). Corrective feedback has been reported to be effective on developing L2 grammar proficiency (Ellis, 2006), although it is uncertain if there was any implicit or explicit feedback offered from Participant 15's language partner. Furthermore, because this study examined fluency, and not grammar, none of the study assessment measures can account for gains or losses in grammatical accuracy. Future studies should explore the differences between feedback given during language partner dialogues and instructor-provided feedback, particularly compared to grammar-focused classroom assessments like quizzes and exams. Additionally, instructors did provide feedback via Canvas Comments on each Conversation Activity the students turned in. Although the feedback varied among instructors, in general it was timely (before the students had to turn in the next activity), and the feedback often called attention to actionable items about what to pay attention to in the coming week.

Additionally, in analyzing the Zoom conversations transcripts of Participant 15's conversations, it is noticeable that, with the exception of activity 12.2 *Past Experiences*, the group participants had pre-written a script, and were each taking organized turns reading their part. It is unknown how this written conversation began and what phases of editing or revision it

may have undergone before being carried out. The CA transcripts do show some grammatical errors, however they are not addressed in the live conversations because each participant is beginning their pre-scripted turn. A snippet from dialogue 12.2 is shown in figure 30, which exemplifies an unscripted conversation where the participants provide each other feedback, however this example is vocabulary related, not grammatical. Although there are some grammar mistakes in their dialogue there seems to be no grammatical related corrective feedback among the group participants in any of their eight dialogues. This may indicate they did not revise and edit the dialogues before reading them in the Zoom conversation or they reviewed the dialogue among the group participants and no corrections were made, either intentionally or unintentionally. An example is found in CA 11.1 *Fashion* and a snippet is shown in figure 31. Interestingly enough, this study participant (#15), also showed a decrease in total and unique words produced, as well as words per second in their speech elicitation tasks which is presented in tables 30 and 31. Figure 31 shows several grammatical mistakes, but each participant keeps on with their own utterance without offering any corrective feedback.

Figure 30. Example of vocabulary related explicit feedback in a dialogue with Participant 15.

15: Estudiante 3, uh ¿hacía la actividad uh en el uh afuera or ¿cómo se dice *indoor*?

Estudiante 3: Um adentro

15: adentro, sí

Figure 31. Example of grammar related errors with no feedback in a dialogue with Participant 15.

15: Es una pregunta muy interesante porque especialmente en la tecnología, la gente lleva y pantalones cortos y camiseta blancas y creo que no es ese sociedad es muy casual, casual y la gente no se importa sobre ellos que llevan y a nuestra generación es un poquito flojo.

Estudiante 2: Sí, yo yo creo mismo yo que nuestra generación es muy aceptable de lo que um todos llevan puesto. Y ahora, especialmente en um en público casi casi todos están usando ropa más cómoda y holgada y no tanto más apretada o ajustado.

Estudiante 3: Mhm. Todos esos collares y pulseras de cadena parecen pensados para usar.

Table 30. Participant 15 (Zoom, Fall 2022) average total words, unique words, and words per second (wps) across pre and post speech elicitation tasks.

Average **total words**			Average **unique words**			Average **words per second**		
pre	post	diff.	pre	post	diff.	pre	post	diff.
353	330.5	-22.5	131	129	-2	1.53	1.45	-.08

Table 31. Participant 15 (Zoom, Fall 2022) raters perceived fluency and % of comprehension impeded.

Fluency			*% of comprehension impeded		
pre	post	diff.	pre	post	diff.
4	4	0	1.5	2	0.5

*As a reminder, the % of comprehension impeded values a lower score. So, a numerical increase actually represents a decline.

It should be noted that Participant 15 was also in a group of three which may have altered the dynamics of the language partners, thus potentially impacting their exchanges in the Communication Activities. A group of three was only permitted if a course section had an odd number of students in it. This may have impacted the student's experience with the Zoom conversations and potentially lessened the number of turns, taking away opportunities for more speaking practice, as three people needed to engage in the conversation, instead of the typical dyad. Although the data in tables 30 and 31 above is a monologic sample from the participant before and after the study.

5.3.2 More opportunities to engage in the language in a low-stress, low-stakes environment

Students in both the WhatsApp and Zoom group discussed their enjoyment of having

opportunities to engage in the language in a low-stress, low-stakes environment. For instance, a student in the Zoom group commented that "*It was useful to be able to speak Spanish aloud in a low pressure environment with just two people.*" Several students in the Zoom group expressed enjoyment around the activities and the chance to practice conversational Spanish: "*The activities were fun and gave a space for me to just practice my conversational Spanish*". Other Zoom group participants enjoyed being "forced" to produce language: "*The activities were really helpful because they forced you to speak Spanish aloud and they helped me remember and learn the vocabulary*." Similar results were presented in Moneypenny and Aldrich (2018), who reported that students engaging in synchronous video exchanges found them helpful in their language development and they preferred to practice in these low-stakes, non-graded environments.

Additionally, the extra challenge of a spontaneous conversation was noted by a student in the Zoom group who commented that "*My speaking and listening skills improved a lot because of the weekly communication activities. It was a low-pressure activity that allowed for us to be completely spontaneous and try to have a normal conversation in Spanish, helping with researching new vocab and applying class knowledge.*" The appreciation for this semi-spontaneous conversation challenge was also noted in the Whatsapp group: "*I liked the activity as the prompts were just challenging enough to make me think about my answers while not being completely out of reach. The aspect of not knowing how my partner was going to respond added to the challenge.*"

Students in the WhatsApp group also explicitly commented about their enjoyment being able to practice Spanish outside of the classroom: "*The activities were beneficial in allowing me to practice communicating in Spanish outside the classroom. I was able to text in Spanish in a more informal way, but I still got to talk about important topics.*".

Furthermore, one student captured the benefits as follows: "*The aspect that helps me the most is the weekly zoom assignments. Being forced to use as much Spanish as I know even if I don't know the right grammar rules helps me dig deep into my knowledge and helps me remember everything more.*" This comment emphasizes the processes of encountering unknown grammar as an advantage of the Zoom Conversation Activities, as the student seems to enjoy consciously monitoring what language forms they need to use.

However, the previous quote above from Participant 15 perceives this lack of grammatical knowledge and corrective feedback as a hindrance in their perception of skill development. Although different in scope, this meta awareness of what the learners perceive they need for language development is part and parcel of the level of metalinguistic awareness necessary to advance L2 development.

5.3.3. Easy social connection and community building with language partners

The third theme that overwhelmingly emerged from student testimonials in both the Zoom and WhatsApp group was their enjoyment of connecting with a classmate (often unknown at first). Many students found making a long-lasting connection with their language partner was a positive part of the experience, which ultimately contributed towards community-building in the class. The following comments are representative of the Fall 2022 group's experience with language partners:

- "*My partner and I became pretty good friends and I really enjoyed working with her.*"
- "*Everyone is learning just like me so there was a lot of helping eachother"*
- "*My partner and I became pretty good friends and I really enjoyed working with her.*"

- "*My partner and I had a lot of fun doing them and teaching each other about ourselves through the activity.*"

Students in the Zoom group also expressed similar comments about their appreciation for connecting with another person in the class:

- *"I became good friends with my Spanish partners. We encouraged each other and asked each other questions."*
- *"My partner and I were both willing to try on the speaking activities making them a pleasant experience."*
- *"I had a nice and fun talking to my partner and getting to learn more about them."*
- *"It was fun getting to know my language partner almost completely in Spanish, and nice to have a friend to practice with.*"

Although they ranked the level of pleasantness with their language partner as either pleasant or very pleasant, none of the three WhatsApp group participants from Winter Quarter 2023 made explicit comments about their language partner experience. This lack of an explicit comment about the partner connection could indicate that the partner connection was not something that made a big impact on their experience.

5.3.4. Increased impact on the partner connection

On the other side of the *partner-connection* coin, is the impact that partner buy-in contributes toward the entire Communication Activities language exchange experience. As observed above, students with an engaged language partner seem to have a strong overall experience with the Communication Activities. This can be seen in comments like "*I had a*

partner who was willing to put in a similar amount of work as I was and was very cooperative." (WhatsApp, Fall 2022). However, the opposite was also true for students who did not actively participate in the activities, took a while to reply to messages, or were not motivated to engage in the language in this manner outside of class. Clearly, equal contributions of the language partners, as well as partner motivation and buy-in, strongly affected each partner's experience over all.

For example, in the WhatsApp group some students reported that one of their partners "*would not respond and would take forever. The other one responded but did not put much effort*." Lai (2016) made similar observations of the significance of learner engagement and its impact on learning outcomes. Specifically, the author highlights that "Learner mentality and group dynamics could be an important area that motivates or demotivates a student to use the mobile immersion as a habit. It deserves educators' careful management" (p. 287). In fact, learner and partner attitude and mentality should be considered a high priority in learning activities such as these, and Lai (2016) goes so far as to suggest that Stockwell and Hubbard (2013) integrate a new item in their 10 Principles of MALL Learning: "Condition learners to a favorable mentality before adopting a tool of MALL" (p. 288). This seems like a favorable step in the journey of effective and enjoyable mobile-assisted language learning.

Although partner motivation, attitude, and engagement seemed to affect the experience of most of the language partners, that was not always the case. As an example, one student in the WhatsApp group (Winter 2023) commented that her partner was "very nice and we always got it done on time" and selected *Very Pleasant* for "how pleasant was the communication and interaction with your Communication Activities partner?" However, in regards to the Communication Activities themselves, the student also reported *Strongly Disagree* for the question "The communication activities were useful in developing my Spanish language skills",

and *Slightly Unuseful* in response to "How useful was your interaction with your language partner?". This participant noted the activities "*felt like a chore, and I didn't get much from it*." in response to the question inquiring about the usefulness of the activities. So, there are cases in language exchanges where the partner connection is positive, although the perception of the activity is not.

5.3.5. Clear task logistics and intentional task design

Task logistics and task design also seemed to play a big role in the students' experience of the Communication Activities. For example, participants offered keen insight into the task design, including the prompt, logistics, and process of the Communication Activities (also referred to as tasks). Surprisingly, what emerged from the student testimonials was not in alignment with one of the main motivations for how the principal researcher designed the activities. Text messaging is frequently conducted on mobile devices and is often asynchronous, allowing texters to engage throughout the day according to their schedules. Given this flexibility, the principal researcher assumed that participants in the study would complete their homework tasks in a similar manner. However, student responses in the post-study questionnaire, and one exit survey, communicated an opposite approach to this homework assignment. One student in the WhatsApp group commented on the difficulty of coordinating with their language partners: "*Because I had two partners, it made it a little more difficult. I had to not coordinate with only one person, but two. We also did double the work. They were nice and understanding, but I felt annoyed sometimes.*" and "*Although, I think trying to coordinate long distance with other people was annoying and difficult. Sometimes my partners wouldn't reply for a while, and it made me anxious.*"

The word coordinate is an interesting choice, because it brings up the question of "what

are they coordinating?" and "Why aren't the students just texting each other as they normally would?". Some insight is offered by another student in the same group (Fall 2022 WhatsApp) who noted "*Because our schedules were limited and we weren't able to have instant back and forth conversations, my partner and I often coordinated our conversations beforehand to make them shorter and easier to understand. Therefore, we didn't have the full opportunity to work on our skills*." The principal researcher deliberately designed the task logistics to mirror a naturalistic texting experience, where users engage asynchronously at their convenience and in a relaxed manner. However, the nature of the task as a homework assignment may have influenced the students' approach. They might have felt the need to be fully present and complete the assignment in one sitting, similar to writing a paper or completing online homework.

The point about coordinating messages beforehand emerged during one exit interview. The interview is discussed in full in the next section, however it is interesting to note that in the Exit Interview which was conducted between the principal researcher and Participant 09 (WhatsApp, FQ22) the student mentioned that he and his partner had two separate chats set up, one in which they would plan out what they were going to say and the other one where they would actually carry out their planned conversation and turn that one in. Although instructors were trained to coach their students to focus on the process, not worry about the conversations being perfect, and just engage in a conversation which was as fluent as possible, there could be several reasons why students still felt the need to turn in a perfect conversation. For instance, students may be used to focusing on the end product of an assignment or may feel pressure and anxiety to not make mistakes in front of someone with a higher skill than you, such as an instructor.

5.4 Participant Exit Interviews

Although all twenty participants in the study were invited to participate in a post-study Exit Interview, only one student completed one. The interview was conducted via Zoom approximately one month after the end of the quarter and lasted approximately thirty minutes. Participant 09, a non-native speaker (NNS) of Spanish, had been studying Spanish formally for three years prior to the study, formed part of the WhatsApp group in Fall 2022. In the language background survey before the treatment, the participant reported sending approximately 11-20 messages on a typical weekday and 20-40 messages on a typical weekend day (Friday, Saturday, and Sunday). The participant also reported their main purpose for texting as *Social (keeping in contact with friends and family "letting people know you're there", general check-ins),* (with the other two options being Informative or Business).

In response to question #1, Participant 09 noted that at first the concept was kind of scary and the first week he didn't really know what "*I was getting into"*, but overall it was a mostly good experience, especially regarding getting conversation practice and "*when you don't know what's coming*". The latter comment referred to the idea of a semi-spontaneous conversation and the challenging nature of engaging in a non-scripted conversation. Participant 09 also commented that it would have been helpful, but annoying to practice on Zoom every other week.

When asked about preferences among the activities, Participant 09's comments indicated a preference for more conversational tasks, more personal topics, and more challenging games. He also said that Communication Activity 14.2 - *What piece of art?* which prompted the learners to select and guess pieces of art (images displayed on a Canvas page) , and the game-based/puzzle activities were more helpful than the writing or story activities, while the infographic exercise was good for practicing target vocabulary. As previously noted, the full list of Communication Activities is found in Appendix B.

A common aspect of TMC to emerge from the data collected in this study from all participants, as well as in several pilot studies, is getting to connect with another learner and forming a connection with them. Participant 09 noted that at first it was a little weird in the beginning of their communication, because they didn't really know each other, but "*having an opportunity to build a relationship with a partner in the class*" was really helpful and they became friendly and study buddies for the test. He also mentioned how they started checking in about non-CA related class items such as class assignments.

Question 5 "Did you notice any changes in your own WhatsApp communication with your language partner over the course of your communicative time together?" provoked an insightful discussion about the perceived development of language skills over the course of the quarter. The student commented that the texts he and his language partner were sending got longer over the quarter, and he suggested this may have been due to increased vocabulary and grammar knowledge, and that they were building from sentences to paragraphs. For instance, the participant specifically noted moving from "*5-6 word questions*", "*yes or no responses*", and "*small words*" at the beginning of the quarter, to more detailed utterances as the quarter progressed.

During the interview, the researcher and participant 09 also discussed technologies for language learning, and 09 noted that he liked to use Cerego[23] over tools like Quizlet or traditional flashcards because it "*makes you do it over a course of a few days*", and he sees that there is "*something about that more deeply drilled it and had to revisit it*". Although a learning application like Cerego and the language partners texting messaging via WhatsApp have somewhat different learning and experience objectives, the comment about extending the learning over several days aligns with both types of learning and something from which the

[23] https://www.cerego.com/

primary researcher was hoping that all students in the study would benefit.

In summary, the five prominent themes to emerge from the student questionnaire were 1) Opportunities to practice the Spanish language outside of class, 2) Opportunities to engage in the language in a low-stress, low-stakes environment, 3) Connections and community building with the language partner, 4) dyad interaction and motivation to learn, and 5) Task logistics and task design. It is promising to see that the first trend to emerge was the learners' appreciation to practice Spanish outside of the classroom. One reason to highlight this point relates to a question from the post-study questionnaire: How often did you practice your Spanish oral communication outside of class?. As briefly mentioned in Chapter 4, the majority of the study participants did not practice their oral communication outside of class very often. As table 32 shows, the majority of the participants (n=8) reported Not Often, while a low percentage reported A Bit. Although it is unclear whether students were considering the Communication Activities in their response, these activities did provide some additional practice. Without the development and integration of the CA, these responses might have been even lower.

Table 32. Student responses to how often they practice their oral communication, as taken from the post-study questionnaire.

	FQ22		WQ23	
	E	**C**	**E**	**C**
Never	-	-	-	-
Not often	8	2	-	-
A bit	2	1	3	2
Quite a bit	-	1	-	1
Very Often	1	-	-	-

In a future research study, it would be beneficial to ask this question both in the pre- and post-study questionnaire to see how this might have changed learners' efforts or available methods for out-of-class language practice.

The second overall theme is often reported as a motivator and potential reason for student success in language development because of the lower levels of stress and anxiety (Moneypenny & Aldrich, 2018)—a frequently cited affordance of technology in TELL research (Blake & Guillén, 2020; Ziegler & González-Lloret, 2022). This present study also gave insight into different modalities (WhatsApp or Zoom) as they relate to affective and motivational factors. Regardless of mode, it seems students are in agreement that they enjoy being able to decide on when and how to complete an assignment without the pressures of instructors or large groups being present.

Next, the *easy social connection and community building with the language partners* further demonstrated a significant trend that emerged during the pandemic: students need to feel connected to their classmates and instructor. This situation underscores how technology can actively support such connections. During the pandemic students consistently commented about the importance and value of feeling connected to their class and anecdotes, and blogs and research cited several approaches that instructors took to support this need, such as revised virtual Office Hours (or study hall), Discord servers, and opening online class early and/or starting later. Now, two years later, innovative thinking about how to strategically draw on effective teaching approaches, which were mandatory during the pandemic, can result in achieving the same goal of classroom community building, but just executed in a different way.

The fourth emergent trend emphasized how the interaction with partners and each individual's motivation to learn and complete the assignment influenced the overall experience. On one hand, the data show several instances of an overall positive experience if both partners are motivated to learn, consistently engaged with their partner, and actively attempt to have a meaningful interaction while completing the task. On the other hand, the reactions of the students made it clear that if the partner did not actively and consistently participate in the conversation

nor put effort into the experience, this negatively affected the whole experience. Unfortunately, a negative experience due to a partner's lack of motivation and effort could negatively affect how a learner approaches innovative learning activities in the future, including dynamics (e.g. outside of class), modality (e.g. mobile devices, text messaging, or Zoom), and classmate collaboration.

The influence that *task logistics and task design* had on the experience was the fifth trend to emerge from student experience data. It seems that once students in the present study got used to the activity protocols—such as setting up a recurring time to complete the task with the partner, exchanging phone numbers, or learning how to record and submit a Zoom recording link—they got in the flow of the activity and everything became easier throughout the quarter. Additionally, the design of the task, such as prompts, instructions, and what the learners are asked to do with the langage, strongly affected both how the learners experience the activity (and the language behavior which is a result of the task, such as taking turns). Learners seemed to enjoy the tasks that were more game-based or more challenging. Additionally, the modality for tasks seemed to play a huge role in terms of enjoyment and effectiveness. For example, the WhatsApp group suggested different tasks which would be more relevant to ones you would carry out via text messaging, perhaps based more on your daily life and real world activities. While the Zoom group preferred different tasks over others, they did not seem too bothered by the homework-style prompt. Perhaps this is due to their experience with engaging in similar homework assignments via Zoom during the pandemic. A further discussion of these five findings is presented in Chapter 6.

5.5 Case studies

After carefully examining the objective data produced by the participants, including total words, unique words, speech rate, and raters' perceived fluency and percentage of

comprehension impeded, and a thorough exploration of the study's participants' Communication Activity transcripts, the following five participants were selected to be represented as case studies. The purpose of providing a more detailed look at these selected participants is to highlight some individual experiences. The following student profiles were selected based on unique characteristics in their contributions and salient points in the study, such as losses or gains, engagement in conversation, turn taking, and diversity in the study's participant group. To support the process of selecting which participants to highlight, graphs were created for the five dependent variables to view individual participants' specific behavior in regards to losses, gains, or general patterns. These complete graphs are found in Appendix I.

Participant 02 - WhatsApp Fall 2022

Participant 02 was a male student in the WhatsApp group Fall 2022. 02 was a non-native speaker of Spanish, an L2 learner, and had been studying Spanish formally for three years. This participant reported English as their dominant language, and had not studied any other languages formally. For both the pre- and post-treatment questionnaires this student self-reported their level of proficiency[24] on the ACTFL scale as Intermediate. Participant 02 had been using a smartphone for 6 years, and at the time of completing this study was utilizing an iPhone. Regarding text message behavior, 02 reported sending 20-40 messages on a typical weekday (M-F) and 20-40 on a typical weekend day. iMessage was their primary source of cell phone messaging, reported using predictive text *sometimes* and for their primary purpose of messaging was *Social (keeping in contact with friends and family "letting people know you're there", general check-ins)*.

[24] https://www.actfl.org/educator-resources/actfl-proficiency-guidelines/spanish/comunicaci%C3%B3n-oral

Table 33. Participant 02 numerical data for dependent variable count (on average).

Total words (average)		Unique words (average)		Speech rate (words per sec (average)		Raters fluency (average) 1-7*		Raters % of comprehension impeded (average) *1-10	
pre	**post**	**pre**	**post**	**pre**	**post**	**pre**	**post**	**pre**	**post**
232.5	161	119.5	115	1.02	1.36	3.5	4.75	2	1.25

Table 33 shows a decline in both total words (-71.5) and unique words (-4.5) produced between the pre and post audio recordings. Interestingly, these data are followed by an increase in speech rate (words per second) (+0.34). The increased speech rate may be a product of increased confidence and the decline in unique and total words may be due to increased metalinguistic awareness. This heighted metalinguistic awareness may provoke increased modification of the learner's own output, such as self-correction and/or applying target language norms (Mitchell et. al., 2013, p. 43). The behavior of modifying output as a result of consciously learning language forms is part of Krashen's Monitor Hypothesis (pp. 42-43), an early claim of second language acquisition research. Additionally, the student may have improved their linguistic accuracy over the course of the quarter, and filtering through their new knowledge as they produce oral language may result in fewer produced words, but potentially improved accuracy. Although accuracy assessment measures were not collected in this study, this would warrant further research. Similarly, the raters perceived gains in this participant's fluency (+1.25), as well as an increase in the participant's comprehension (+0.75). Participant 02's Communication Activities, carried out via WhatsApp, showed an average turn taking of 6.38 turns per conversation, and a review of their actual conversations revealed a balanced back and forth of turns with their language partner.

Interestingly enough, participant 02 did not appear to find the WhatsApp modality for the CA to be the most useful, reporting that he somewhat agreed in regards to the usefulness, and felt

that "*the WhatsApp assignments felt tedious or like they weren't actually helping me understand the unit"*. Having said that, this participant seemed to thoroughly enjoy the engagement with their language partner, reporting that the interaction between them was *very pleasant* and *rather useful*. He specifically mentioned that they became really good friends and really enjoyed working with his partner. Participant 02 also left insightful comments about how their complimentary skills helped them improve their language skills: "*I definitely feel like we both happened to have different strong suits with Spanish. I pick up vocabulary very well but she was way better at conjugations. This dynamic definitely helped me improve*." Additionally, 02 ranked writing as the perceived most developed skill and speaking as the least developed. Moreover, the gains in speech rate and raters' perceived fluency contrasts with the participant's own perception which is demonstrated in table 33.

Additional observations of the language used within the WhatsApp conversations showed a very streamlined and content-focused approach to the discussion. Participant 02 and his language partner stayed very much on task with the target language and task and the dialogue did not deviate from discussing the task, and resulted in very little fillers, conversation breakdowns or error repair. Figure 32 shows two different WhatsApp dialogues between Participant 02 and his language partner, which represent the general style and flow of conversation found in all their CA.

Figure 32. Selections of WhatsApp dialogues produced by Participant 02.

11.2 *Choosing an outfit*	14.2 *What piece of art?*
[10/6/22, 3:54:25 PM] Estudiante 2: ¡Hola 02! ¿Tienes tiempo para la tarea? [10/6/22, 4:00:53 PM] 02: ¡Hola Estudiante 2! ¡Sí! ¿Sabes de la boda a la que va a Instructora 9 este fin	[11/17/22, 1:41:57 PM] 02: ¡Hola, Estudiante 2! ¿Tienes tiempo para una discusión sobre arte? [11/17/22, 1:43:02 PM] 02: Tengo una pintura favorita, ¿puedes adivinar cuál es?

de semana?
[10/6/22, 4:02:28 PM] Estudiante 2: Sí, necesitamos crear el traje perfecto para ella.
[10/6/22, 4:03:32 PM] 02: ¡Estoy de acuerdo! Para una boda un vestido siempre es una buena idea para un conjunto
[10/6/22, 4:03:55 PM] 02: ¿Cuál te gusta?
[10/6/22, 4:05:30 PM] Estudiante 2: Si, estoy de acuerdo. Creo que sería bueno si ella usara un vestido largo y verde. ¿tal vez con un patrón?
[10/6/22, 4:06:36 PM] Estudiante 2: ¿Qué tipo de zapatos y accesorios debe llevar?
[10/6/22, 4:17:43 PM] 02: ¡Tacones por supuesto! Estoy pensando que los zapatos blancos son bien.
[10/6/22, 4:18:44 PM] 02: ¿Y accesorios? La boda está al aire libre así que las gafas de sol con estilo son necesarias
[10/6/22, 4:19:37 PM] 02: ¿Cómo crees que deberán ver?
[10/6/22, 4:51:32 PM] Estudiante 2: Estoy de acuerdo con todas estas opciones
[10/6/22, 4:53:27 PM] 02: ¿Qué color estas pensando para las gafas de sol?
[10/6/22, 4:56:00 PM] Estudiante 2: Creo que las gafas de sol blancas serían perfectas. Luego igualarían los tacones.
[10/6/22, 4:57:15 PM] 02: ¡Sí! Creo que Instructora 9 está listo para la boda
[10/6/22, 4:58:40 PM] Estudiante 2: Estoy de acuerdo

[11/17/22, 2:05:44 PM] Estudiante 2: Creo que la pintura que elegiste tiene mucho color, ¿verdad?
[11/17/22, 2:07:47 PM] 02: Sí pero son todos de colores similares.
[11/17/22, 2:09:18 PM] Estudiante 2: ¿Es un mural?
[11/17/22, 2:10:32 PM] 02: No, no es un mural. Es una pintura impresionista.
[11/17/22, 2:12:58 PM] Estudiante 2: Que interesante
[11/17/22, 2:13:37 PM] Estudiante 2: ¿es viejo o nuevo?
[11/17/22, 2:14:28 PM] 02: Es viejo y de France.
[11/17/22, 2:15:00 PM] Estudiante 2: Creo que as “The Starry Night” de Vincent Van Gogh
[11/17/22, 2:15:33 PM] 02: ¡Sí! Es “Starry Night”
[11/17/22, 2:16:06 PM] 02: ¿Y usted? ¿Cuál es tu pintura favorita?
[11/17/22, 2:16:28 PM] 02: ¿Tiene mucho color?
[11/17/22, 2:17:16 PM] Estudiante 2: Mi pintura favorita tiene mucho color y mucho detalles
[11/17/22, 2:17:53 PM] 02: Hmmmm ¿Cuál es el estilo de arte?
[11/17/22, 2:19:36 PM] Estudiante 2: Es un mural
[11/17/22, 2:19:56 PM] 02: ¡Interesante!
[11/17/22, 2:20:14 PM] 02: ¿De donde es el artista?
[11/17/22, 2:20:43 PM] Estudiante 2: El es de mexico
[11/17/22, 2:21:40 PM] 02: ¿Es "La Historia de México" de Diego Rivera?
[11/17/22, 2:22:15 PM] Estudiante 2: ¡Si!
[11/17/22, 2:22:22 PM] 02: ¡Me encanta ese mural! Diego Rivera era un artista muy talentoso.
[11/17/22, 2:23:24 PM] Estudiante 2: Estoy de acuerdo, me gusta su arte mucho

A review of Participant 02's WhatsApp dialogues revealed that not only did this pair take part in equal turn taking, but they also took turns politely opening the text conversation asking each other if they had time to chat or time to do the activity. This could be inferred as an example of their mutual respect for each other and consistent communication practices. Turn-taking, mutual respect, and commitment to the activities support learner motivation and partner choice, even if individual activities were not always seen as beneficial.

Participant 02's numerical data indicates a decline in total and unique words, but an increase in speech rate; and raters observed improved fluency, but a decrease in comprehension impeded. These findings may point to an increase in confidence as demonstrated through an increased speed of speech, and perhaps more awareness of language use as the participant was more careful with the words they intentionally chose to produce. Further, the participant's balanced turn taking in the Communication Activities and high engagement with their language partner may have benefitted the learner in terms of more practice and motivation for using the language, even if they did not find the activities themselves to be very useful.

Participant 07 - WhatsApp Fall 2022

Participant 07 was a female student in the WhatsApp group Fall 2022. 07 was a non-native speaker of Spanish, an L2 learner, and had been studying Spanish formally for four years. This participant reported English as her dominant language, as well as not studying any other languages formally. For both the pre- and post-treatment questionnaires this student self-reported their ACTFL proficiency[25] level as Novice. Participant 07 had been using a smartphone for approximately 9 years, and at the time of completing this study was utilizing an iPhone. Regarding text message behavior, 07 reported sending 20-40 messages on a typical weekday

[25] https://www.actfl.org/educator-resources/actfl-proficiency-guidelines/spanish/comunicaci%C3%B3n-oral

(M-F) and 20-40 on a typical weekend day. Instagram was their primary source of cell phone messaging, reported using predictive text *sometimes* and for their primary purpose of messaging was *Social (keeping in contact with friends and family "letting people know you're there", general check-ins)*.

Table 34. Participant 07 numerical data for dependent variable count (on average).

Total words (average)		**Unique words (average)**		**Speech rate (words per sec (average)**		**Raters fluency (average) 1-7***		**Raters % of comprehension impeded (average) *1-10**	
pre	**post**	**pre**	**post**	**pre**	**post**	**pre**	**post**	**pre**	**post**
168	150	65	71	0.76	0.78	2.38	2.7	1.88	3

Table 34 shows a decline in both total words (-63) produced and an increase in unique words (+6) between the pre and post audio recordings. There is a minute increase in speech rate (words per second) (+0.02). Similarly, the raters perceived slight gains in this participant's fluency (+0.32), however the raters also perceived a decline in the participant's comprehension (-1.12). Their average turn taking for the Communication Activities, completed via WhatsApp, was 17.63 turns per conversation. Participant 07 was in a group of three, which may have resulted in the higher number of turns than the other participants highlighted in these case studies. Being a part of a three person group greatly impacted the participant's experience with the CA, especially in regards to their partner interaction.

Slightly contrasting with Participant 02's summary above, Participant 07 seemed to enjoy and find value in the activities, however their language partner connections and logistics seemed to impact their experience in a negative way: "*The activities went okay. I think it was useful to practice texting in Spanish with other people. Any writing practice is helpful. And I found most of the prompts straightforward and interesting. Although, I think trying to coordinate long distance with other people was annoying and difficult. Sometimes my partners wouldn't reply for awhile,*

and it made me anxious. I think a listening or speaking activity could be more useful. I mostly did reading and writing, which I already get a lot of practice at." Even though 07 reported the usefulness of the activities as *somewhat useful*, when asked about her language partner experience she reported *average* regarding the pleasantness and *Neither useful nor unuseful* regarding interacting with her language partners. 07 also reported that having two partners made it more difficult to coordinate the logistics of the activity and she felt they also did double the work. This participant also commented that inconsistency with partner replies made the conversation less natural and as a result, "*maybe things were lost in translation*." 07 closed her comment by mentioning that a speaking-focused activity may have been more advantageous: "*I think more speaking activities would be helpful. Although partner speaking activities in class are helpful, sometimes it can be hard to speak up. Maybe more at home activities would be helpful.*" This was not the only WhatsApp study participant to suggest a preference for more speaking activities, as is discussed below with Participant 09 who also shared a similar sentiment about wanting more speaking practice. Participant 07's observation that the class already gets a lot of practice reading and writing is corroborated by Instructor #1, who taught both with WhatsApp and Zoom and during her Exit Interview shared that one reason she would prefer to teach in the Zoom group is to offer more variety in skill practice and development to the students.

In the following dialogues evidence of the group arranging a time to complete the activities is present, which, as noted previously, was something the researcher did not expect. It is conjectured that even though the modality of text messaging is considered informal dialogue, the fact that students were using it for homework perhaps maybe made them treat the experience as more formal, and engage in the same behavior as they would for other school assignments, such as sitting down in a fixed time and place to complete it in one sitting.

Figure 33. Samples from Participant 07's dialogues with their 2 language partners.

12.1 Ecotourism practices	12.2 Past experiences
[10/11/22, 9:58:48 PM] 07: ¿Leen la lista de ecoturismo en Canvas? [10/11/22, 10:57:00 PM] 07: Okay… ¿Quieren empezar mañana? 😭😭 [10/11/22, 11:01:25 PM] Estudiante 3: ¿Quien hace bien ecotourismo? [10/11/22, 11:06:34 PM] Estudiante 2: lo siento me estoy quedando dormir [10/11/22, 11:06:41 PM] Estudiante 2: 😴 [10/11/22, 11:08:01 PM] 07: No sé, pero los parques nationales tienen muchos reglas. [10/11/22, 11:08:37 PM] 07: Está bien [10/11/22, 11:11:28 PM] Estudiante 3: No problema [10/11/22, 11:13:38 PM] 07: En la lista, un ecoturismo del presente es "beneficiar a comunidades nativas", pero creo que a beneficiar a comunidades nativas necesitamos no ecoturismo o sus opinónes. Es sus tierra. [10/11/22, 11:14:24 PM] 07: ¿Qué crees? [10/11/22, 11:18:19 PM] 07: Y sé mucho lugares no protegen la tierra pero dicen hacer, como deforestación (even en los parques nationales!) [10/11/22, 11:19:10 PM] 07: So, no creo que el ecoturismo es más popular hoy [10/11/22, 11:20:40 PM] Estudiante 3: Creo que es mas importante protégar el medioambiente [10/11/22, 11:21:58 PM] 07: Si. Y ¿Qué crees sobre mi textos? [10/11/22, 11:23:07 PM] 07: Sin medioambiente sano, no nosotros 🤯🤯 [10/11/22, 11:24:15 PM] Estudiante 3: Tu textos tiene muchos puntos buenos. [10/11/22, 11:24:38 PM] 07: Gracias 😭😭 [10/11/22, 11:25:07 PM] 07: ¿Tienes opiniónes? [10/11/22, 11:33:53 PM] Estudiante 3:	10/19/22, 12:24 PM - 07: ¿Cuándo estás libre para la tarea? 10/19/22, 12:34 PM - Estudiante 2: estoy en clase ahora, pero después 1:30, soy libre 10/19/22, 5:05 PM - 07: ¡¡Pérdon!! 10/19/22, 5:06 PM - 07: Me olvidó a responder!!! 10/19/22, 5:07 PM - 07: Estoy libre ahora (until noche) 10/19/22, 6:39 PM - Estudiante 2: Estudiante 3? 10/19/22, 8:18 PM - 07: ¿Quién puede empezar para el guessing juego? 10/19/22, 8:21 PM - Estudiante 3: ¿Listos? 10/19/22, 8:21 PM - 07: Sí, y ¿quieres empezar? 10/19/22, 8:22 PM - Estudiante 2: Sí 10/19/22, 8:23 PM - Estudiante 2: puedo ir primero 10/19/22, 8:24 PM - 07: ¡Bien! 10/19/22, 8:24 PM - Estudiante 3: Sí 10/19/22, 8:25 PM - 07: ¿Dónde hacías la actividad? 10/19/22, 8:26 PM - Estudiante 2: en una rancho 10/19/22, 8:28 PM - 07: Hmmm… 10/19/22, 8:28 PM - Estudiante 3: ¿Con quíen hacías la actividad? 10/19/22, 8:29 PM - Estudiante 2: un Caballo 10/19/22, 8:33 PM - 07: ¿Cómo te sentías cuando hacías la actividad? 10/19/22, 8:33 PM - 07: Creo que caballos son personas también 10/19/22, 8:34 PM - 07: JAJAJA (pérdon) 10/19/22, 8:37 PM - Estudiante 2: JAJAJA 10/19/22, 8:38 PM - Estudiante 3: 🤣 10/19/22, 8:39 PM - Estudiante 2: muchas divertirdo, me encanta los caballos pero me dolía a veces 10/19/22, 8:41 PM - 07: Awww 10/19/22, 8:42 PM - 07: ¿A qué hora

Otro punto importante es buena para enseñar la conciencia ambiental sobre la vacacion. [10/11/22, 11:34:44 PM] 07: ¿Qué es? [10/12/22, 12:02:53 AM] Estudiante 3: Cuando tu ibas explorías una cueva, es bueno aprendías sobre la especie de la cueva. [10/12/22, 12:04:24 AM] 07: Sí [10/12/22, 12:04:36 AM] Estudiante 3: Algunos lugares hacen estos. [10/12/22, 12:06:29 AM] 07: Cierto [10/12/22, 12:06:43 AM] 07: Pero, ¿Crees que sobre la lista? [10/12/22, 12:09:57 AM] 07: ¿Es una practicá? Sí, necesits aprendar la naturaleza antes de exploras [10/12/22, 12:10:04 AM] 07: necesitas* [10/12/22, 12:11:08 AM] 07: Es importante para la conservación de la naturaleza [10/12/22, 12:12:13 AM] Estudiante 3: Sí [10/12/22, 12:18:42 AM] 07: Sí! También, alguna vez personas en una comunidad cuidan el medioambiente con jardines.	hacías la actividad? 10/19/22, 8:43 PM - Estudiante 2: siempre en la mañana 10/19/22, 8:48 PM - Estudiante 3: ¿Tú crees el paisaje eras hermoso? 10/19/22, 8:50 PM - Estudiante 2: sí creo que el paisaje muy bonito 10/19/22, 8:50 PM - 07: Y, ¿Puedes describir el paisaje? 10/19/22, 8:52 PM - Estudiante 2: había lagos y montañas y muchas árboles y el aire era fresco 10/19/22, 8:55 PM - 07: Ooo imagino que era hermoso 10/19/22, 8:55 PM - 07: Tengo un guess 10/19/22, 8:55 PM - Estudiante 3: Si 10/19/22, 8:56 PM - 07: ¿Montabas a caballo? 10/19/22, 9:01 PM - Estudiante 2: SÍÍÍÍ 10/19/22, 9:04 PM - 07: ¡Yay!

Participant 07 showed an increase in unique words, speech rate, and raters' perceived fluency over the 10-week study, which also may indicate an increase in confidence and perhaps gains in vocabulary. Although total words showed a slight decline, as did raters' perceived comprehension impeded. A decline in total words could be observed as both a gain or a loss, due to discourse markers and fillers like *um* and *uh* being counted as individual words, so it may be that the decline in total words for Participant 07 was actually representative of more intentional and specific speech.

Participant 07 also reported finding the tasks engaging and interesting, although her experience being in a group of three was frustrating and she felt like they did extra work. An analysis of the dialogues produced by this participant showed that this participant often carried

the conversation and made efforts to keep producing Spanish and get through the task. This additional effort on her part may have also resulted in more linguistic production and more confidence, although it could also be one of the reasons for her frustration.

Participant 09 - WhatsApp Fall 2022

Participant 09 was a male student in the WhatsApp group Fall 2022. 09 was a non-native speaker of Spanish, an L2 learner, and had been studying Spanish formally for three years. This participant reported English as their dominant language, as well as not studying any other languages formally. For both the pre- and post-treatment questionnaires this student self-reported their level of proficiency[26] on the ACTFL scale as Novice. Participant 09 had been using a smartphone for 8 years, and at the time of completing this study was utilizing an iPhone. Regarding text message behavior, 09 reported sending 11-20 messages on a typical weekday (M-F) and 20-40 on a typical weekend day. iMessage was 09's primary source of cell phone messaging, he reported using predictive text *sometimes* and their primary purpose of messaging was *Social (keeping in contact with friends and family "letting people know you're there", general check-ins)*.

Table 35. Participant 09 numerical data for dependent variable count (on average).

Total words (average)		**Unique words (average)**		**Speech rate (words per sec (average)**		**Raters fluency (average) 1-7***		**Raters % of comprehension impeded (average) *1-10**	
pre	**post**	**pre**	**post**	**pre**	**post**	**pre**	**post**	**pre**	**post**
283.5	183.5	87.5	85.5	1.03	0.97	3.5	3.19	4.25	2.33

Table 35 above shows a decrease in Participant 09's total words (-100), unique words (-2), speech rate (words per second) (-0.06)), and raters' perceived fluency (-0.31), although the

[26] https://www.actfl.org/educator-resources/actfl-proficiency-guidelines/spanish/comunicaci%C3%B3n-oral

raters' perceived comprehension score showed gains of (1.92). The difference in total words between the pre- and post-measurements is rather striking. To explore further, the time duration of the audio pre and post audio recordings was compared and does not seem to explain this difference as the recording time does not vary too much between pre and post: audio_1_pre (4:04), audio_2_pre (3:37), audio_1_post (4:11), audio_2_post (3:29). As suggested previously, this striking decline in total words, could be the participant may be using less filler words like *um* and *uh*.

Testimonials from Participant 09 also support the notion that the partner connection and level of engagement with the partner can greatly impact the experience, regardless of how the users feel about a task, in this case the Communication Activities. For example, Participant 09 rated the usefulness of the Communication Activities as "somewhat agree", noting that he liked the prompts because "*they were just challenging enough to make me think about my answers while not being completely out of reach*" and the aspect of the spontaneous nature of the CA was also enjoyed by the participant, noting that "*The aspect of not knowing how my partner was going to respond added to the challenge*." Although the student also commented how scheduling differences impacted the experience, noting that "*It was not the most practical activity as me and my partner worked on different schedules.*" Again the theme of pre-scheduling the text messaging homework is present here and was not something the principal researcher initially anticipated. Similarly, Participant 09 rated the usefulness of the activities as *Slightly Unuseful* and followed this opinion by sharing that "*Because our schedules were limited and we weren't able to have instant back and forth conversations, my partner and I often coordinated our conversations beforehand to make them shorter and easier to understand. Therefore, we didn't have the full opportunity to work on our skills.*" During the Exit Interview, the student noted that he and his language partner had two separate WhatsApp conversations going, one where they

would discuss and plan about what they would write in their conversation to turn in, and then turn in the more polished version. Aside from the hindrances mentioned about the CA, Participant 09 ranked his partner experience as *Very Pleasant*, and stated that "*I had a partner who was willing to put in a similar amount of work as I was and was very cooperative.*" Finally, to close out the post-experience questionnaire the participant noted that they would have liked "*More speaking practice, for instance during class time, would have been helpful as this skill was not developed in the homework activities and rarely done in class, especially considering that the final is oral-based*." Although all instructors in this course followed the same curriculum, instructor differences among the groups in the study most likely impacted the overall experience of the participants in different ways.

Figure 34. Samples from Participant 09's dialogues with their language partner.

11.2 Choosing an outfit	12.2 Past experiences
[10/6/22, 5:17:32 PM] 09: ¡Hola Estudiante 2! Quiero invitar Instructora 2 a un fiesta con el tema "emo." ¿Que conjunto va a llevarla? [10/6/22, 5:23:40 PM] 09: Para empezar, busca por zapatos van a seguir el tema. ¿Que sobre los zapatos de tacón negras? Van a destacarla su pies con un color arriesgado. [10/6/22, 5:39:04 PM] Estudiante 2: Buena idea! Necesito todas sus ropas negras para un emo estilo. [10/6/22, 5:44:58 PM] Estudiante 2: Para el traje, pienso lleva vaqueros rotos negros y un top corto con el estampado de la banda KISS! Ellos muy emo tambien! [10/6/22, 5:46:40 PM] Estudiante 2: Qué accesorios es bien completar el traje? [10/6/22, 6:47:08 PM] 09: ¡Me encanta su idea! Un conjunto solo negro con la camiseta de KISS, los vaqueros, y los zapatos de tacón es una fuega	[11/10/22, 3:03:24 PM] 09: ¡Estamos teniendo un tiempo fantástico con nuestro familia anfitriona aquí en Espana! ¿Qué tipos de arte crees son más populares en España? [11/10/22, 3:03:25 PM] 09: Creo que el arte moderno es muy popular en España. Fui al museo Guggenheim en Bilbao que tenía muchas obras de arte moderno, como un escultura por Jeff Koons y un cuadro por el artista Andy Warhol. [11/10/22, 3:17:23 PM] Estudiante 2: Creo que las pinturas en los museos de España está el mejor forma de arte en todo del país. Por ejemplo Geurnica en el Museo Reina Sofía está el mas famoso pintura de la guerra civil española. [11/10/22, 3:19:56 PM] Estudiante 2: Es muy diferente en mi país. En los Estados Unidos el forma de art mas populares está la musica y la filmografía. Los Angelos está el mejor cuidad en todo del mundo para

mira. [10/6/22, 7:37:35 PM] 09: ¿Para los accesorios, que sobre una pulsera con "spikes"? Con un bolsa con negras rayas, va a estarla arreglado bien. [10/6/22, 7:38:36 PM] 09: ¿Te gusta este conjunto por Instructora 2? ¡La fiesta voy a ser fantastico! [10/6/22, 8:19:22 PM] Estudiante 2: me gusta tu pulsera y bolso ideas. Me gusta todo esta conjunto! Instructora 2 se vera bien a la fiesta!	el trabajo de musicós y actors también. [11/10/22, 3:20:45 PM] Estudiante 2: ¿Qué arte es una "visita obligada" en España? [11/10/22, 3:37:09 PM] 09: Sí, arte historico es grande en España y Europa en general. En España, las obras de Diego Velásquez es "visita obligada." Fue un pintor que creó pinturas en el estilo Baroque. Los collecionistas encantan sus retratos de reyes y más, y su obra maestra "Las Meninas" está en Madrid. [11/10/22, 3:40:17 PM] 09: En el EEUU, filmografía es muy importante, sí. ¡En Los Ángeles, el museo de el Academy se inauguró el año pasado! Tiene diseños originales por "sets" y "costumes" de las películas muy detallado.

Participant 09 showed a decline in all variables of total words, unique words, speech rate, and raters' perceived fluency. However, the raters' perceived comprehension impeded decreased slightly. The decline in total words was rather substantial, although the variable unique words was only an average decline of -2. Similar to the above case study, the decline of total words may be seen in a positive light due to potentially less fillers and more intentional speech. Although a further analysis of actual words used in the speech sample would need to be performed to provide evidence for this conjecture. A decline in speech rate and perceived fluency may be due to the learner's increased awareness of their linguistic production, prompting them to be more careful in their speech. Although not executed for this present study, a pre- and post- analysis of accuracy in the speech samples, such as grammatical and lexical accuracy, could provide helpful insight into any gains or losses in accuracy to potentially explain the declines. Further, the two separate WhatsApp chats that Participant 09 and his partner had may have actually provided them with additional language practice and increased exposure to the target language, which

could have added to their metalinguistic awareness. An analysis of the Communication Activities dialogues showed a balanced turn taking as well as similar balanced level of engagement. This motivation, strong partner connection, and engagement with the content points towards an overall positive experience for this participant.

Participant 14 - Zoom Fall 2022

Participant 14 was a male student in the Zoom group Fall 2022. 14 was a non-native speaker of Spanish, an L2 learner, and had been studying Spanish formally for seven years. This participant reported English as their dominant language and had studied Hebrew for five years in primary school. For both the pre- and post-treatment questionnaires this student self-reported their proficiency[27] level on the ACTFL scale as Intermediate. Participant 14 had been using a smartphone for 11 years, and at the time of completing this study was utilizing an iPhone. Regarding text message behavior, 14 reported sending 20-40 messages on a typical weekday (M-F) and 20-40 on a typical weekend day. iMessage was their primary source of cell phone messaging, reported using predictive text *yes (often)* and their primary purpose of messaging was *Informative (information gathering such as seeking times of events, what to bring to a party, etc.)*.

Table 36. Participant 14 numerical data for dependent variable count (on average).

Total words (average)		**Unique words (average)**		**Speech rate (words per sec (average)**		**Raters fluency (average) 1-7***		**Raters % of comprehension impeded (average) *1-10**	
pre	**post**	**pre**	**post**	**pre**	**post**	**pre**	**post**	**pre**	**post**
213.5	157	94	87	1.21	0.79	4.35	2.67	1.8	3

Participant 14 (who completed the CA via Zoom) seemed to have an overall very pleasant

[27] https://www.actfl.org/educator-resources/actfl-proficiency-guidelines/spanish/comunicaci%C3%B3n-oral

experience with the Communication Activities. First, he ranked *Strongly Agree* regarding the usefulness of the CA and commented that "*The activities were fun and gave a space for me to just practice my conversational Spanish. I practiced speaking and reading the most.*" Participant 09 also ranked the CA as *Rather Useful* and indicated the shared level of language skills as a potential contributor to that ranking: "*We were at pretty similar speaking levels which allowed us to practice and help each other. No one was outpacing one another.*" This participant also gave credit to the effort of both himself and his partner of why he ranked his interaction with his language partner as *Very Pleasant*: "*My partner and I were both willing to try on the speaking activities making them a pleasant experience*."

Figure 35. Samples from Participant 09's dialogue[28] with their language partner.

11.2 Choosing an outfit	
14: Es mejor 14:Alright so, now it's recording OK hola ok por nuestro podcast necesitamos empezar posible con pocos chistosos sí Estudiante 2: Mm-mmm 14:no más Estudiante 2: [laugh] y 14:You froze for me for a second 14:Oh, you're still frozen, ooo, it's me, audio [unintelligible]. Something froze. 14: Okayyyyy Estudiante 2: Hello? 14:Oh, okay sorry 14:Okay 14: lo siento estoy aquí estoy aquí aquí lo que	Estudiante 2: mmm-mmm 14: estos profesores Estudiante 2: y también los profesores de la profesora en inglés tiene mucho um joría joyas 14: Yyy si uh colores también Estudiante 2: y a veces tiene lentes o gafas 14: sí sí gafas grandes Sí Estudiante 2:[laugh] ah uh okay esos son los profesores en inglés y ya hablamos sobre los matemáticas 14: K Estudiante 2:Quiere otro especialización que quieres hablar 14: Uhhh no sé posible las o los

[28] Written dialogues from participants in the Zoom group are speech-to-text transcriptions carried out by the principal researcher.

Estudiante 2: Okay, okay, sí los chistosos y también necesitamos umm necesitamos uh incluar los hombres y mujeres 14: sí sí es importante y también uh necesitamos introducir el tópico de nuestro podcast Estudiante 2: Uh-huh 14: Que- Estudiante 2: que es tópico que es 14: es los s conjuntos de los profesores sí Estudiante 2: y los profesores van a van a los profesores 14: ¿quieres los profesores en nuestro podcast? no no necesitamos ellos estár en nuestro podcast sólo hablamos sobre ellos Estudiante 2: que si quieres podemos preguntar otra estudiantes 14: o es bueno me gusta esta idea okay okay y entonces como primero uh hablamos sobre profesores de matemáticas Estudiante 2: mmm-mhm necesitamos con cinco tipo de profesores 14: sí sí a la menos 5 profesores Estudiante 2: Cinco 14: y Estudiante 2: entonces matematicas 14: Si profesores de matemáticas Estudiante 2: cómo estás matemáticas 14: Sí	profesores de español o otro lengua las profesores de las lenguas sí Estudiante 2: Sí 14: ellos tienen los conjuntos mejores en mi opinión Estudiante 2: Mmm mmm todos tienen mucho orgulloso como pride I think that's pride orgulloso 14: sí sí sí Estudiante 2:Um se pone su conjuntos tienen mucho colores 14: muchos colores sí sí like sus conjuntes están en la moda you know like su estilo es muy popular no sé y Estudiante 2:Sí 14: Y podemos incluir fotos o dibujos de profesores con nuestro podcast durante este sección pero no sé Estudiante 2:pode- pode- podemos usar fotos, pero since it's a podcast los 14: Yea Estudiante 2:Mmm la gente no va a ver los fotos fotos 14: va a ser difícil para Estudiante 2:nosotros vamos a risky sí podemos pero podemos para nosotros 14: sí Estudiante 2: Para para verlo y describir en el podcast 14: Es bueno es bueno me gusta esta idea Estudiante 2:Mmm-mmm

Estudiante 2: quieres hacer historia sí qué es la número 3 a la 14: Uh la profesoras de química o con otras ciencias una otra ciencia Estudiante 2: ¿Química? 14: sí química chemistry Estudiante 2: OK uh ok ok [unintelligible] 14: Sí en mi experiencia todos estos profesores um todavísta ellos llevan los conjuntos más formales well like un camisa con una corbata unas veces un chaqueta sí no sé Estudiante 2: Personalmente yo yo mira los profesoras más formal de los profesores porque en mi clases de matemáticas hay mucho profesores que usos sus camisa camisetas son holgados 14: o sí OK Estudiante 2: no, está informal 14: ah estás de acuerdo estás de acuerdo y también uh podemos hablar sobre las profesores de inglés. ellos en mí opinión son los profesores más raros en sus conjuntes like puede estar algo no sé alguno día Estudiante 2: uh-huh 14: Como un vestida y un traje otro día que no muy raro	14:y al final del podcast I mean no sé uh que necesit que quieres para el final como like la final Estudiante 2: Ummmm final uh podemos dejar la dejar con un pregunta con un pregunta 14: Sí Estudiante 2: Una pregunta 14: Sí Estudiante 2: y a qué especialización qué tipo de profesor tiene los um como se dice conjuntos 14:sí conjuntos mejores Estudiante 2: mejores 14: sí para para el primer podcast no el primero uh olvidé la palabra el next podcast Estudiante 2: Uh huh 14: El próximo podcast Estudiante 2: Uh huh 14: Y si decimos adiós pensamos que estamos bien Estudiante 2: Mmm mmm 14: okay Estudiante 2: sí 14: bueno Estudiante 2: bueno 14: OK

Throughout the entirety of the quarter Participant 14 and his language partner maintained this

sense of semi spontaneous conversation, relying little on their notes and more on each other and their own linguistic resources to overcome breakdowns in communication or move forward in conversation. Figure 36 below shows a snippet from another CA which ruther represents this reliance on each other to continue the conversation, exemplifying a less scripted conversation.

Figure 36. Snippet of dialogue 11.2 between Participant 14 and their language partner.

```
Estudiante 2: también con para la baile
14: sí también. Si ella quiere bailar, no puede you know llevar como tacones
altos. Like necesitas necesita zapatos, zapatos,
Estudiante 2:  zapatos ¿cómodos?
14: Yea, zapatos cómodos, sí comodos ya es bueno uh…¿un vestido?
Estudiante 2:  ¿y mucha joyería?
14: O sí, sí, sí, joyas
Estudiante 2: joyas, joyas,
14: joyas, sí, aretes y un collar como hace bueno. También uh necesita un
una bolsa un bolso.
Estudiante 2: un bolso
14:: Como su teléfono y los otros cosas.
Estudiante 2:  Mhm-mm.
```

Participant 14 was one of the only participants in the study to show a decline in all variables: total and unique words, speech rate, and rater's perceived fluency and comprehension impeded. Again, a comparison of grammatical and lexical accuracy would add insight to these findings, although this was not performed for this study. This participant enjoyed the activities, and as observed in their weekly Communication Activities made a lot of effort to utilize their own linguistic resources and engage in creative and unscripted conversations with his language partner. The fact that this participant had previous formal training in another language may have contributed to the motivation, as well as understanding certain best practices for language learning. Further, this participant ranked speaking and listening the highest when responding to his perception of the most developed skill, which seems to evidentiate the positionality in the Zoom group, since this group practiced speaking and listening an additional approximately 10 minutes a week.

Participants 18 & 19 - Zoom Winter 2023

Participant 18 was a female student in the Zoom group Winter 2023. 18 was a non-native speaker of Spanish, an L2 learner, and had been studying Spanish formally for five years. This participant reported English as their dominant language and also spoke Tamil. For the pre-study questionnaire this student self-reported proficiency[29] level on the ACTFL scale as Novice and Advanced in the post-study questionnaire. Participant 18 had been using a smartphone for 13 years, and at the time of completing this study was utilizing an iPhone. Regarding text message behavior, 18 reported sending 40+ messages on a typical weekday (M-F) and 40+ on a typical weekend day. iMessage was 18's primary source of cell phone messaging, she reported using predictive text *yes (often),* and for their primary purpose of messaging was *Social (keeping in contact with friends and family "letting people know you're there", general check-ins)*.

Participant 19 was a male student in the Zoom group Winter 2023. 19 was a heritage speaker of Spanish and had been studying Spanish formally for one year. This participant reported English as their dominant language and had been studying no other languages formally. For the pre-study questionnaire this student self-reported their level of proficiency[30] on the ACTFL scale as Intermediate and Superior in the post-study questionnaire. Participant 19 had been using a smartphone for 14 years, and at the time of completing this study was utilizing an Android. Regarding text message behavior, 19 reported sending 20-40 messages on a typical weekday (M-F) and 20-40 on a typical weekend day. Messenger by Facebook (now Meta) was 19's primary source of cell phone messaging, he reported using predictive text *sometimes* and his primary purpose of messaging was *Informative (information gathering such as seeking times of events, what to bring to a party, etc.)*.

Table 37. Participant 18 and 19's numerical data for dependent variable count (on average).

[29] https://www.actfl.org/educator-resources/actfl-proficiency-guidelines/spanish/comunicaci%C3%B3n-oral
[30] https://www.actfl.org/educator-resources/actfl-proficiency-guidelines/spanish/comunicaci%C3%B3n-oral

Participant	Total words (average)		Unique words (average)		Speech rate (words per sec (average)		Raters fluency (average) 1-7*		Raters % of comprehension impeded (average) *1-10	
	pre	post	pre	post	pre	post	pre	post	pre	post
18	177	186	84	107.5	0.79	1.15	2.08	3.2	3.25	3.1
19	147	81	63	45.5	0.76	0.88	2.19	2.5	3.13	4.8

The pairing of 18 and 19 is an interesting case because their language background profiles add a unique touch to their case studies, their Zoom transcriptions are full of linguistic curiosities in both breadth and depth, and their responses on the post-study questionnaire strike curiosities individually and as a language partner pairing.

To begin, table 37 above shows the averages of the objective and subjective data of the fluency variables. Participant 18 showed gains in all variables: total words (+9), unique words (+23.5), speech rate (+0.36 wps), raters perceived fluency (+1.12) and raters' perceived comprehension (+0.15). Participant 19 showed gains in the scales most representative of fluency, with a slight increase of +0.12 for speech rate and +0.31 for the raters' perceived fluency, however showed declines in all other variables: total words (-139), unique words (-17.5), and raters perceived comprehension (-1.67).

It should be noted that the speech elicitation task prompts were designed in such a manner that both Task 1 and Task 2 were open-ended and allowed creativity in a free response structure, which means that participants did not repeat exactly what they may have produced between the pre- and post-speech tasks. Furthermore, Task 1 asked participants to select between five prompts, and while some participants may have selected the same prompt during the pre- and post-speech tasks, some participants selected a different prompt for the post-speech task. This may have been a factor which affected such strong contrasts of the fluency variables as

noted in table 37 for participant 19.

When ranking the usefulness of the Communication Activities (CA) participant 18 (a female L2 learner, who also spoke Tamil) ranked *Somewhat Agree* and noted that "*The benefit is how I became a more confident Spanish speaker. The disadvantage is that I felt I needed to rehearse what we were talking about so I didn't make as many mistakes*." For the same question, Participant 19 (a heritage Spanish speaker who reported not speaking any other languages) rated the usefulness as *Strongly Agree* and noted that "*They went well and allowed me to practice a bit more.*" In regards to the usefulness of the interaction between language partners, 18 ranked them as *Rather Useful* reporting that "*By helping my partner, I felt that I learned a lot as well*" and 19 ranked them as *Very Useful* and followed with the comment, "*It prepared me well for the final oral exam*." In addition to finding the CA and interactions useful, both Participants 18 and 19 also allude to a positive experience. For example, 18 said the interaction with their language partner was *Very Pleasant*, noting that "*I had a nice and fun talking to my partner and getting to learn more about them*" and 19 ranked this experience as *Pleasant*, although he offered no further comments about that specific question.

Figure 37. Samples from Participants 18 and 19's dialogue.

8.2 ¿Cómo fue el restaurante? *(How was the restaurant?)*	Final_consejos *(final Advice)*
18: Um hola uh ¿dónde fuiste para celebrar el cumpleaños? 19: Hola uh uh yo uh celebrar mi cumpleaños uh con mi familia en Famous Daves uh es un un restaurante en Fresno. 18:Um ¿Qué tipo de comida es? 19: Uh es carne uh y uh tengo papas y cebolla y lechuga en uh muchas cosas de comida.	18:: Ummm otro consejo um para mi es para mí es like ver películas y series en español con los subtitles es muy um ayudar para mí mucho. Um y con el película o la serie con las subtitles es um yo um entiendo muchas um palabras y ayudarme con hablar um en like like ahora 19: Mmm, uh, yo usa subtitles uh cuando yo yo ver uh Netflix yo uh ver, right? Is it ver? Cuando yo, or would you say yo- I think that's correct

18: Mm um ¿qué comiste?

19: Uh yo comiste uh papas fritas y cebolla fritas con mucho carne y uh barbecue

18:Mmm uh me gusta papas fritas uh ¿Te gustó la comi la comida?

19: Uh sí, sí, me gusta y uh mi familia no me gust uh no le gusta les gusta estos porque ellos no no gusta carne mucho uh puro uh vegetales. Uh ¿Dónde fuiste para salvar tu, cump-

18:¿Qué bebiste?

19: Oh

18: Oh sorry

18:Did you wanna keep going?

19: Oh, I was asking more questions, shoot my bad

18:Yeah, ¿qué bebiste?

19: Uh yo biste Root Beer, un soda

18:Um ¿cómo fue el servicio?

19: Uh el servicio es más y menos uh mal en the beginning [laugh] en es más y menos.

18: ¿Te gusta el restaurante?

19: Sí, uh, es mi restaurante favorito.

18: Ah, nice, uh sí, ah, me parece al restaurante y la comida um es rica um me gusta y yo voy hopefully anyways um you can ask me now

19: Okay, ¿dónde fuiste para celebrar tu

18:: [unintelligible]

19: Cuando you ver Netflix, y yo uh vi mucho novelas telenovelas uh-

18:: sí [unintelligible]

19: Es en español y-

18: Mmm mmm

19: Umm uhhhh y uhhh no sé cómo se dice uh help do you know how to say help in Spanish?

18: ayudar

19: oh yeah yeah yeah, uh ayudar ayuda mi cuando yo necesito con uh confid confiden con- mmm confidence, I forgot how you say uh sorry I usually uh
18: I think that brave is like valiente

19: mmmm I-I-ummm let me think how would I word this? Uh yo uh yo usa uh español uh cuando yo uh uh pffffff uh visitar mis amigos uh y Netflix has subtitles ayuda mucho uh porque ellos uh usa err yea usa y hablar español mucho uh porque ellos de México

18: ¿tienes muchos amigos um de like hablar español?

19: sí, muchos uh en mi ciudad es la primera lengua.

19: uh

18:: Sorry, um

19: Uh en mi ciudad es la primera lengua

18:: Mmm

19: Uh primary language.

	18:: Mmm es bien bien. 19: Yeah 18:: ¿tienes más consejos? 19: Mmm practicar español en tu vida normal. Im your normal life, practice Spanish. 18: Mmm. A veces yo yo usar español palabras en español, cuando des like um hablar con mis amigos sobre mi familia, um yo uso um palabras español porque es um yo like conozco mucho like um cosas para ayudar mi hermana también aprender español so es muy um uh ayudar ayudar helpful um para mis amigos y mi familia.

A recurring observation across all of the Communication Activities completed by 18 and 19 was the persistent apologies that 19 offered when making mistakes or asking for help from 18. 19 exerted a lot of effort in producing Spanish and if he did not know a word or had to ask for help he said "I'm sorry" several times in English. Also interesting among this pair was the consistent relatively equal number of turns taken across each CA for the seven activities completed, as shown in table 38 below.

Table 38. Number of turns taken by participants 18 and 19 for each Communication Activity completed.

Participant	**8.1**	**8.2**	**13.1**	**13.2**	**14.1**	**14.2**	**Final_consejo[3]**
18	27	20	12	37	21	45	35
19	27	20	13	38	22	45	35

The pairing of 18 and 19 is also representative of students who seemingly did not use a

[31] English translation: Final advice

script when completing their CA. In comparison with the other participants, both this pairing and Participant 14 showed a higher number of turns as these students worked towards a more spontaneous, unplanned dialogue in contrast to other students who were clearly reading from a written script, as was often the perceived case with participants 15 and 16. For example, Participant 14's average number of turns across the seven CA was 8.71, 18 and 19's average number of turns were 28.13 and 28.57 respectively, while participant 15 and 16 averaged 8.71 and 5.86 number of turns respectively.

Participant 18 self-reported an increase in her ACTFL scale of proficiency from Novice to Advanced over the duration of the study. Although this is not a reasonable assessment for a study as short as 10 weeks, this information could be understood as a representation of increased confidence, which is also supported by her gains in all of the fluency variables including total and unique words, speech rate, raters' perceived fluency and a drop in comprehension impeded. The weekly conversations between 18 and 19 showed that 18 often led advancements and progressions in the conversation. For example, observations of the dialogues indicated that 18 had a more advanced vocabulary and grammatical knowledge than her language partner, and her consistent engagement in the activities, and in more of a leadership role, may have influenced her gains in fluency.

Contrastingly, Participant 19 only showed gains in speech rate and raters' perceived fluency, while total and unique words and raters' perceived comprehension impeded showed declines. The weekly conversation practice seems to have helped 19 speak more quickly, which is seemingly supported by both the objective data (speech rate) and subjective data (rater's perceived fluency). Curiously, in terms of speech rate these language partners started off at almost the same words per second: 18 = 0.79 wps and 19 = 0.76 wps. Participant 18 made a much larger jump throughout the study (+0.36 wps) than 19 (+.12 wps), which again, perhaps

might be explained by her extra efforts to support the progress of the conversation and help her language partner with lexical and grammatical items. It is also worth highlighting, again, that the turn-taking count for the CA for both 18 and 19 was very similar for all seven activities, which may have influenced the increase of speech rate for both the participants, simply due to consistent practice.

5.6 Instructor Surveys & Exit Interviews

Three of the nine instructors also commented on our study during the exit interviews. A more quantitative look at the instructor profile and descriptive statistics about their experience is found in Section 4.5 Instructor Surveys. The Exit Interviews were carried out on Zoom, lasted approximately between thirty and sixty minutes, and were facilitated by the principal researcher. Table 39 below shows a breakdown of the instructors who completed Exit Interviews. The instructor responses on the post-study experience questionnaire was used to guide the discussion, although as is normal with an Exit Interview the conversation naturally flowed throughout several related topics.

Table 39. Instructors who completed Exit Interviews.

Instructor #	Fall 2022	Winter 2023
1	Zoom	WhatsApp
6	Zoom	Zoom
7	Zoom	NA

From the three Exit Interviews conducted five prominent themes emerged: 1) grading, 2) a new type of learning environment, 3) varying effort among groups, 4) problematic pairings of students (language partners), and 5) the affordances of technology to enhance other learning activities.

First, instructors expressed grading the Communication Activities became a challenge because the assignments were set as Complete or Incomplete which presented problems given the varying degree of effort by different students. All three instructors interviewed shared how some groups would really try to develop a thoughtful dialogue and others would just do the bare minimum, while others were in between, which made grading difficult because students could only receive 10 points (complete) or 0 points (incomplete).

The instructors thought developing a rubric would be helpful and make grading more fair, while still keeping grading relatively easy for the instructor. For example, the rubric could allow points for addressing questions, being spontaneous, not reading a script, or perhaps if the scale was 10 points, 5 points could be allotted for completing the activity and 5 more points for going above and beyond. Instructor #1 brought up the question of how do you grade effort because that looks different for different students, which makes equitable grading a hard thing to manage for this activity. Similarly, instructor #7 agreed that because the points were all or nothing it was easy to grade in the sense of time it took because you didn't have to determine scores, which might have been difficult. However, on the other hand it didn't feel right giving the same credit to a pair who had talked for a minute and a half that you would for a pair who had talked for over seven minutes.

Clearly, the effort varied among groups substantially. Although this might be expected in many group and pair work learning situations, this made equitable grading a challenge (as noted above), and also may have affected learners' engagement and enjoyment with the activity. For example, one instructor mentioned a language partner pairing (in the Zoom group with a heritage speaker (HS) and an L2 learner) where the advanced student was frustrated with the relatively low level of the non-native speaker. The instructor perceived frustration on the part of the HS perhaps due to them feeling like they were responsible for driving the conversation and that the

L2 learner may have felt intimidated and shy.

In watching the Zoom conversations and reviewing the WhatsApp conversations, the principal researcher corroborates these comments. There was a vast difference in conversation quality, length, and engagement between the dyads. For example, some Zoom participants chatted for about five minutes in an unscripted, spontaneous nature, making mistakes, negotiating meaning, and helping each other, while other groups' conversations lasted for two minutes and each person was obviously reading from a script. Similarly, in the WhatsApp messages, the length of the dialogue and number of turns also varied. For instance, some conversations included just two turns by each participant with an average length of two complete sentences per turn, while other conversations averaged twenty turns per participant and included more short questions and answers in the utterances, some interruptions, and a more natural flow of dialogue.

Third, all the instructors interviewed noted at least one problematic pairing of language partners. In addition to the Exit Interviews, this statement is also supported by analyzing the student questionnaires, observation of the Zoom recordings and WhatsApp conversations, and through the principal investigator's own experience as an instructor in the study during Fall 2022. If one participant in a language partner pairing was not motivated to participate in the activity, this strongly affected the quality of the conversations, as well as the overall experience of the Communication Activities. For example, although instructors were asked not to make groups of three, at least one group of three was inevitable if the class had an odd number of students. A student in a group of three in the WhatsApp group (with instructor 9) commented that one of the partners would take forever to respond and not contribute in meaningful or helpful ways, and being in a group of three felt like "*double the work*". Requiring smaller groups for WhatsApp chats was also corroborated in Lai (2016) who noted that "If the team is too big, it is

often more difficult to have deep exchanges" (p. 282).

The challenges and processes for pairing the students was a recurrent theme among the instructor feedback. Some comments had to do with the challenge of creating balanced pairs with a good dynamic early in the quarter when the instructor did not know them well yet. Although the principal researcher offered general advice on ways pairings could be done, it appeared that each instructor selected the option they felt that was best for that particular class. For example, some strategies for pairing the students included random selection, self-selection, or intentional pair assignment made by the teacher. Curiously it also seemed that, in general, the students tended to sit by their CA language partners while physically present in class.

As also noted in the student feedback, the instructors also observed the impact that the student pairs made on the overall experience, offering comments that some groups worked really well, while others did not. The instructors suggested that if there was an obvious pairing which was not going to work out, it should be changed right away. For instance, instructor 07 tried an approach allowing students to pair themselves up, which ultimately resulted in one problematic pair, with especially varying levels in motivation and language level which seemed to be a challenge for both learners. Instructor 07 also noted that if he were to repeat this experience again he would be on the lookout to make actionable changes earlier on in the quarter, such as a lack of effort, use of Spanish, and overall engagement with the activities.

Comfort level with the technology also impacted the success of the pair work. Adjusting to the activities was prevalent in both the Zoom and WhatsApp groups, although the topic of comfort level seemed most prominent in the Zoom group. This may be true because at first, students in the Zoom group seemed anxious, had their cameras turned off, and used more English at the beginning of the quarter. Instructor #6 noted this seemed to be wear off as the quarter went along due to consistent engagement with the activities, and repeated support and encouragement

by the instructor. Although adjusting to the logistics of the Zoom group seemed to be more about scheduling, the WhatsApp group, both instructors and students, seemed uncertain of how to proceed in what was expected of them in regards to how to engage in the conversation, and may have eleven felt uncertain about utilizing this mode of communication for academic purposes. While students are increasingly utilizing their mobile devices (Loewen et al., 2019), especially for text messaging (Taylor, 2023) it cannot be assumed they will just automatically know how to leverage this tool for learning purposes. This is another example supporting how essential it is to provide explicit expectations and continuous support and feedback to students especially when introducing new and innovative learning activities.

The fifth theme to emerge from the Exit Interviews with the instructors was the trend that students need a variety of modes and exercise types to continue developing language skills. This study emphasizes and contributes to research in this realm, especially pertaining to technology enhanced learning and class materials (Golonka et al., 2014; Ziegler, Parlak & Phung, 2023). The first supporting evidence from the instructor data is how the instructors responded to the question "What modes or methods did you use to facilitate oral communication activities in your class?". The cohort of instructors produced a variety of methods such as online sources including conversation board games, warm up activities, group work (both large and small), YouTube presentations, think-pair-share activities, games such as Taboo, class discussion, and small group activities utilizing the whiteboard.

Furthermore, in alignment with the students' perceptions, the instructors also found value in the out-of-class, low-stakes environment which the Communication Activities provided for the learners. For example, several comments were made of similar nature:

- "*They went great. Students were happy to have a space where they could practice speaking Spanish outside of the class*". (Instructor in Zoom group)

- "*I think the activities provided a space for students to have an informal low-stakes discussion.*" (Instructor in Zoom group)
- "*They practice their Spanish in a relax mode, low stress with a partner in similar process (learning Spanish)*." (Instructor in WhatsApp group)

An equally valuable contribution came from a WhatsApp instructor who shared how the students already had a lot of writing activities and the instructor selected *Disagree* when asked about the usefulness of the communication activities, reporting that "*This quarter had a significant amount of writing activities (resumenes talleres de lectura, final writing assignment, etc.). Therefore, students had plenty of opportunities to practice their writing and I don't think they put that much effort or time in the actividades de comunicación*."

All three instructors who completed Exit Interviews commented how the Communication Activities (which are executed outside of class and via one mode of technology, either Zoom or WhatsApp) afforded students more opportunities to practice the language outside of class, and in a low-stakes environment. This may be especially true for these 50-minute language classes. This type of practice can help set students up for success in other communicative situations, as it may help them build their confidence for when they return to class and apply skills they have practiced outside of class. Similar research for developing oral competence using asynchronous videos suggests this mode is helpful in students producing more complex utterances and engagement with the tasks (Morris & Blake, 2022). Instructors in the present study also commented that for some of their students these activities may be the only Spanish speaking practice their students got outside of class. For instance, Instructor 6 commented that the activities "*went great. Students were happy to have a space where they could practice speaking Spanish outside of the clas*s." (Zoom, WQ23)

A few other noteworthy themes which emerged from the instructor feedback are briefly presented below.

5.7 Additional topics of consideration

Following are four additional topics which emerged as a result of data analysis: Approaching innovative learning activities with students, both modalities afford language skill development opportunities, synchronicity versus asynchronicity, and the feedback provided by the instructors.

Approaching innovative learning activities with students

Several aspects of the Communication Activities were new and different from a more traditional approach to language instruction and homework. For example, students were asked to practice the language and complete homework assignments using their own mobile devices and outside of class, thus making them responsible for their own learning in a different dynamic than they might be used to. Furthermore, the design of the activities prompted creative and spontaneous use of language, prioritizing function over form. Additionally, WhatsApp was a new technological communication platform for all of the students in the study, which infers a certain learning curve as users became used to the platform. This level of novelty in the activities may have impacted how learners experienced and engaged with the activities, at least at the beginning of the quarter, as they got used to the new learning approaches and tools.

One particular very salient aspect of this new approach was that instructors encouraged students to make mistakes and focus on the process of language learning, not necessarily an end product, which may not be what the students are used to. Instructor #1 noted that part of coaching students can be to focus on providing the students with consistent assurance and

guidance to focus on the process and not worry about the end product. The instructor may need to repeat several times to the students not to read from a script and not to worry about a perfect use of language. This is true for both the WhatsApp and Zoom group. Additionally, as proved true in the group of participants in this study, instructors may need to provide guidance and general training on the use of the new application (WhatsApp) because it was not well-known among this group of learners, and may be the case for other undergraduate L2 learners of Spanish. Blake (2009) corroborates that although certain text-based TMC environments can facilitate oral fluency development, this is dependent on effective instructional design. Proper teacher training on task design, implementation, and educational technologies is also essential because teacher training of educational technologies will have a direct impact on the students' attitude with the technology (Stockwell, 2022) which was most likely a factor in this study, as well.

In the same vein, instructors in the Zoom group also noted challenges with not all students immediately feeling comfortable on camera. Instructor 06 noted that at the beginning of the quarter some students seemed more shy and/or awkward on camera, but she noticed that as the quarter progressed the students became more comfortable and confident, which included producing longer sentences, using less English, showing more facial expressions, and they seemingly had less anxiety and a more relaxed nature about them. Instructor 07 also noted how it took some time for the students to get used to the activities, such as the structure, modality, and scheduling, and some would easily resort to English.

Both modalities afford language skill development opportunities

Similar to the data extracted from the students' experiences, the instructors' feedback also draws attention to how the use of different modalities will address different needs in regards to

language skill development. For example, Zoom can help develop oral skills and WhatsApp can help develop writing skills more. Although any practice in any modality can help develop various characteristics of language.

Synchronicity v. Asynchronicity

Similar to trends in the student feedback, instructors also commented about the expectation for the WhatsApp participants to complete their assignment at the same time in one sitting. For example, Participant 01 questioned "*Sometimes there would be a delay of 30 minutes to an hour between replies and I was wondering for the other person on the other end, what's it like to be sitting there and waiting for the other person, or you get mad, it's probably very distracting, perhaps one reason, perhaps why they had a more rehearsed version, just hit send*." Again, this poses the question why is there an expectation among the texting group that their assignment must be completed synchronously.

Feedback provided

The type of feedback the instructors left on the Canvas comments for the students varied quite a bit. Some instructors left specific, forward-thinking, action-oriented feedback, while others made more general comments. The former included characteristics such as pronunciation, gender/number agreement, and sentence structure, and other instructors pointed out repeated errors. One instructor noted how these activities allowed instructors to see repeated issues and help them address them over time, which can act as a form of formative assessment.

Overall, the feedback from the instructor also points to potentially a more positive experience with the Zoom modality for these types of activities. Instructor #1 taught both quarters the study took place and was able to participate both in a Zoom and a WhatsApp group.

When asked which modality she would prefer to carry out, again the instructor said Zoom and offered three primary reasons for this response:

1. Class size. When the class is rather large, such as 15+ students, Zoom is something to help them with practice they don't have time to do in class.

2. Personality type. Introverted people may have a hard time speaking in a group of 15+ people, and it may be helpful for them to have this one-on-one experience.

3. Course curriculum. At the time the study was conducted, the course curriculum already included a lot of writing opportunities, and the Zoom activities offered a chance to develop different language skills. Instructor 06 also taught both quarters the study was carried out and patterns she noticed among both groups of students were a) script reading at the beginning of the quarter, b) not putting on their cameras, and c) fixing issues between students.

5.8 Conclusion

This chapter highlighted the findings from the qualitative portion of our study which included data collected from a participant post-treatment questionnaire and the instructors post-treatment questionnaire, and exit interviews. Sections 5.3 and 5.4 offered insight into the students' experience of the Communication Activities, including their perceptions of the tools themselves (WhatsApp or Zoom), task design, engagement and interaction with their language partner, and their perception of skills developed. Five emergent themes emerged: 1) students valued increased opportunities to practice the Spanish language outside of class, 2) students appreciated language practice in a low-stakes, low-stress environment, 3) students enjoyed connecting with a classmate over the academic quarter, and the study brought to light 4) the impact that the partner pairing has on the overall experience was highly emphasized, and 5) the importance of defining clear task logistics and intentional task design.

In Section 5.5 we reviewed five case studies with the intent to offer a more granular look at individual student experiences, including both quantitative and qualitative measures of five diverse learners in the study. Lastly, in Section 5.6 we offered a glimpse into the instructor experience, including brief discussions of advantages, disadvantages, general observations, and providing feedback. All the instructors noted the 1) challenges in grading, 2) the varied effort among the students, 3) the various approaches to pairing up the students, 4) coaching students when engaging in innovative learning activities, and 5) the benefit of various modalities to foster developing different language skills.

In general, the data discussed here represents a variety of mixed experiences, with insight into what worked well and what participants could improve upon. Learners appreciated the activities' purpose, but the task prompts need revising to match with the activity's modality. This would ensure alignment with the communication technology used and topic of discussion. Additionally, the novelty of asking learners to utilize WhatsApp, a messaging application that was new to all participants, seemed to have a bit more friction than the modality of Zoom. A partial explanation could be the learners' familiarity with Zoom in terms of technical knowledge and familiarity with using Zoom to complete homework assignments due to the increased usage of this video software during the pandemic in 2020-2021. Zoom also seemed to be the preferred modality from the instructors' perspective for reasons such as providing more speaking and listening opportunities in a curriculum that already has a lot of writing activities, as well as providing a more low-pressure environment for more shy or introverted learners to practice their speaking and listening skills. Chapter 6 further explores the main topics presented in this chapter, specifically how they respond to the study's research questions.

CHAPTER 6: Discussion

In this dissertation, we have advocated for the use of mobile technologies, specifically the modality of text messaging as mode of technology-mediated communication (TMC) to facilitate communicative, interactive exchanges in support of L2 learners developing their oral fluency. The theoretical framework of sociointeractionism, along with relevant research, as discussed in Chapter 2, has highlighted the need and benefit for learners to take advantage of text messaging and, in the process, take learning outside of the classroom to engage in the target language via a mode of communication which is already familiar for them and easily accessible. The interactive and multimodal nature of text messaging, along with the accessible nature of mobile devices, make text messaging a promising tool to develop L2 skills. Nevertheless, as the present data supports and will be further discussed in this section, face-to-face communication may be preferred by the learners, because of a perceived skill development and ease of logistics.

The data examined in this dissertation calls attention to the benefits and disadvantages of utilizing text messaging as a mode of learning for developing L2 oral fluency. This mixed-methods study highlighted quantifiable variables of fluency such as total word count, unique word count, speech rate, pauses, and perceived fluency and comprehension, as well as qualitative measures, including student perceptions and attitudes towards the treatment. These findings were discussed in Chapters 4 and 5. In this present chapter, we will discuss the most salient findings, especially as they relate to our research questions.

6.1 Quantitative Data

6.1.1 Research Questions Discussed

With respect to measures of fluency, this study examined two sets of numerical data. First, for objective data the researcher looked at total words, unique words, speech rate, and

number and duration of pauses. Second, the subjective data examined human rater perceptions on a scale of fluency (speech rate, pauses, and repair) and the percentage of incomprehension caused by poor pronunciation. I will briefly recount our findings and then discuss them below. Once again, the quantitative data research questions were as follows.

Research Question 1. What is the relationship between text messaging and oral fluency, as measured by 1) total words, unique words, and speech rate? 2) number and duration of pauses? 3) percentage of impediment of pronunciation in comprehensibility? 4) turn-taking?

6.1.2 Total Words

Overall, the WhatsApp group produced more total words across the pre- and post-speech tasks in comparison to the Zoom group (this is shown in Chapter 4 in Table 8 and Figure 3). This is true for the speech elicitation tasks separated and the tasks combined, although the ANOVA did not show any statistically significant results ($p=.40$ for time and $p=.37$ for group and time). Additionally, as a measure of effect size Cohen's d also did not show any statistically significant results (time $d = 0.165$; group $d = 0.012$). In an overall comparison of gains or losses across groups for total words, the WhatsApp group showed an increase in 16.5 words and the Zoom group showed a decrease of .5 words.

For comparison, Abrams (2003) found that members in the synchronous TMC group, along with the control group (regular classroom activities), outperformed the asynchronous TMC group in regards to number of words. Although the methodologies between Abrams and this present study are not direct comparisons, the notable gains in total words produced by groups that participated synchronously (e.g. text chat or in-person) draws attention to the pressures of time-constrained communicative interactions and the potential effect that has on spoken linguistic production. This present study did not explicitly separate the experiment and control

groups into asynchronous versus synchronous, because of the nature of the Zoom conversations, and the assumption the learners would engage in their text tasks more asynchronously as they went about their day, which ultimately did not end up being the case. In light of this, future research should explore the effect that temporality in WhatsApp messaging has on fluency, among other aspects of language. For instance, researchers can analyze the time stamps of the messages to see any effect between messages that are more asynchronous (delayed turn taking) versus those that are more synchronous (immediate turn taking). Additionally, future research should also use surveys, interviews or focus groups, to measure learners' perceptions of homework tasks via WhatsApp, particularly as it relates to the choices they make about when they choose to carry the homework out.

Further, Kern (1995) found that the average total number of words produced in the TMC platform (InterChange) was 216-230 average words per student and 111-137 on average for their face-to-face oral discussions. Although the assessment situation between Kern (1995) and the present study is different, common across both studies is the idea that students produce more language in written TMC situations than in oral discussions. Kern (1995) calls attention to speakers repeating words and phrases in oral discussions, which is common in oral discourse, but typically absent from written discourse (p. 465). The author keenly observed that all students participated in the TMC exchange, while in the oral discussions the conversations tended to be dominated by five specific students. Although, it is not a direct comparison between Kern and the present study because the oral assessments in the latter were monologic. However, a future point of exploration would be to analyze the weekly Communication Activities for total and unique words produced to compare them across groups and with the individual participants' pre- and post-speech tasks. However, the Communication Activities data do show the number of turns

taken by each student. This information can offer some insight into asynchronous or synchronous communication behavior. The data is presented in Section 6.2.2.

6.1.3 Unique Words

With speech elicitation tasks combined, both the WhatsApp and Zoom group showed a slight increase in unique words in the speech tasks over the 10 weeks, and the Zoom group showed a slightly larger gain over the WhatsApp group. However, both groups showed slight declines of unique words when considering Task 1 individually. In an overall comparison of gains or losses across groups for unique words, the WhatsApp group showed an increase of 1.5 words and the Zoom group showed an increase of 7. The speech task design, specifically the prompts, may have affected these results substantially. For example, in speech elicitation task 1, the participants were asked to respond to one of five prompts, which are shown in Appendix E. A large majority of the participants selected prompt 1: “In Spanish, please tell me what you do in a normal week.”. By nature, this prompt incites repetition in student responses as they talked about their weekly routine, which naturally has repetition in it, such as attending certain classes on days of the week and similar extracurricular activities across days, such as exercising or having dinner.

Section 6.1.4 Speech Rate

As presented in Section 4.3.1, both the WhatsApp and Zoom group’s speech rate improved over the ten weeks as calculated in the pre- and post-speech tasks: WhatsApp wps (words per second) gain = 0.12 and Zoom wps gain = 0.09. Additionally, the analysis of variance showed a statistically significant, although small, effect of time ($p=0.009$). Although it would be expected, or hoped, that language learners would improve their speech rate over a 10-week period of intense language study, the WhatsApp group had almost the same performance as the

Zoom group. This observation may suggest that text messaging does not hinder L2 learners' oral fluency development. These observations highlight the potential for text messaging platforms like WhatsApp to contribute positively to L2 learners' oral fluency development. These findings add to the existing body of research about a cross-modality transfer effect, and also provokes future research to explore the effect of text messaging on other characteristics of language.

Similar studies report mixed findings. For example, Blake (2009) explored English as a second language learners in a 6-week course being treated in a text-based TMC environment, a face-to-face classroom environment and a control environment with no student interactions. Although this study found statistically significant gains (using an ANOVA) for the internet chat group in phonation time ratio and mean length run, speaking rate was not a statistically significant measure of fluency. In this case, speaking rate was measured in syllables per second, which contrasts with the present study's measure of speech rate, words per second. Although several studies have explored TMC and fluency (Lin, 2014), including speech rate (Blake, 2009), a majority of these studies utilized a telecollaboration or video conferencing modality, such as voice email and online interviews (Volle, 2005), videoconferencing (Xiao, 2007), and voice blogs (Sun, 2012). With the exception of studies cited in this dissertation (e.g. Abrams, 2003; Beauvois, 1992; 1997; Blake, 2009; Kern, 1995; Kost, 2004; Payne & Whitney, 2002; Razagifard, 2012), to the principal researcher's knowledge, there are few studies which have examined the impact of text-based TMC, much less text messaging, on oral fluency.

6.1.5 Perceived Fluency

After accounting for Inter-rater Reliability (IRR), the ANOVA showed an effect of the interaction of group and time as it relates to the human raters' perception of the study participants' fluency ($p=0.09$). For this assessment, the raters were asked to consider speech rate, pauses, and repair (of communication of breakdowns). This data, alongside the speech rate data

mentioned above in Section 6.1.4, suggests that both the subjective and objective data are in alignment, and indicates a potential effect of group and time as it relates to speech rate and fluency. This alignment between the objective data (speech rate) and subjective perceptions (human evaluations) underscores the credibility of both datasets and the overall study, particularly concerning speech rate and fluency. Together, these findings provide more evidence supporting the effectiveness of the treatment.

However, based on this data it is not clear which is the more advantageous or disadvantaged group. The emmeans for the raters' perceived fluency showed a decline of 0.6 for the Zoom group and an increase of 0.37 for the WhatsApp group, which indicates the human raters perceive the Zoom group's fluency declining over the duration of the study, and the WhatsApp participants' fluency increasing. In contrast, the speech rate numbers indicate that both groups started off at the same place (WhatsApp = 1.04 wps and Zoom = 1.08 wps) and made small, similar gains at the end of the study (WhatsApp = 1.16 wps and Zoom = 1.17 wps).

Without asking the raters directly, it is difficult to infer why collectively they perceive the Zoom group to have declined in speech rate and the WhatsApp group to have increased. Although this discussion does bring up the provocative topic of comparing machine-generated and human-generated assessment data. In this case, the former refers to the objective data of speech rate as measured by total words, unique words, and speech rate, and the human-generated assessment data as measured by perceived measures of fluency. The objective data does not allow for any human bias in its calculation, while the subjective data is open to human interpretation. One reason why both objective and subjective data were used in this study was to provide a more holistic perspective of fluency, as proposed by Derwing and Munrow (2005). However, this type of rating is susceptible to accent preferences and prejudices: "influence of accented speech or a personal bias against particular accents or voices" (p. 381). Collecting

similar data through distinct instruments can help provide a less biased analysis and discussion of data.

6.1.6 Comprehension impeded

Similarly, after accounting for IRR, the percentage of comprehensibility impeded by pronunciation showed no statistically significant results. Three main factors may have influenced these results. First, the small sample size of study participants make it impossible to infer statistically significant claims about the impact of this variable. Second, as previously discussed, the design of the scale may have confused some raters, prompting them to select the incorrect location on the scale. Although this was accounted for to the best of the ability of the research team, it cannot be stated with absolute certainty that all remaining raters and ratings made no mistakes in the rating process. Third, rater training and understanding of the task may have skewed the results. Having said that, Derwing et al. (2004) argue for the need to examine the reliability of listeners' judgements of fluency in order to construct validity of perceived fluency (p. 658). The authors mention that in previous work they found untrained raters to be relatively reliable in assessing factors in the speech of non-native speakers (NNS), such as comprehensibility and accentedness (p. 659). Apart from the incident of the scale values being on opposing ends, the instructions on the raters page were straightforward and, overall, seemed to be adhered to by our raters. Further, one main reason that the researcher of this present study chose to crowdsource a large number of diverse raters, was to provide judgements from a variety of listener types, as suggested by Derwing et al. (2004) and as a valid way to provide assessments which are unbiased by teacher or expert influence, for example (Derwing & Munro, 2005).

6.2 Qualitative Data

Data was also collected to understand the student (and instructor) attitudes and perceptions toward utilizing text messaging (in comparison with oral speaking modes) for language learning. To measure these queries, students and instructors completed a post-study questionnaire and were invited to participate in exit interviews. What follows is a brief summary of the findings and further discussion, especially as they relate to the research questions.

As presented in Chapter 5 the main themes to emerge from the student data were that the digital activities provided 1) more opportunities to practice the Spanish language outside of class, 2) more opportunities to engage in the language in a low-stress, low-stakes environment, 3) an easy social connection and community building with their language partner, 4) insight into the impact that the partner connection has on the overall experience, and 5) brought to light the importance of clear task logistics and intentional task design.

6.2.1 Research Questions Discussed

Following is a discussion about Chapter 5 results as they correspond with the study's qualitative research questions:

- What are the learners' and instructors' perceptions about…
    1. …the relationship between their L2 texting behavior and their L2 oral fluency?
    2. …language learning via a mobile device in a semi-formal learning environment?
    3. …task design of the communicative activities?

6.2.2 Relationship between L2 texting and L2 oral fluency

To contextualize basic text messaging behavior collected in the pre-treatment questionnaire, we will restate the data presented in Chapter 4. As shown in table 40, the majority of participants sent/received between 20-40 text messages on any day of the week. Three

participants reported sending over 40 messages a day during the week and that number increased to six participants over the weekend. On the low end, a small number of students reported sending between 0-5 and 6-10 messages on a given day. So, with the exception of a few participants, this group texts quite actively.

Table 40. Average number of text messages sent during a typical week.

Approximately, the average number of text messages sent on a typical…		
	…weekday.	**…weekend day (Fri., Sat. & Sun.)**
No. of messages	No. of participants	
0-5	1	0
6-10	2	2
11-20	5	2
20-40	9	10
40+	3	6

Also as a reminder, the majority of students in the group utilize iMessage for their messaging behavior, no student had used WhatsApp before, and the majority of participants utilize texting for social purposes. This information is reflected in table 41. Therefore, in general, this group of participants texted frequently for social purposes through iMessage.

Table 41. Primary applications and purposes of text messaging.

What is your primary application for messaging?		**What is your main purpose for text messaging?**	
Message service	**No. of participants**	**Purpose**	**No. of participants**
iMessage	14	informative	5
WeChat	0	social	15
SMS	1	business	0
WhatsApp	0		
Other (Discord, Snapchat, Instagram (x2), Messenger)	5		

6.2.3 Turn taking

In regards to turn taking via WhatsApp, the group averaged 7.4 turns per Communication Activity (as highlighted in figure 38 below). It is worth highlighting again the outliers in this group of students. For example, Participant 07 was in a group of 3 people, which, combined with a more spontaneous dialogue style and frequent interactions, increased the participant's number of turns produced across all the Communication Activities (CA). Contrastingly, Participant 12's WhatsApp dialogues were among just two people, did not include as much spontaneous conversational dialogue and only showed that the students did the bare minimum as required by the CA, by producing longer seemingly scripted utterances, in contrast to several more naturalistic back and forths.

Figure 38. Average turn taking in weekly Communication Activities.

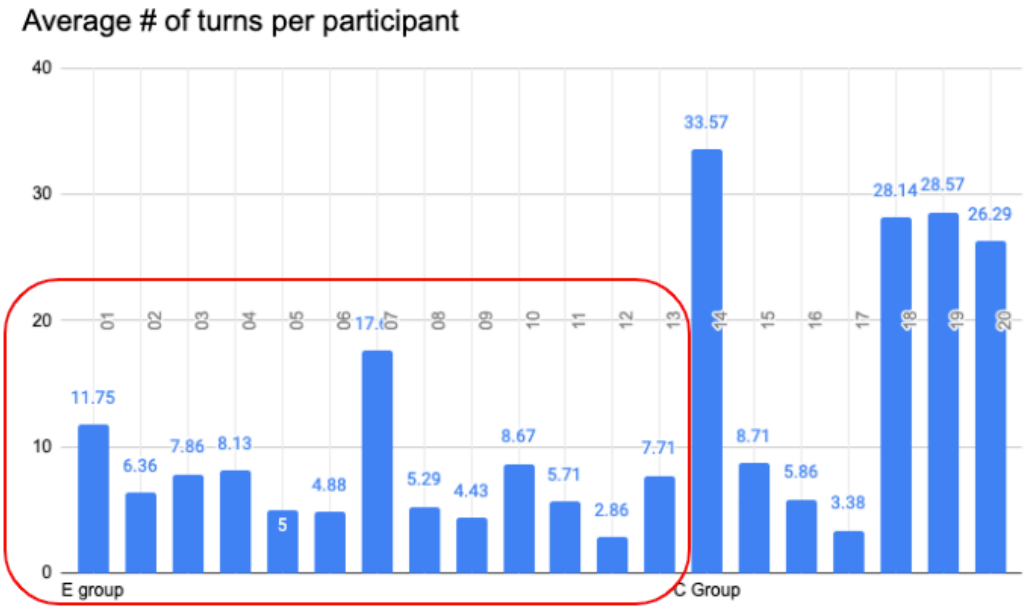
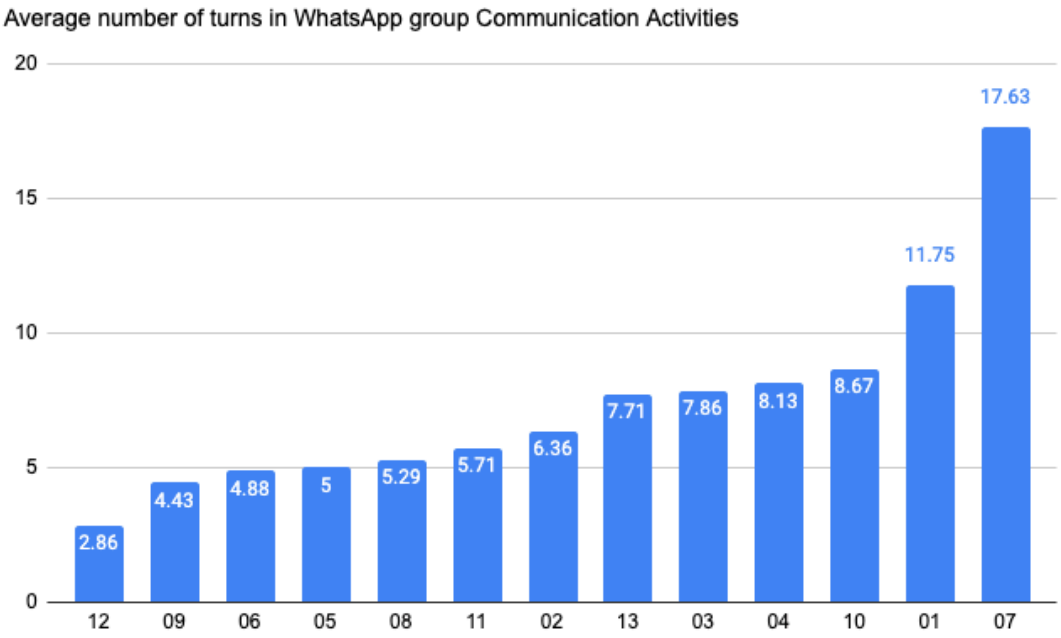


Figure 39 emphasizes the WhatsApp participants and arranges them from lowest to highest number of average turns across CA. This visual representation draws attention to the average turns ranging from 4.43 to 8.67, eliminating the outliers of participants 12, 01 and 07.

Figure 39. Average turn taking in weekly Communication Activities.



Below, table 42 shows all WhatsApp (E group) participant quantifiable data, average number of turns in the Communication Activities and the gains or losses between the pre and post speech tasks for total words, unique words, speech rate, and pauses. This data helps provide insight into any relationship between the turn taking in their texting behavior and the four variables of fluency.

Table 42. Snapshot of all WhatsApp participant quantifiable data.

participant	average number of turns	gain/loss total words	gain/loss unique words	gain/loss speech rate	gain/loss pauses
01	11.75	53.5	6	0.24	-27.5
02	6.36	-1.5	-4.5	0.34	-63
03	7.86	-8.5	-3.5	-0.006	13
04	8.13	-17	-1.5	-0.18	13.5
05	5	74.5	15	0.25	29.5
06	4.88	23	-16.5	0.09	-1
07	17.63	-8	6	0.02	-31.5
08	5.29	42.5	6	0.08	32
09	4.43	-15	-2	-0.05	1.5
10	8.67	35	8.5	0.14	30.5
11	5.71	-26.5	-15.5	0.004	-14

12	2.86	9.5	7	0.33	3.5
13	7.71	57.5	14.5	0.39	-17

Although the comparison in methodologies is not equal between this present study and Kern (1995), similar findings overlap in interesting ways. For example, also Kern reported higher turn taking and a higher number of total words produced in the TMC group (InterChange) than in the oral discussion group. As mentioned in Chapter 4, the data collected in this present data reports a lower turn taking average (7.40) in the TMC mode (text messaging) than the oral discussion mode (Zoom) (19.21). This contrasts with Kern (1995) findings that report an average of 12.5 turns in the InterChange group (tmc group) (an average of 11.8 and 13.3 for the two sections studied), and an average of 4.6 turns in the oral classroom discussion (section 1, 5.4 and section 2 3.8). One possible reason for this difference is the learners in the Kern study were a part of a large classroom discussion with approximately twenty-one students per class. The fact that the teacher and other students were present in the classroom, especially students which may have dominated the conversation, may account for drawing the average down as some students may have felt more shy in that dynamic. In contrast, the face-to-face oral conversations in this present study consisted only of two learners, and they may have felt more comfortable trying out new language, making mistakes, and thus, producing more language and more turns.

The small sample size (n=13) of the participants who utilized WhatsApp for their Communication Activities represent a varied set of data in regards to turn-taking measures and how they relate to measures of fluency. There does not seem to be any statistically significant direct relationship between number of turns in messaging and the variables of fluency including total words, unique words, speech rate, and pauses. The small sample size does not allow for substantial claims to be made about trends. However, it is worth pointing out a few observations. Participants 05, 08, and 10 showed a substantial increase in total words produced, as well as an

increase in pauses. However, participants 01 and 13 also show a high increase in total words, but a significant decrease in total pauses. Participants 02, 07, and 11 showed a decline in total words and total pauses, which may represent a more intentional and polished speech, although without a detailed discourse analysis of speech quality and accuracy it is difficult to know for sure. Lai (2016) also commented about the difficulty in controlling the quality and quantity of the chats. This present study encouraged the use of spontaneous content-based conversational chats, and told students not to worry about perfect accuracy. However, what is similar to Lai (2016) is a struggle that researchers and instructors encounter in regards to how they should consider quality and quantity as the effort and intention they produced, not necessarily a perfectly grammatical sentence. Although large claims cannot be made about the relationship between texting and oral fluency, due to limited sample size, duplicating this study and executing variations of it would be helpful to continue understanding the relationship between texting and L2 oral fluency. Additionally, future studies may also consider including a self-report of learner confidence in the final self-assessment. This is because in this present research study, students may have over reported their ACTFL proficiency level when asked to report it on both the pre- and post-treatment questionnaires. Some students may have inflated their sense of their current level, based on a true gain in confidence of their language proficiency. This confidence boost may have been a result of their engagement in this language class, possibly this language treatment, and potentially other factors. Therefore, it would be insightful to include how confident the learners feel in their language proficiency before and after the treatment in order to complement the other data points and make more holistic observations and analysis.

Regarding WhatsApp participant perceptions of a relationship between text messaging and the impact on L2 oral fluency, participants did not make explicit reference to provide insight into this question. Although participants did provide quotes specific to the texting activities, such

as "*Any writing practice is helpful*", "*The activities were beneficial in allowing me to practice communicating in Spanish outside the classroom. I was able to text in Spanish in a more informal way, but I still got to talk about important topics*", and "*The activity really helped build my writing and reading skills*", there were no observed mentions of a direct impact or influence on their oral fluency.

However, the self-report data about most developed skill could offer insight into the question of the impact of texting on L2 oral fluency. WhatsApp participants (E group) in Fall 2022 ranked writing as their perceived most developed skill, and the Winter 2023 group ranked speaking as the highest skilled developed (with writing coming in second). Although the text messaging group collectively perceived their language *production* skills to be the most developed over the 10-week study, no correlation can be drawn about speaking skills directly. Although the Winter Quarter 2023 group ranked speaking as the most developed skill, this was a response of only three participants.

In the survey completed by 139 undergraduate Spanish learners, participants mentioned that texting may have a negative impact on their writing because autocorrection (available in texting) may make it difficult to remember how to spell certain words on their own (Jones, 2020). Additionally, when asked if the participants think texting negatively impacts their speaking, approximately 32% responded no, 40% yes, and 15% gave a mixed response. Some participants also mentioned how their use of certain textisms in texting, such as *lol* and *brb*, is permeating into their oral production (speech), and they are saying "brb" or "lol" out loud in its abbreviated form. A noteworthy trend in Jones (2020) was that the participants were very aware of linguistic register (informal v. formal) and even if they admitted their texting behavior was impacting their language production, they seemed to only apply that behavior in informal situations where that might be more appropriate than more formal situations. This survey also

provided participant feedback about the positive impact of texting on linguistic production, including 50% of respondents saying they do not think it negatively affects their writing in other environments. One cited participant noted a main reason being that they have increased exposure to the target language.

6.2.4 Language learning on a mobile device in a naturalistic environment

Asking learners to carry out required learning activities on their mobile devices on their own time in a prompted, but open-ended way seemed difficult for both learners and instructors to comprehend at first. Perhaps the novelty and innovation of it all, including technology, modality, logistics, task design, and expectations were too many new factors all at once. However, as learners got used to the activities they seemed to become more comfortable with the tasks as the quarter progressed. This was also the case in Castrillo et al.'s (2014) exploration of negotiation with meaning via WhatsApp.

Part of supporting students in becoming comfortable with new types of learning activities can be approached through consistent training and coaching. Instructors should train the learners on how to use the technology, and provide clear instructions and examples. Stockwell (2022) notes how useful proper training of apps and mobile-based tools can be for making sure learners get the most out of the learning activities, which can also help maintain higher levels of motivation (p. 58). In fact, number 9 of Stockwell and Hubbard's (2013) 10 principles for effective implementation of mobile learning says to "Provide guidance and training to use mobile devices for language learning most effectively" (Stockwell, 2016, p. 301). However, this assumes that the instructors have also been properly trained in the pedagogy, technology, and objectives of particular tasks or learning activities. During teacher orientation for the course that the researcher leveraged for data collection for this research study, the activities and purposes

were explained to the instructors. Instructors would have benefitted from a more detailed explanation about the design, expectations, and technicalities of the activities. To complicate matters further, not all instructors were present at the training. This more thorough explanation would then ultimately have benefitted the students. Furthermore, instructors should consistently coach students along the way at what they are doing well and on what they may need to improve. Coaching students is an expected part of teaching and should include technological support. A candid and poignant quote on this topic came from Instructor #1:

> I had never done or used any activities like this before, I was curious to see how it would turn out [1]. Overall, I enjoyed watching the student's videos and leaving them feedback [2]. I noticed that some students were telling jokes or having fun while doing the videos, so I encouraged that behavior [3].

This testimonial emphasizes three key elements of these activities: 1) the originality of the activities, even new for the instructors; 2) the use of these activities for formative assessment in order to provide actionable and timely feedback to their students; and 3) the comfortable environment of these activities, which allowed students to play and have fun while engaging with the language, thereby increasing motivation and lessening anxiety[32].

As has been discussed throughout this dissertation, both students and instructors seemed to have a preference to use Zoom to carry out activities of this nature. This may be in part due to their familiarity with Zoom as a technological tool for learning and their lack of experience in using WhatsApp. It seems the only initial friction specific to students in the Zoom group was sorting out a recurring schedule that worked for the group. However, once they arranged this, the activities progressed smoothly throughout the quarter.

[32] As a reminder, Instructor #1 taught in both groups, Zoom in Fall 2022 and WhatsApp in Winter 2023. The quote above comes from her experience with the Zoom group.

In contrast, the treatment group members were all new to WhatsApp, and thus had to go through the process of downloading a new app, getting familiar with the user experience, and learning how to export the text chat (these instructions were included in their activity instructions). In sum, the novelty of a new tool, as well as utilizing a more informal platform (text messaging on one's mobile device) seemed to create a sense of uncertainty and apprehension in the students, which should be addressed by a well trained teacher and consistent coaching throughout the academic term.

6.2.5 Task design of the Communication Activities

One of the most prominent themes to emerge from this study was the importance of intentional task design. The outcome of this study highlights the importance two specific elements: 1) designing tasks so learners primarily focus on meaning, rely on their own linguistic resources, work towards filling in a 'gap' in information, and draw from a clearly defined outcome other than the use of language (Ellis, 2009), and 2) aligning them with the modality the learners are using to complete them.

First, in addition to instructors implementing these best practices in task design, it is crucial for them and researchers to clearly communicate task details, including objectives and target language skills, in research studies. This ensures comprehensive processes and facilitates balanced study comparisons for meta-analyses (Lin, 2015). Having a more systematic approach to task design ultimately benefits learners more (Lin, 2015, p. 269). In a metaanalysis of task type and TMC for L2 oral proficiency development, Lin (2015) reported that the primary researchers most frequently employed opinion-exchange tasks and jigsaw actually produced a negative effect on oral performance. Opinion exchange was the most prevalent type of task used to elicit communication between L2 learners and the tasks that were most likely to trigger negotiation and prompt output, such as jigsaw and info gaps (p. 279) were rarely used. Having a

variety of tasks in this present study (e.g. info-gap, opinion exchange, and decision making) allowed learners to participate in different types of exchanges, thus allowing them to engage in different linguistic strategies. Further, the task variation gave the principal researcher insight into how learners reacted to the tasks, both in what type of language they produced, task difficulty, and which ones they preferred. The latter data informed future iterations of the Communication Activities, which have been developed for continuous integration into the SPA 3 course curriculum. It is essential to offer a variety of task types, as well as intentionally incorporate the task type into the task design.

Second, our testimonials point to modality as being important in designing tasks. It seems that, especially with a mode as informal as text messaging, learners are sensitive to the task that they are asked to carry out within this modality. For example, asking learners to text about more academic, or classroom based, content in a semi-controlled manner seemed a bit odd and awkward to learners. It might be more appropriate to design activities and tasks that more accurately reflect how language is used and what topics are frequent within the actual modality of text messaging. For example, the pre-study questionnaire asked questions about texting frequency and purpose[33], but future research should ask questions more targeted to the learner's personal and professional interests and goals.

Although they were intended to facilitate a social and informal style of communication, the structure of the CA still may have been too rigid to be considered "social" and perhaps seemed more business- or homework-style. It seems for this particular group, tasks which centered around a more social topic and elicited more short turns may have been more well received by this group of learners. For future similar studies, asking students to participate in a survey about what they text about, or even drawing from pre-quarter student get-to-know

[33] See questions 14-19 of the language background and demographic survey found in Appendix A.

questionnaires may provide helpful insight into what to include in the task prompts. This finding that the task should match the tech and vice versa, reflects Principle 8 of Stockwell and Hubbard's (2013) principles for MALL implementation: Let the language learning task fit the technology and environment, and let the technology and environment fit the task (Stockwell, 2016, p. 304).

Designing effective and pedagogically sound tasks before the selection of the tool is a necessary practice. Instructors and curriculum/material designers must remember that it is a well-designed task that will be the impetus of the L2 oral communication (Morris & Blake, 2022), and ultimately any L2 learning, not necessarily caused by the tool itself. However, the data from this study points towards a preference in modality to carry out different tasks, it should not be assumed that the same task will be as effective in one mode as it might be in another.

Communication style and modality preference is another topic worth briefly discussing as it relates to student engagement in the Communication Activities carried out by the WhatsApp group. If a participant was not already a frequent texter, they may produce minimal inputs such as "yes" or "no", perhaps discouraging exchanges with their language partner (Lai, 2016). As noted above, the majority of participants (75%) reported *social* as their primary purpose for texting, which Lai (2016) indicates that people who treat a text messaging platform as social would really try to use the language in their daily lives (p. 287). The prompts and objectives of the CA were not a true representation of how social language could be constructed in a real-life dialogue between users of language. What it means to be a social texter, the texting behavior of this particular group (as represented in the CA), and the task design ultimately was not well aligned. Lai (2016) also reported that students tended to chat about topics they were interested in, such as sports, food, music, travel, news, etc. (p. 287). Selecting their own topics of interest is

key in elevating motivation, and one of the driving forces behind PangeaChat[34], a language learning platform where users learn the language through texting their classmates and friends.

This present study also had the challenge of aligning learning objectives and task design with a modality that was perhaps not the most well-suited for these objectives. For example, CA *12.1 Ecotourism Practices* asked learners to compare ecotourism practices and decide on what elements they would add to an infographic of the "Top 5 best ecotourism practices today" (decision making). CA *13.1 Cadena de historias* asked students to co-create a 10-line story (narration). While these activities are collaborative opportunities to co-construct meaning and have a clearly defined end goal, they may not be totally representative of how undergraduate students engage in text messaging. Despite this, some activities may have responded to that challenge more effectively than others. For example, CA *8.2 ¿Cómo fue el restaurante?* tasked learners to discuss what they had eaten the night before at a restaurant and provide a review of the experience (opinion exchange) and *14.2 ¿Qué obra de arte?* asked students to select a piece of art and take turns asking questions in order to guess which piece the other had selected (information-gap). For future considerations of using WhatsApp for language learning, activity designers should consider ways to integrate topics of interest to the students, even if they are perhaps outside of the curriculum.

Other topics worth briefly mentioning include the pairing of the dyads of learners and the influence of TMC as considered a hybrid form of discourse, in that it possesses features of both spoken and written discourse. While there is no ideal way to pair learners for these activities, some measures can be taken to be more intentional about student pairing, encouragement and accountability. Some ideas might be changing the grading structure or modifying the tasks to be more dynamic and reflective of real life situations. Instructors should also be aware that pairing

[34] https://pangea.chat/

dyads may be different each time they teach the course or implement the activities since groups of learners change from one course to the next.

This work draws on the theoretical foundation that classifies text messaging as a hybrid form of discourse, blending features of both spoken and written communication. As a result, questions regarding the impact of synchronicity and asynchronicity emerge. Although the Zoom group participated in synchronous face-to-face oral communication via a video conference software, the WhatsApp group had more autonomy to engage in either temporal aspect. A quick review of the timestamps on the WhatsApp conversations, as well as student testimonials, indicate a preference for synchronous conversations, however a few outlier examples reveal otherwise.

In another study exploring effects on synchronous and asynchronous TMC on oral production of L2 German, Abrams (2003) reported that the synchronous group produced more language than the asynchronous group. In a further investigation of this present study, it would be useful to capture the timestamps from the WhatsApp dialogues, and compare learners who produced more asynchronous or synchronous language with the Zoom group. This future study would then be comprised of three groups: 1) WhatsApp-asynchronous (majority of conversation has big delays between utterances), 2) WhatsApp-synchronous (majority of conversation has little or no delay between utterances), and 3) Zoom-synchronous. Assessment features would include the dependent variables already presented in this study (e.g. unique words and speech rate), but also mirror similar features from Abrams (2003) such as lexical richness and density and syntactic complexity found within the weekly Communication Activities dialogues.

Lastly, the asynchronous element embedded in carrying out the activities via WhatsApp provided learners with more planning time to produce their language, which can relieve some cognitive load and act as scaffolding for future language production activities (Morris & Blake,

2022; Payne, 2020). Payne (2020) further suggests using an asynchronous text chat before an oral face-to-face discussion can often result in a higher level of discourse in that latter discussion environment (p. 245). A modification of this present study could have all learners utilize WhatsApp for asynchronous discussion in preparation for a group Zoom conversation or in-class meeting. Synchronous text-based TMC may also afford L2 learners similar pre-task planning benefits, which may "result in more fluency, complex and accurate output" (p. 264). Regarding this present study, WhatsApp group participants who exchanged messages synchronously may have been at the same advantage as those who engaged more asynchronously, as it relates to cognitive load and communication planning.

The diversity of modern communication modes, such as text messaging, email, and social media, has blurred the previously clear distinction between asynchronous and synchronous modes of communication. Because communication modes now exist which are considered a hybrid form of discourse, as argued in this dissertation, this can make assigning one single temporal classification to the mode often challenging and/or no longer necessary or relevant. For example, O'Rourke and Stickler (2017) define synchronous communication as "dialogic communication that proceeds under conditions of simultaneous presence (co-presence) in a shared communicative space, which be physical or virtual" (p. 2). The authors include text-based chat systems in this definition. The researchers and author of this dissertation agree with O'Rourke and Stickler's (2017) inclusion of "mutual responsiveness or personal connection" (p.3) as support for including text-based TMC in the classification of synchronous communication. Thus, although there maybe milliseconds of time between each interlocutor's response, the "simultaneous occupancy of the communicative space makes SC [synchronous communication] a joint activity, in the sense that there is both individual and joint (mutually known) attention to unfolding meaning" (p. 3). This mutual attention in a shared point in time is

why we classify immediate turn taking, when users text back and forth in the same shared time, as synchronous text-based communication. Because of this, addressing the synchronous versus asynchronous texting behavior among users of WhatsApp could offer even more data to understanding the cross-modality transfer effect that happens across text-based TMC and speaking.

6.3 Conclusion

Morris and Blake (2022) highlight the need for instructors to share challenges and best practices of fostering L2 oral communication through TMC (p. 544), which is in part what this dissertation addresses. Although contexts vary among languages and institutions, offering insight into topics such as those presented in this study (e.g. task design, modality preference, partner motivation, and impact on measures of fluency) is a contribution to this important goal. Similar to what Lin (2014) noted about the importance of researchers elaborating on task principles and explaining task design processes, sharing objectives and findings can also support and build on past research, should drive future research, as well as inform data-driven/based L2 learning material development.

Among the literature of mobile-assisted language learning (MALL) research, especially in the realm of text messaging, there is less data extracted from learners engaging in mobile learning activities and communication in a naturalistic environment. This study aimed to contribute to this gap by capturing language use in a naturalistic context. However, it cannot be considered truly naturalistic because learners knew they would be turning in their dialogues, the observer's paradox must be taken into consideration when reflecting on these results. Lin (2014) suggests that elicited data are superior to naturalistic data, although the only reasoning provided suggests that it is due to the high number of elicited data that exists over naturalistic data, which may have skewed the results. It is a challenge to request completely natural, unaltered text

messages from students to be used for learning and research purposes. If students were asked to provide messages after the fact (as was the case in Jones (2020)), there is no way of knowing if students altered the messages in any way before submitting them for analysis. Although researchers and instructors could always manage the data extraction on behalf of the student, this seems to contradict the goal of developing learner autonomy. More natural messages may have occurred in the separate messages that some participants mentioned they had created. Additionally, research capturing all participant messages could offer a more natural look into text messaging behavior. This was an integral part of the principal researcher's Master's thesis (excerpts are found in Jones, 2020) and may be expanded upon in further research to continue contributing and augment related data.

CHAPTER 7: Limitations, Implications for Teaching and Future Research, & Conclusion

This final chapter is dedicated to an outline of implications for teachers and future research and limitations of the study. Future considerations will provide insight and ideas about expanding on and extending related research on TMC. The primary limitations of the study had to deal with 1) small participant pool, 2) short duration of the treatment, and 3) lack of researcher control on other classes. The implications section offers a look at how this research contributes to scholarship, research, and teaching in the realm of second language acquisition (SLA) and technology-enhanced language learning (TELL), especially in the subfield of mobile-assisted language learning (MALL) and text messaging. In the final section we will make some general comments on the study.

7.1. Future Considerations

This research study revealed several considerations as they relate to future research and classroom applications. We propose the following suggestions for future research including revisions to this present study, as well as provocative inquiry for classroom instruction based on what this study has brought to light.

7.1.1 Communication Activities

As discussed in Chapters 4 and 5, the Zoom-based Communication Activities (CA) seemed to be more well-received by the learners and instructors in this study, than the WhatsApp modality. After undergoing revisions based on research and feedback, the CA have remained integrated into the course curriculum and continue to receive positive student evaluations. The iterations on the current CA have further taken into account the previously mentioned principles of task-based language teaching (Ellis, 2009) and the MALL principles set forth by Stockwell

and Hubbard (2013), where the task is closely aligned with the technology[35]. The updated CA also prioritize integrating topics that are more relevant to students' interests and keeping the language partners to a maximum of two students whenever possible. Keeping groups small is especially important because turn-taking can be challenging in video conference software, and even more so when engaging in one's second language (Payne, 2020). The current CA also includes a brief post-completion survey asking students to rank the activities in regards to their usefulness for language practice and development, as well as for motivation and enjoyment. These short surveys will help inform teachers and researchers how students respond to various task types. Instructors and researchers who do work in technology mediated task-based learning would benefit from grounding their theoretical and practical work on the fundamentals set forth by González-Lloret (2016) and Stockwell and Hubbard (2013) (see Hubbard (2016) for a simplified version of the principles).

Additionally, for future iterations of this research the number of turns counted in each CA dialogue could be included as a dependent variable in a correlational analysis between mode (Whatsapp or Zoom) and time (pre- and post-). In general, the participants in this study, high beginner second language (L2) learners of Spanish, liked the Communication Activities and indicated that they afforded the learners more opportunities to engage in the target language. Specifically the students in the Zoom group commented that they would have liked to have gotten immediate feedback, in order to become explicitly aware of their errors and to be able to immediately repair them. No student in the Zoom group provided any negative comments about the time pressures inherent in synchronous face-to-face speaking situations, in contrast to the observations reported in Blake and Morris (2022) that their students participating in

[35] Suggested reading: for further suggestions on effective design and sequencing of tasks in a MALL environment see Hockly, N. (2013). Designer learning: The teacher as designer of mobile-based classroom learning experiences. Monterey, CA: *The International Research Foundation for English Language Education.* Retrieved from http://www.tirfonline.org/english-in-the-workforce/mobile-assisted-languagelearning/

asynchronous video exchanges "remarked that video posts gave them more control and agency to check for errors and express what they wanted to without any time pressures" (p. 531).

These two studies seem to generally imply that language learners enjoy and find value in both asynchronous and synchronous video exchanges, and that perhaps each structure has its own benefits. For example, synchronous dialogic exchanges can provide students a more spontaneous two-way conversation experience, with an added time pressure leading to forced output (Swain, 1995), which is essential for second language acquisition. On the other hand, asynchronous monologic videos allow students more time to reflect and prepare their production, offering its own advantages. For instructors who may choose to implement synchronous two-way video exchanges, they may find benefit in integrating a post-activity reflection to the assignment, where the students watch a recording of their interaction and take note of various items, such as accuracy, triggers for communication breakdowns, and repair strategies.

7.1.2 A hybrid discourse model for language production

The data collected in this study, in combination with other related research in psycho- and cognitive linguistics, may also prove helpful in supporting the creation of a language production model that supports both speaking and writing. Although language models exist for both written (e.g. Flower & Hayes, 1981) and spoken language (e.g. Levelt, 1989), to the knowledge of the researcher, no such model exists that takes into account the hybrid nature of technology-mediated communication (TMC). Previous research regarding a cross-modality transfer effect from text-based TMC to speaking has drawn on Levelt's (1989) model of language production as a framework (Blake, 2009; Lin, 2015; Payne & Whitney, 2002; Razagifard, 2012). Although some researchers assert that the differences in cognitive processes employed in writing and speaking are minimal (Razagifard, 2012), highlighting that the main

difference being the mechanism for articulation (Blake, 2009; Payne, 2020), it seems prudent to advocate for further exploration in this area. To continue building on research, it is essential that researchers continue to explore any potential cognitive or processing differences that occur when users produce language in a hybrid TMC platform, such as text messaging. This understanding may offer valuable insights into cognitive and psycholinguistic changes caused by the use of technology over time, as well as the inevitable evolution of human development. Furthermore, the development of a hybrid language production model may pave the way to be used as a more updated framework for future studies in this realm.

7.1.3 Other suggestions for future research

With an eye to doing future research, the same groups of students should interact with both modalities over the course of the academic term. The inquiry of that study would shift the focus from exploring a cross-modality transfer effect of texting to speech to exploring the differences among modalities (video v. text messaging) including learner preference, skills developed, and task design. Moneypenny and Aldrich (2018) assert that there is a paucity of scholarly investigations pertaining to students completing course requirements in different modalities, such as face-to-face or online. Although the context of Moneypenny and Aldrich varies from this present study, in that the authors explored modality of a full course (e.g. all online, all face-to-face, some online, some face-to-face, or transfer from another university), any comparison of modalities for language learning, whether it be for an individual assignment or entire course, would be beneficial to the scholarship of language learning.

Future studies should include a question in the pre-study language and technological background questionnaire about how participants use their mobile device for learning. It would be helpful to understand what types of activities or applications learners are already using for

language learning on their smartphones, such as YouTube, language learning apps like Mango Languages[36] or Duolingo[37], or online translators and dictionaries. This can shed light on the students' level of familiarity with utilizing mobile applications or text messaging for language learning (e.g. WhatsApp audio message, messaging among friends, or messaging apps for language learning like PangeaChat[38]), which can provide researchers and instructors an understanding of a student's existing level of fluidity in a language or guidance for language coaching.

Finally, although the temporality (asynchronicity versus synchronicity) of the WhatsApp group was not included in the dependent variables in this present study, because of the time stamps available on the WhatsApp dialogues, measuring such an effect would be possible, although as an estimate. Exploring the influence of those dyads that engaged in their tasks more immediately versus those who took time throughout the day to complete the task could have meaningful implications for the effect of temporality on fluency in a text-based TMC environment.

7.2 Limitations

The first limitation, and potentially the most impactful one, was the small sample size. The small pool of participants was primarily caused by 1) an academic worker strike, 2) participant attrition, and 3) the requirement for the speech recordings to be done at home. During the first quarter of this study, there was an academic worker strike on campus and the majority of the Spanish classes did not complete the quarter, which resulted in a loss of approximately 5 weeks of classes. This impacted the number of assignments turned in and exams taken, including extra credit assignments (a primary motivation for many participants in this study). This resulted

[36] https://mangolanguages.com/
[37] https://www.duolingo.com/
[38] https://pangea.chat/

in the principal researcher needing to collect data the following quarter. However, only two course two sections were available for data collection that second quarter. Second, as may be common in empirical student-based studies, some attrition is inevitable. Because the initial demographic and language background survey was completed while the primary researcher was visiting classes in person for recruitment, there was almost a 100% return rate. However, because the pre- and post-audio recordings were required to be done at home, due to limited class time, very few students followed up on this task and did not turn in the audio recordings, thus were not eligible for the study. Initially the principal researcher hypothesized that the participant pool would be about 80 students. This was based on the average enrollment in this course series. However, due to the reasons described above, the end result was 25% of the initial expected number of participants (n=20). Because of this, we decided to include more qualitative data and in-depth observations through the case studies (as shown in Section 5.5). As Kern (1995) points out, the small sample size and descriptive nature of his study do not necessitate a formal statistical analysis and making generalizations to other populations should be done with caution (p. 463). This same caution should be exercised in generalizing the results of this present study, as well. A more robust sample size can help increase reliability of the data, as well as any potential impact of data on the field, which may serve as an impetus to replicating and/or expanding this research study in the future.

Second, a 10-week long study is generally not enough time to change linguistic behavior in most learners so as to show substantial gains in most linguistic features. This is especially true for finite features such as the five specific elements of fluency assessed in this study: total words, unique words, speech rate, overall fluency, and comprehension impeded. However, due to the academic system that the class was enrolled in, the time allowed for both quarters of data collection was a maximum of 10 weeks. Future studies that may replicate this study, or portions

of it, may find it beneficial to consider a longitudinal 2-quarter study following those students who continue into the next Spanish class in the series or executing it at an institution on the 15-week semester system.

Third, the principal researcher did not have direct control or an influence on the outcome of the other course sections. This may have impacted the motivation, engagement, understanding of objectives, activity quality, and feedback quality and type from the instructors and students in the other classes. Although instructor variation is a welcomed part of teaching, a more thorough training on the Communication Activities and study objectives at the start of the quarter, as well as a mid term check in, would help make for a more cohesive understanding across all sections of the course.

A few additional study limitations are also worth mentioning. First, all study participants were new to using the WhatsApp messenger application. As with most technology, the first time users interact with a new tool there will be a steep learning curve as they work through discovering functionalities, best practices, and getting used to the user experience. Second, the assessment instruments that were employed to assess the participants' speech were monologic and done in isolation, while their treatment was a dialogic exercise done in collaboration with another student. Due to the time constraints and situational logistics of the class it was not feasible to require that these assessments take place during class time, especially since they were optional. Offering a space on campus for learners to come participate in a 2-person dialogue at the beginning of an academic quarter also poses affective risks in that students may not feel comfortable speaking in a second language with another student they do not yet know very well. Additionally, it is difficult to find a time and place that is convenient for all students. Perhaps in the future, the pre- and post- speech tasks could be carried out on a telecollaboration software like Zoom between two language partners.

Third, the speech elicitation tasks were also variable, thus making direct comparisons of results not completely reliable. For example, the nature of some tasks triggered more repetitive language use; and, although each student was presented with the same cartoon strip in Speech Task 2, the answers were variable as it allowed students to be creative with their language and create any storyline they wished. Finally, one of the goals of this study was to encourage naturalistic communication between students, hoping to capture language use on a mobile device in a naturalistic environment. Although students did complete the activities outside of class on their own devices, it should be noted that the data collected from the dialogues is not totally naturalistic due to factors such as the observer's paradox (Stockwell, 2022, p. 79) since the students knew they were turning the conversation in as an assignment. This is further corroborated by a few student anecdotes that communicated they had a separate chat going where they were planning their assignment chat.

7.3. General Implications

Overall it seems that mobile language learning is well received by learners and can offer a variety of teaching and research opportunities. However, there is a need for continuous refinement and experimentation in this mode of education. In general, students are not averse to using their mobile devices for purposes of language learning, but the tasks should be relevant and well defined, the objectives and instructions should be very clear, and continuous instructor support should be a part of the process. Although students seem to support mobile learning, they may also prefer to make that decision on their own. Perhaps they turn to their mobile devices with such ease and frequency because it is their own choice to do so when and how they want. This is worth considering when engaging in MALL research.

As such, further MALL research is warranted because each learning individual is unique and class preferences and styles shift with different groups of learners. Before implementing

MALL activities and research in a classroom environment, careful consideration should be taken to understand the dynamics and communication behavior of the present group. As it comes to mobile learning, practitioners and researchers should not only stick with one proven practice and should not be afraid to try new things. In sum, there is a need for more MALL research. Interdisciplinary mobile learning continues to make great strides in making learning and courses more accessible and flexible (Huls, 2022), and mobile *language* learning is a prominent part of this effort (Kessler et al., 2023; Loewen et al., 2019). The field needs to elaborate more clearly a flexible pedagogical framework for mobile teaching and learning.

Regarding text messaging for language learning, student experiences and perceptions infer that language learners of Spanish (or other L2s) are curious about utilizing text messaging to develop their language and culture skills. When employing text messaging in the language classroom, to support learner language skill development, understanding of the language mechanics, and to encourage motivation for participation, learners may benefit from text messaging training in the target language. In previous pilot studies handouts of Spanish *textese* were provided to the learners to encourage them to play with language, while also developing their language skills. This preparation could be extended in the form of showing different text language across different Spanish-speaking countries, highlighting language variation.

Second, technology-mediated communication (TMC) is constantly evolving. This study has added additional support to this fact, while also drawing attention to how fast TMC technologies evolve and the current multimodal nature of them. More and more TMC messaging platforms are more so including multimodal capabilities, such as images, memes, gifs, and emoji, as well as the ability to have video calls, record videos, and send audio messages (which WhatsApp includes). Instant messaging community platforms like Slack and Discord also include unique features such as huddles (Slack). It may be overwhelming for researchers and

instructors to consider the learning affordances of the multitude of platforms available to leverage for TMC, but these platforms are extremely popular among a variety of age groups and communities. Since its inception, TMC has been an attractive platform and topic of study in many subfields of second language acquisition and applied linguistics, including sociolinguistics, applied linguistics, discourse analysis, language change and evolution. The interaction afforded through these platforms is even more pertinent considering the ubiquitousness of these platforms.

Third, with respect to pedagogical concerns, turn-taking studies can point the way to designing effective tasks. For example, researchers can examine the quantity, quality, and content of each turn. These data can provide researchers and teachers with insight into 1) which tasks elicit the most linguistic production, and 2) aspects of task difficulty. This knowledge will help instructors and instructional material designers, especially those working in a task-based language teaching (TBLT) curriculum, select more targeted tasks for certain language forms and specific content purposes, as well as more appropriately align task difficulty with learner level.

Teaching approaches vary across different learning contexts: fully online, hybrid, or blended, the latter integrating technology into in-person instruction and homework (Saichaie, 2020). While online and in-person teaching necessitate distinct approaches and methods, there is room for overlap and adaptation. Many participants in this study may have spent up to two years engaging in fully remote learning, which suggests that they have a strong familiarity with video conferencing platforms like Zoom and corresponding approaches to learning. This prior experience with Zoom might explain a learner preference for the platform (over WhatsApp as seemed to be the case in this study). Transitioning technology, like Zoom, from a purely remote to a blended learning environment can still enhance student learning and engagement, when relevant modifications are made and repurposing of material is done. The pre-existing prominence of Zoom in learning might have influenced its inclusion in the study, highlighting

the value of synchronous video exchanges in language learning.

In light of what we have discovered in this dissertation, SLA frameworks of interactionistism and socioconstructivistism are still powerful frameworks for these new platforms. Although a fresh look at these perspectives can be a multimodal or multiple skill approach, such as “multimodal interaction”, “multi skill interaction”, “multimodal socioconstructivism”, “multiskill socioconstructivism”. Researchers should also feel inspired to explore these realms using more contemporary approaches such as considering teaching as a design science (Laurillard, 2012). However, what seems most pressing at this time is to consider theoretical frameworks that can not only support such a dynamic space as TMC, but also ones that account for human-machine interaction, such as an ecological framework to language learning (Godwin-Jones, 2021), technoconstructivism (Spodark, 2008), and concepts such as ergonomics and complex adaptive systems as discussed in Caws and Hamel (2016). Caws and Hamel (2016) propose drawing on ergonomics as a framework for looking at what the learner does when interacting with a technology-mediated tool as a way to advance CALL design and improve interactions (p. 18). This approach also seems compatible for exploring HMI between learners and generative AI tools in communicative learning tasks (further described in the following section). Exploring HMI from an ergonomic framework can offer insight into user and machine behavior during interactive tasks which could offer valuable contributions to user experience (UX) and learning design within a CALL environment. Additionally, Schulze and Scholz (2016) argue that “learner-computer interaction”" (p.65), which we frame as human-machine interactions, are complex adaptive systems because they include dynamic language learning processes, among various other actors– learners, instructors, and technological hardware (p. 65). The interaction that occurs between a human learner and a technological tool like generative AI is adaptive in nature, and when guided by an appropriate communicative

language learning task, drawing on a complex adaptive systems perspective can offer valuable knowledge into the continuous processes of second language development. More specific ideas about generative AI as they relate to this research study are discussed below in Section 7.4.

7.4. Artificial Intelligence

Given the study's focus on communication technologies, human interaction through TMC, and technology-enhanced language learning, a nod to the role of artificial intelligence (AI) is in order. We are thinking of language models like Claude, ChatGPT, CoPilot, Gemini, and Lambda, and their interactions with language learners. Human-machine interaction (HMI) has evolved dramatically in recent years, shifting from mere input by the user to a scripted or automated output by the machine. One such relevant example is tutorial CALL (from the earlier years), which relied on string-matching algorithms to provide students with further guidance or feedback, but they were not always the most reliable (Blake & Guillen, 2020, p. 123). Advancing on the tool was iCALL (intelligent computer-assisted language learning) which provides learners with "helpful feedback via limited artificial intelligence and corbus-based routines" (p. 123). This approach creates a database collecting and tracking learner responses to ultimately match the feedback with predicted commonly asked questions and feedback using sets of limited parsing strategies, not just string matching comparisons (p. 124). The emergence of generative AI systems such as ChatGPT, Gemini (previously Bard), and Dall-E, has pushed the "intelligence" of iCALL to a whole new level.

A comprehensive discussion of the subject of generative artificial intelligence (AI) as it relates to TELL and MALL is beyond the scope of this paper, however it should be considered the next step in research that involves technologies, interaction, and language learning. New technologies enabling language learners to have interactive conversations in any language and on

any topic, while receiving individualized feedback, are reshaping language learning, theoretical frameworks, and methodologies in teaching and research. For instance, the ChatGPT[39] mobile app alone offers an individual the ability to text and voice chat, in real time, at any time and place the learner desires, and receive realistic responses. This contemporary environment very much reflects the Communication Activities and language partner design of this present study, although replacing one of the human learners with an AI language partner. OpenAI's large language model allows the user to set a response voice of their preference and engage in a variety of communicative interactions, which are followed with directly related feedback; and, with proper prompting by part of the user, the AI tool can correct the user on their use of language and offer explicit feedback. This mobile friendly, conversational assistant is just one valuable resource for research in human-machine interaction and mobile assisted language learning research. While the platform WhatsApp (as was used in this research study) also offers voice and text messaging, perhaps the next phase of this research is to examine the same dynamic, but among a learner and generative AI, as they collaborate on completing learning tasks.

The integration of generative AI with interactive language learning tasks like the ones mentioned in this dissertation (the Communication Activities), represents a significant direction in application and research. This is because learners can engage in the same type of activity, although paired with an AI companion insead of a human language partner, while leveraging many of the same benefits afforded in conversational task-based interaction. Advantages of integrating the AI component include an adaptive-learning conversational companion which dynamically responds to the level of learner's input. For example, on one hand, drops in the learner's language accuracy, knowledge, and metalinguistic questions may result in the AI

[39] https://chat.openai.com/

mirroring that lower level. On the other hand, AI may react to advanced language use by acting as a "more capable peer" (Sadler & Dooly, 2022, p. 320) and pushing the learner to a level just above what they can do on their own, which may warrant research on how human-AI interaction can create a Zone of Proximal Development (ZPD), a key component to a sociocultural perspective of language learning (van Compernolle, 2022). Furthermore, integrating an AI conversational companion would address some of the challenges mentioned in this paper such as lack of motivation and a delayed response time from the interlocutor. This is because generative AI tools, such as ChatGPT, Claude, and Gemini can be accessed at any time and never tire of responding to input (with the exception of unexpected "hallucination" phases (Chowdhury, 2024)). Replicating this current study by having learners complete their interactive, communicative tasks with a generative AI tool, instead of a human language partner, is an exciting avenue for future research.

7.5 Conclusion

We have looked at the effect of text messaging on second language (L2) oral fluency of non-native speakers of Spanish. This study examined the issue drawing from both quantitative and qualitative measures, within a semi-controlled group of 20 high beginner learners of Spanish. This study did not find evidence that supported the primary hypothesis of a cross modality transfer effect between text technology-mediated communication and L2 oral fluency. However, it is important to note that, in comparison to the Zoom group, the WhatsApp group performed on par with the Zoom group with respect to measures of fluency, including total words, unique words, speech rate, pauses, and overall fluency and comprehension impeded.

This study yielded two significant findings. First, both groups demonstrated slight improvements in speech rate, irrespective of modality. Second, within the Communication

Activities, participants displayed a preference for video conference software, contrary to the researcher's initial assumptions, while exhibiting a less favorable response to the WhatsApp activities. Furthermore, this study endeavored to challenge the prevailing bias within the social sciences, that publication typically prioritizes statistically significant outcomes (Plonsky & Oswald, 2014). The present study points towards a student preference for completing communication homework activities using Zoom, which diverges from the initial expectation that students would prefer WhatsApp. Although it should be noted that these findings are specific to this small set of data, and further research should be conducted. These unintended implications offer practical utility for instructors and curriculum designers, for example in the design and implementation of communicative language tasks, and adds value to educators beyond merely affirming a research hypothesis.

The researcher has supported the use of mobile devices, specifically text messaging, as a platform to develop oral language skills. Theoretical foundations in sociointeractionism and the argument for text messaging as a hybrid form of discourse illuminate the affordances of text messaging in developing L2 fluency. This mode of communication enhances L2 fluency by enabling learners to engage in target language interactions, collaboratively construct meaning with their interlocutors, and work towards shared goals. Text messaging provides an informal, low-stress environment that accommodates both asynchronous and synchronous temporal aspects, making it a valuable tool for language learners.

The large body of related research, as discussed in Chapter 2 and throughout this dissertation, exhibits a notable degree of heterogeneity in its approach, encompassing a wide range of scope, methods, and findings. From the literature previously discussed, it is evident that there is a scarcity of research that explicitly investigates a potential cross modality transfer effect between text messaging and oral skills in L2 Spanish. This study aimed to contribute to this

identified gap, especially emphasizing quantitative fluency variables in Chapter 4 and qualitative data through exploring learner experience and perceptions in Chapter 5.

Morris and Blake (2022) emphasized the potency of mixed (or multiple) methods studies in yielding comprehensive and compelling outcomes (p. 537). They argued that advancing the field necessitates research that supplements quantitative assessments of linguistic skills with qualitative insights into learner experiences and perceptions. This dissertation aligns with this perspective by incorporating both quantitative data and qualitative measurements.

> As language researchers and practitioners, it is both our privilege and responsibility to adapt to the ever-changing needs of our students and harness the present and future digital tools to maximize learners' social interactions in the target language, as this, in essence, is what makes us human. (Morris & Blake, 2023, p. 546)

This dissertation has endeavored to respond to all elements alluded to by Morris and Blake. While drawing on existing technologies, pushing boundaries in creativity pedagogy, and looking forward, the findings of this investigation enrich the evolving domain of mobile-assisted language learning, specifically leveraging text messaging for L2 Spanish development and acquisition. With the ubiquity of mobile devices and text messaging, and the demand for accessible, low-cost, interactive language learning applications, there is a compelling opportunity for the development of innovative learning activities that leverage these tools (e.g. mobile devices), and platforms (e.g. text messaging) and, now given recent innovations, the affordances of generative AI.

This study also highlighted drawbacks of these platforms for language learning, and any potential limitations should be addressed in future research, teaching material, and application

development. The primary conclusions of this study affirm the benefits of practice with the target language outside of class using a variety of technological devices. However, more research, especially quantitative measurements, is needed to support more generalizable claims about the discrete effects. To conclude, our study makes a pertinent contribution to the volume of empirical data to a pertinent and fundamental area of inquiry within the domains of technology-enhanced language learning, educational technologies, and language acquisition.

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APPENDIX A: LANGUAGE BACKGROUND QUESTIONNAIRE AND DEMOGRAPHIC SURVEY

Thank you for your interest in participating in this study on language learning and technology!

Investigator: Lillian Jones

Introduction and Purpose You are being invited to join a research study. This study is being done to understand the effects of technology-enhanced language learning on the second language skills of learners of Spanish. If you agree to be in this research, you will be asked to 1) complete a consent form and pre-quarter language background and basic demographic survey, 2) submit pre-quarter oral recordings (based on a speech elicitation task), 3) complete a post-study experience survey, and 4) complete post-quarter oral recordings (based on a speech elicitation task). You will also be invited to complete an optional Exit Interview. Your taking part in this research should take about 30 minutes at the beginning of the quarter, and another 30 minutes at the end of the quarter. This research study also includes analyzing the data produced in the weekly course activities called Communication Activities.

Taking part in research is completely voluntary. You are free to decline to take part in the project or you can stop taking part in the project at any time. Questions If you have any questions about this research, please feel free to contact the investigator at liljones@ucdavis.edu.

When you take part in this research you will be (audio) recorded. The recordings will be rated and possibly transcribed, however your name and any identifying information will be removed from the recording prior to any data analysis which may include rating and/or possible transcription.

This study is optional, ungraded, and will not affect your grade in this class nor any other class you take or have taken. All data you provide in this study will be anonymized prior to any data analysis and presentation. The IRB Net ID is 1958052-1.

1. Consent 1 - I consent to participate in this study and understand that the information I provide may be used in this study of foreign languages. This may include informing general research and practices, as well as being presented at conferences and presentations.
2. Consent 2 - I understand that items I produce for the class in which this research is taking place may be used for research and anonymous data analysis. These items include materials such as this survey, the post-quarter survey, text messages produced solely for class purposes, and audio recordings. Please type your full name to confirm your consent in the study. As a reminder, all identifying information will be removed from the following survey during data analysis.
3. How do you identify yourself in regards to your Spanish language background?

4. How many years have you been formally studying Spanish? (e.g. the number of courses/years you have taken Spanish up until now)
5. Have you been studying any other languages formally?
6. If you checked yes above, please indicate which other language(s) you have studied formally, and for how long? e.g. Italian, 3 years
7. What is your primary language? (e.g., the language with which you grew up primarily speaking in the home.) Please list all languages if more than one.
8. Do you speak any other languages? Please list all that apply.
9. Please rate your own Spanish language skills according to ACTFL guidelines (American Council on the Teaching of Foreign Languages) (https://www.actfl.org/resources/actfl-proficiency-guidelines-2012/spanish).
10. You can refer to the graphic below if that is helpful. - Spanish language skills
11. At what age did you receive your first Smartphone? / How long have you been using a smartphone?
12. What is your current smartphone operating system? - Selected Choice
13. What is your current smartphone operating system? - Other - Text
14. Approximately, how many text messages do you send on a typical weekday?
15. Approximately, how many text messages do you send on a weekend (Friday, Saturday or Sunday)?
16. What is your primary application for messaging? - Selected Choice
17. What is your primary application for messaging? - Other - Text
18. Do you use predictive text? (both with English or Spanish)
19. What would you say is your main purpose for your text messaging?
20. What is your gender?

APPENDIX B: COMMUNICATION ACTIVITIES

Fall Quarter 2022:

Communication Activity - 11.1 - Fashion

Scenario: You and your partner are hosting a podcast about current fashion trends. As you map out the outline of the podcast content, you need to make certain decisions as to what your podcast conversation will include. Consider items such as style, accessories, articles of clothing, what is trending among men/women/non-binary, where this trend is occurring, examples of the trend (for example, famous people shopping at Target wearing such a trend), etc.

Task: Your task is to create an outline of the podcast, according to the topics above. Please make sure to include an opening, body of the podcast (with at least 5 main elements), and a conclusion to the podcast.

Once you have agreed upon an outline of your podcasts your task is complete. You do not need to create the outline in a WordDoc, just ensure you have discussed it and arrived at an agreement in your conversation.

*Please use as much Spanish as you can in your conversation.

Communication Activity - 11.2 - Choosing an outfit

Scenario: You and your partner are going to decide on an event for your instructor to attend and create an outfit that they have to wear. Communicate with your partner about where your instructor is going, what they are going to wear, why you think they should wear these items, what colors the clothes are, etc.

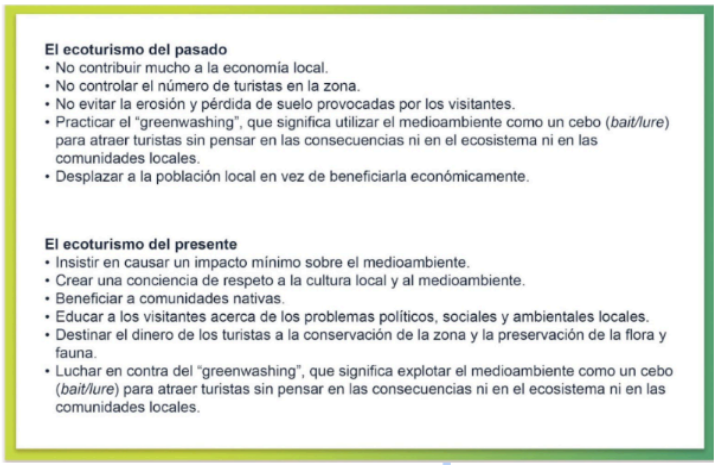
Task: Decide on the event and the outfit. The outfit should include at least 1) shoes, 2) main outfit (dress, pants/top, shorts/skirt/top, 3) a hat/glasses/purse/wallet and/or other accessories, and the 4) colors and/or patterns of these items.

Once you have agreed upon the event and the outfit your task is complete.

*Please use as much Spanish as you can in your conversation.

Communication Activity - 12.1 - Ecotourism practices

Scenario: With your partner, you are going to compare ecotourism practices from the past with the practices of the present. Your ultimate goal would be to create an infographic with the top 5 current ecotourism practices.
Instructions: Read the list of ecotourism practices from the past and those that are employed today. Discuss the differences that seem most interesting or surprising to you all. With your partner, answer the following questions:
• Do you all agree that the current practices are commonly practiced? Why or why not?
• What other practices that you observe in your current community are not listed here?
• What revisions might you make to the list to more accurately reflect the practices that are in place in your community?
• What practices would you add?



[This image is taken from the student's SPA 3 curriculum materials. It is assumed they will be able to understand the text in Spanish. And they will have the materials and resources to look up any unknown words].

Task: Decide on what elements you would add to an infographic of the "Top 5 best ecotourism practices today".

Once you have agreed upon the elements you would include in the infographic your task is complete. You do not need to create an infographic, just determine the elements you would include.

*Please use as much Spanish as you can in your conversation.

Communication Activity - 12.2 - Past experiences

Instructions: Individually think about one of your favorite past times or an event that happened when you were young. For example, an event or experience that you would do often as a young person. Or, for example, an event or experience that happened once in your life when you were young. Your partner is going to try and guess what this experience or activity was. They will ask you questions such as with whom you were with, what you were doing, how you were feeling, where you were, etc. And you will answer. They have three guesses to guess what your activity was. Some examples of questions you might ask are:

* ¿Dónde hacías la actividad?
* ¿Te mantenías en forma cuando hacías la actividad?
* ¿Cómo te sentías cuando hacías la actividad?
* ¿Con quién hacías la actividad?
* ¿Qué pasó cuando….?
* ¿Cómo reaccionaste?

[Students should be expected to be able to understand this level of Spanish. It is expected they will have materials and resources to look up any unknown words].

Task: Your partner is going to guess what your event was based on the information you provide through your questions and answers. Once both partners have guessed or shared what their experience/event was, the task is complete. Please each take at least 5 turns asking questions.

*Please use as much Spanish as you can in your conversation.

Communication Activity - 13.1 - Story chain

Instructions: With your partner, you are going to create a short story about an immigrant that came to the United States to study and/or to work. Take turns creating the sentences to work together to create the story. A "turn" is one sentence. Once each partner has contributed 5 sentences (the story is 10 sentences long) your story is complete. Use the vocabulary below to help guide your story. Think about what you know about immigration and also what you know from Finita's experience.

Task: You will create a story of at least 10 sentences about an immigrant that came to the United States to study and/or to work. You do not need to write out the story in a WordDoc. Once you have completed the 10 sentences in your conversation your task is complete.

apenas	emigrar	mejorar
asimilarse	ese, esa, esos, esas	mudarse
la bandera	este, esta, estos, estas	la naturalización
la caja	la frontera	nostálgico/a
el/la ciudadano/a	el gobierno	la paz
la comunidad	el hilo de identidad	provocar
cruzar	inmigrar	el recuerdo
de repente	el juramento	la tarjeta verde
dejar atrás	las lágrimas	la tristeza
deportar	la ley	volver a __

*Please use as much Spanish as you can in your conversation.

[This image is taken from the student's SPA 3 curriculum materials. It is assumed they will be able to understand the text in Spanish. And they will have the materials and resources to look up any unknown words].

Communication Activity - 13.2 - Role Play (una entrevista con Finita)

Instructions: You and your partner are going to role play and carry out a short interview between a reporter and Finita. Finita has grown up and is now an adult living in the United States. In this scenario, a news reporter from NPR is interviewing adults who immigrated to the United States as a child. One of you will be the reporter and the other person will be Finita. Decide amongst yourselves who will take each role.

Thinking about what you know about immigration and what you have learned through this unit, carry out a simple, fictitious interview based on what you learned through our class discussions, as well as drawing from your own knowledge and experience.

The goal is for the reporter to learn about the background and story of Finita, including how she was and what she did in her home country (Cuba) before moving, her motivations for relocating (why she immigrated), what the process was like, what happened, how she was feeling in the moment and during the process, and when she arrived to the United States.

Below are a few questions to help you get started. Feel free to use these questions in your interview, or you may also use other relevant questions you would like to ask.

For example,
1. ¿Cómo era tu hogar en Cuba?
2. ¿Cómo eras en Cuba? ¿Qué hacías habitualmente?
3. ¿Cuál fue tu principal motivación/razón para inmigrar?
4. ¿Cómo fue el proceso de inmigrar? ¿Cómo fue la experiencia de mudarse?
5. ¿Cómo te sentías antes de mudarte? ¿Cómo te sentías durante el viaje? ¿Cómo te sentías después de llegar a los EEUU?

Task: Interview Finita to understand her reasons behind immigrating and what the experience was like, as well as how she is feeling now. Once you have asked and answered at least five questions, your task is complete.

*Please use as much Spanish as you can in your conversation.

Communication Activity - 14.1 - Opiniones about art

Instructions:

1) First step - Read the following situation. Take a moment to think about and prepare your response. Then, take turns with your partner, discussing your reactions and opinions, and explain if you agree or not with each other's opinions and feel free to add any other relevant information.

Estás estudiando en un país de habla hispana (i.e. España, Argentina, Cuba, etc.) por un semestre y tu familia anfitriona (host family) quiere saber más sobre tu país (los EEUU). Contesta su pregunta con la mayor cantidad de detalles: ¿Qué tipos de arte son populares en tu país? ¿Por qué?

[Students should be expected to be able to understand this level of Spanish. It is expected they will have materials and resources to look up any unknown words].

2) Second step - decide on which work of art from your country you would suggest as a "must see" to your host family when they go to visit your country. The work of art can be a painting, sculpture, building, etc. Share with your partner what the artwork is, why you would suggest it, why you like it, etc. Are you and your partner in agreement? Why or why not?

Task: Discuss famous works of art in the United States. Decide on an agreed upon must-see work of art from the United States that you would suggest to your host family to see during their visit.

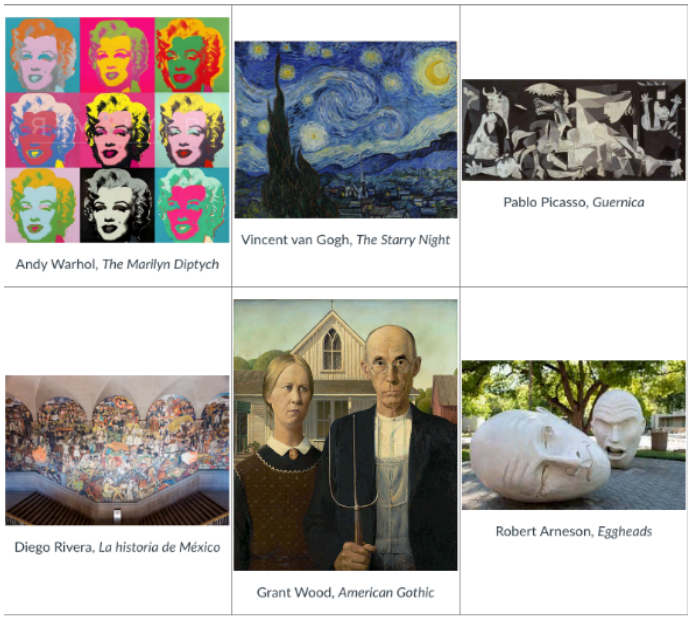
*Please try to use as much Spanish as you can in your conversation.

Communication Activity - 14.2 - What piece of art?

Instructions: Below are six famous works of art. The images include the name of the artist and the name of the piece of art. Individually, select one of the pieces of art from the image bank. Do not tell your partner which piece of art you have chosen. Individually, take a few minutes (3-5) to do some individual research online to answer the following questions about the piece. Make sure to jot down a few notes to remember the information (or keep the web pages open for your reference).

• ¿Cómo describes la obra de arte? (colores, textura, etc.)
• ¿Cuál es el estilo de arte?
• ¿De dónde es el/la artista?
• ¿Cuándo se terminó la obra de arte?
• ¿La obra de arte responde a un movimiento artístico, cultural, o político en particular? ¿Cuál?
• ¿De qué está hecha la obra? Y, ¿cuáles son algunas de las técnicas que utilizó el artista para crear la obra?
• ¿Cuál es tu opinión personal de la obra? ¿Te gusta? ¿Por qué sí? ¿Por qué no?

[Students should be expected to be able to understand this level of Spanish. It is expected they will have materials and resources to look up any unknown words].



After briefly researching, your partner will ask you the above questions, to which you will respond. Afterwards, your partner will guess which piece of art you have selected.

Task: guess which piece of art your partner has selected. Once each partner

has guessed correctly/revealed which piece of art they selected, your task is complete.

*Please try to use as much Spanish as you can in your conversation.

Winter Quarter 2023:

Communication Activity 1. Actividades de comunicación_introducción_y_preparación_

This quarter you will have the opportunity to connect with a language partner, a classmate from your SPA 3 course. Throughout the quarter you will engage in weekly communication activities designed to help you develop your Spanish communication skills, using real-life tasks and scenarios. In order to help you understand the objectives of these activities and get the most out of them to best support your learning, the activity below is designed as an Introduction and Preparation activity for these activities.

> To receive credit for this activity, please complete the following steps:
>
> 1. Watch this informational video about the objectives and best practices of these activities.
>
> 2. Read the infographics which highlight the general objectives and best practices of these activities.
>
> 3. Send your language partner a short message in which you 1) introduce yourself and 2) ask them one question. The question may be about the class, perhaps what they are looking forward to this quarter, where their interest in learning Spanish comes from, if they have traveled to any Spanish speaking countries, etc.
>
> 4. Take this short quiz to confirm you have watched the video, read the infographics, and understand the expectations for these activities.
>
> *To access all of the video information in writing, you will find the same information in the Actividades de Comunicación - Student Guide
>
> 5. Have fun!

Actividades de comunicación_8.1_¿Qué_comiste_ayer?_

Scenario: You are discussing what you ate yesterday with your friend. Your friend likes what you mention and is interested in learning how you prepared your food. Think of a meal you made yesterday (or recently), and consider the ingredients and the steps you took to prepare it. Share this information with your language partner. Once you finish sharing what you prepared and ate, some of the ingredients, and the steps you took to prepare the dish, your partner needs to guess if

you ate this for breakfast, lunch, dinner or a snack. Once you finish sharing and your partner guesses which meal it was, then switch it up!

Task: Once each language partner takes a turn sharing what they ate and how they prepared it, and the other partner guesses for which meal it was, your task is complete.

Below are a some examples of questions to help guide your conversation:

- ¿Qué comiste ayer? / ¿Qué plato es? / ¿Qué plato preparaste ayer?
- - Ayer comí…/ Ayer preparé…
- ¿Qué ingredientes tiene? / ¿Qué lleva el plato?
- ¿Cómo lo/la/los/las preparaste? / ¿Cuáles son los pasos para prepararlo/la/los/las?
  - Primero…luego…después…

  (*use "lo" if you are referring to a masculine singular noun, such as "un plato" (a dish), el pescado, el pollo, el pavo, etc.; use "los" if you are referring to a masculine plural noun such as los mariscos or los huevos; use "la" if you are referring to a feminine singular noun, such as la manzana o la naranja; use "las" if you are referring to a feminine plural noun, such as las frases or las uvas.

- ¿Te gustó? ¿Por qué sí? o ¿por qué no?

Now, it is your turn to guess for which meal your partner ate this food!

- ¿Comiste el plato para el desayuno/el almuerzo/la cena/una merienda? / ¿Preparaste este plato para el desayuno/el almuerzo/la cena/una merienda?

*Please use as much Spanish as you can in your conversation. Remember to use your Contraseña vocabulary and grammar guides to help support your conversation.

Actividades de comunicación_8.2_¿Cómo_fue_el_restaurante?_

Scenario: You have just returned from dining at a restaurant to celebrate your best friend's birthday and you are sharing your experience with your roommate. Individually, decide on the type of restaurant, the name of the restaurant, what you ate there, how the service was, who you were with, and if you liked or disliked the restaurant. Share this information with your language partner. Once you have both shared your experiences you will decide if you would like to go to that restaurant or not. With your language partner, take turns asking about each other's experience. One person will ask all the questions and the other will respond, then you will switch and the other language partner will ask all the questions. You can choose to discuss either a real experience you had or invent one! Be creative!

Task: Once each partner has shared about their dining experience, each classmate needs to decide if they will eat at the other restaurant or not. Tell your language partner if you are going to eat at

that restaurant or not, and briefly explain why or why not. Once you have both shared your experience and decide if you will go to the other restaurant your task is complete.

Below are a some examples of questions to help guide your conversation:

- ¿Dónde fuiste para celebrar el cumpleaños? / ¿Dónde comiste? / ¿Dónde (ustedes) celebraron el cumpleaños?
- ¿Qué tipo de comida es?
- ¿Con quién fuiste?
- ¿Qué comiste? (Mention at least one appetizer, a main dish, a side, and a dessert)
- ¿Te gustó la comida? ¿Por qué sí? o ¿Por qué no?
- ¿Qué bebiste?
- ¿Cómo fue el servicio? / ¿Qué tal el servicio? / ¿Cómo era el/la camarero/a?
- ¿Te gustó el restaurante?

*Please use as much Spanish as you can in your conversation. Remember to use your Contraseña vocabulary and grammar guides to help support your conversation.

Actividades de comunicación_13.1_ cadena_de_historias_
(same activity as above “Communication Activity - 13.1 - Story chain”

Actividades de comunicación_13.2_ Role_play_una_entrevista_con_Finita_WhatsApp
(same activity as above “Communication Activity - 13.2 - Role Play (una entrevista con Finita)”)

Actividades de comunicación_14.1_ opiniones_de_arte_
(same activity as above “Communication Activity - 14.1 - Opiniones about art”)

Actividades de comunicación_14.2_ ¿Qué_obra de_arte?_
(same activity as above “Communication Activity - 14.2 - What piece of art?”)

Actividades de comunicación_final_consejos_

What advice would you give to a beginning learner just starting their Spanish language learning journey?

Individually, reflect on your language learning journey, including this class and any previous courses you have taken or experiences you have had engaging in the Spanish language (for example, at work, traveling or studying abroad, speaking with family members, etc.). What has this journey been like for you? What experiences have helped you develop your language skills most? What methods of studying and language practice have been most effective for you? What

has been the biggest challenge? What has helped you overcome that challenge? You might consider your reading and listening skills, speaking and writing skills, as well as your knowledge and awareness of Spanish-speaking cultures.

Task: With your language partner, discuss the items above and work towards developing a list of advice you would give for a true beginner of Spanish just starting their language learning journey. With your language partner, decide on three pieces of advice you would give to a beginning language learner. Once you have agreed on the three pieces of advice, your task is complete.

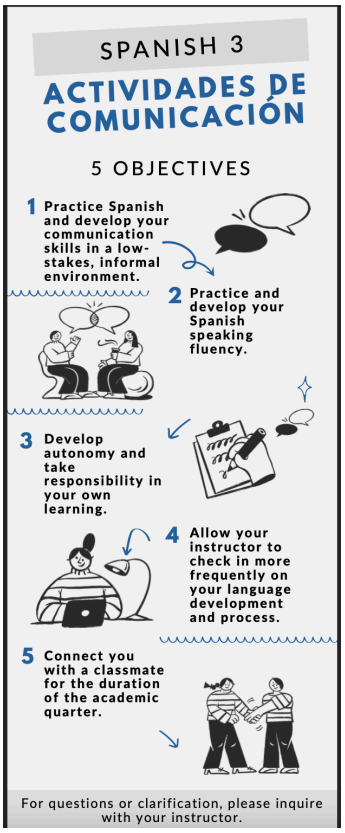
*You may use either English or Spanish for this conversation. The goal is to reflect and converse with your partner, so choosing the language in which you feel most confident may help you express your ideas most clearly.

APPENDIX C: LANGUAGE PARTNER PAIRING GOOGLE SHEET

These are your language partners for the *Actividades de Comunicación.* Please write your name in one of the yellow cells and remove the yellow highlight once you have done so. Please make sure you have connected with and exchanged contact information with your language partner by start of class on Friday, 01/13		
	estudiante 1	**estudiante 2**
Group 1	Please write your name here	Please write your name here
Group 2	Please write your name here	Please write your name here
Group 3	Please write your name here	Please write your name here
Group 4	Please write your name here	Please write your name here
Group 5	Please write your name here	Please write your name here
Group 6	Please write your name here	Please write your name here
Group 7	Please write your name here	Please write your name here
Group 8	Please write your name here	Please write your name here
Group 9	Please write your name here	Please write your name here
Group 10	Please write your name here	Please write your name here

APPENDIX D: TRAINING & SUPPORT MATERIAL FOR COMMUNICATION ACTIVITIES

1. SPA 3 - actividades de comunicación - infographic - best practices
2. SPA 3 - actividades de comunicación - infographic - objectives
3. Informational YouTube video



APPENDIX E: SPEECH ELICITATION TASKS

Instructions:

1. Please submit one separate recording for each part of this task, one recording for Part I and one recording for Part 2.
2. Please record yourself speaking in Spanish (in response to the task for about 3-4 minutes for each part).
3. Please email your recordings to Lillian Jones liljones@ucdavis.edu. Please put "SPA 3 - oral recordings - language study" in the subject line.
4. Your oral recordings will be stripped of any identifying information and anonymized for data analysis. Remember these tasks are optional and ungraded. Please just do your best!

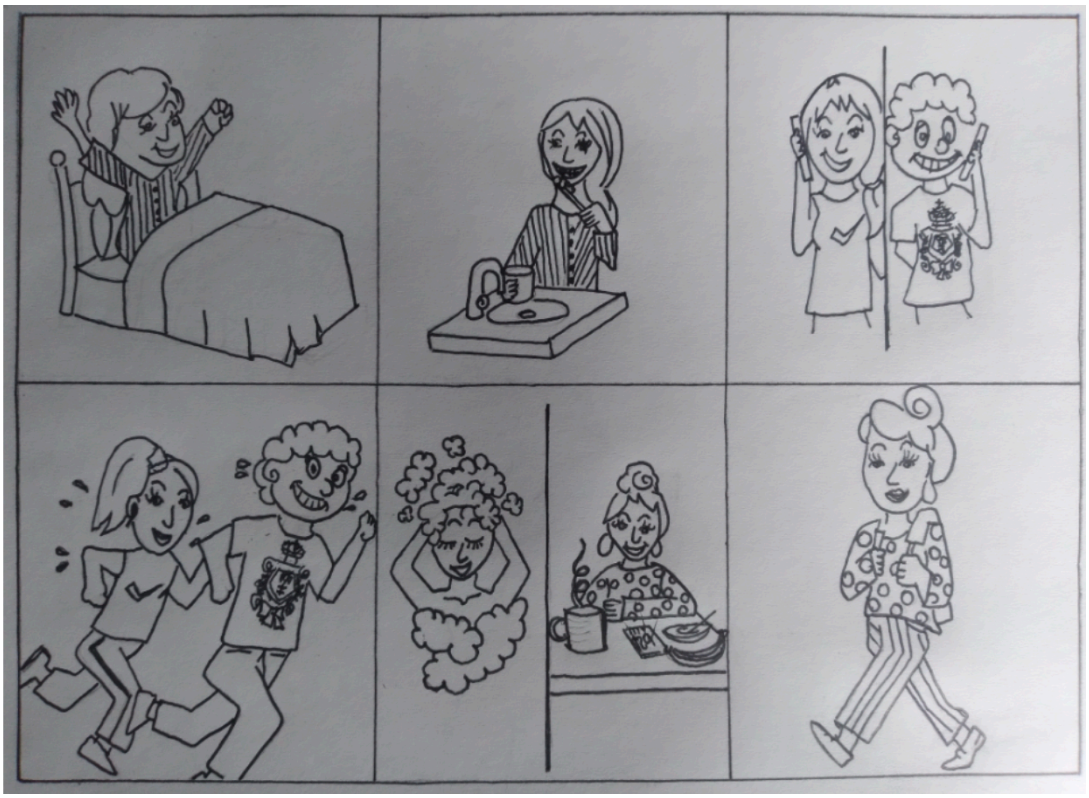
¡Gracias!

Part 1. Please select just **one** of the following prompts and respond to it in Spanish. Please speak spontaneously and as naturally as possible, and do not use any notes or a script. Please try to speak for about 3-4 minutes.

a) Prompt 1: In Spanish, please tell me what you do in a normal week.

b) Prompt 2: In Spanish, please tell me about your grocery shopping experience (logistics of transportation, food you buy, interaction with the cashier, how often you go, etc.)
c) Prompt 3: In Spanish, please describe your favorite coffee shop and why you like it. If you do not frequent coffee shops, please tell me about your favorite café, boba tea place, Froyo place, etc.
d) Prompt 4: In Spanish, please tell me about the last purchase you made in person (what was it, where you were, how much it cost, etc.)
e) Prompt 5: In Spanish, please tell me about one of your favorite hobbies or extracurricular activities you like to do (what it is, what you like about it, with whom you may do it, etc.)

Part 2. Please narrate (in Spanish) a short story based on the cartoon strip below. Please speak spontaneously and as naturally as possible, and do not use any notes or a script. Please try to speak for about 3-4 minutes.



APPENDIX F: STUDENT PARTICIPANT EXPERIENCE QUESTIONNAIRE

¡Hola! & Hello!

Thank you for participating in the study regarding Spanish language learning and technology. Would you please take 10 minutes to share about your experience? This will help inform future studies of this type, and may also inform other research carried out regarding the teaching and learning of foreign languages.

Q1 What helped you the most in developing your Spanish language skills during this quarter? (In this question you may consider activities that you did in class, homework activities outside of class, methods, strategies, assignments, etc.)

_____

Q2 How often did you practice your Spanish oral communication outside of class?

	Never (1)	Not often (2)	A bit (3)	Quite a bit (4)	Very Often (5)
How often did you practice your Spanish speaking skills outside of class?	o	o	o	o	o

Q3 What methods or modes did you use to practice your speaking skills outside of class?

_____

Q4 Thinking about the weekly communication activities you did with your classmate, *Actividades de comunicación*, please rate them on the following scale:

	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
The communication activities were useful in developing my Spanish language skills.	o	o	o	o	o

Q5 Thinking about the score you gave above for the weekly communication activities, please expand on your score here in the space provided. For example, how did the activities go for you? What were the benefits of the activities? (if any) What were the disadvantages of the activities? (if any) What aspects of the language did you practice most? (For example, language skills such as speaking, writing, reading & listening).

Q6 Overall, how PLEASANT was the communication and interaction with your Communication Activities partner?

	Very Unpleasant (1)	Unpleasant (2)	Average (3)	Pleasant (4)	Very Pleasant (5)
How pleasant was your interaction with your language partner?	o	o	o	o	o

Q7 Please expand your answer from the question above.

Q8 Overall, how USEFUL was the communication and interaction with your Communication Activities partner?

	Not useful at all (1)	Slightly unuseful (2)	Neither useful nor unuseful (3)	Rather Useful (4)	Very useful (5)
How useful was your interaction with your language partner?	o	o	o	o	o

Q9 Please expand your answer from the question above.

Q10 While completing the Actividades de Comunicación on WhatsApp, did you utilize predictive text in Spanish?

o Yes (often)
o Sometimes (a little, but not very often)
o No (never)

Q11 How would you rate your own Spanish language skills according to ACTFL guidelines (American Council on the Teaching of Foreign Languages) (https://www.actfl.org/resources/actfl-proficiency-guidelines-2012/spanish)

	Novice (1)	Intermediate (2)	Advanced (3)	Superior (4)	Distinguished (5)
Spanish language skills	o	o	o	o	o

Q12 Which language skill would you say you practiced and/or developed most over this academic term? Please rate them in terms of the "most developed" (4) to "least developed" (1). You must select only ONE number for each skill.

	1 (1)	2 (2)	3 (3)	4 (4)
Reading (1)	o	o	o	o
Listening (2)	o	o	o	o
Writing (3)	o	o	o	o
Speaking (4)	o	o	o	o

Q13 Is there anything else you would like to add?

_____

Please write your full name. As a reminder, this will only be used to link to your initial survey and will be coded and analyzed anonymously.

_____

Q14 Would you like to provide further feedback of your experience by performing an Exit Interview with the main researcher of this study?

An Exit Interview is an opportunity to chat in person (either via Zoom or in person) about your experience in more detail, to gain a further understanding of your experience.

If so, please select yes below and write your email address in the box below and the principal researcher will contact you for further information and to set up a time to speak.

o Yes (1) _____
o No (2)

Q16 I consent to the information that I submit in this survey to be used for research purposes. I understand any identifying information will be removed prior to data analysis. Please write your name in the box below.

I understand I also need to list my name in order to earn my potential extra credit by participating in this study.

_____

¡Muchísimas gracias por tu tiempo! / Thank you very much for your time!

APPENDIX G: INSTRUCTOR EXPERIENCE QUESTIONNAIRE

¡*Hola*! & Hello!

Dear Spanish 3 instructor:

Thank you for your support and participation in the study regarding Spanish language learning and technology.

I would like to ask about your experience engaging in the study tasks, especially in regards to the Actividades de Comunicación and your perception of your class' engagement with the Spanish language.

Would you please take 10 minutes to share about your experience? Your insight is invaluable to inform future studies of this type, my dissertation study and writing, and may also inform other research carried out regarding the teaching and learning of foreign languages.

In addition to this questionnaire, you will also be asked to participate in an in-person focus group at the end of Winter Quarter. This timeline is proposed in order to be able to discuss these elements in a timely manner, while many of the experiences and your thoughts may be fresh in your mind.

Thank you for your time and helpful insight.

Please never hesitate to contact me with any questions or comments.

Lillian Jones

liljones@ucdavis.edu

---

1. Section and course number

   *Note - if you have been involved in this study for more than one quarter, please fill out a separate survey for each class experience. For example, if you taught SPA 3 both Fall 2022 and Winter 2023, please fill out the survey once for Fall 2022 and again (one more time) for Winter 2023.

   Academic quarter: Fall 2022 ◯ | Winter 2023 ◯

2. Class section: _____

   *If you are unsure of your section, you may leave your name in the blank below and I can look it up in my notes. For example, 001, 002, 003, etc.

3. Name: _____

All identifying information will be removed during data analysis and future presentations and discussion. Thank you!

Section 1. Class

1. What modes or methods did you use to facilitate oral communication activities in your class?

   _____

2. Overall, how engaged were your students during in-class activities? For example, did students show active participation such as volunteering to respond to questions, active note-taking, small and large group discussions, attentive listening, focused reading, etc.?

   _____

Section 2. Communication Activities

As a reminder, the weekly communication activities were the homework assigned every Thursday with the goal to help students develop their conversational/communicative skills. If you need to, you can check out the following documents to remind you of the Communication Activities the students were assigned each week.

- Fall Quarter 2022
- Winter Quarter 2023

Please think about these weekly communication activities and answer the following questions:

1.

	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
The communication activities were useful for my students to develop their Spanish language skills.	o	o	o	o	o

2. Thinking about the score you gave above for the weekly communication activities, please expand on your score here in the space provided. For example, how did the activities go for your class as a whole?

3. What was the initial reaction of the students in regards to the Communication Activities? / What was their general attitude towards the activities? Did you notice a change as the course progressed?

4. What was YOUR initial reaction of the Communication Activities? / What was your general attitude towards the activities? Did that change as the course progressed?

5. What were the benefits of the activities? (if any)

6. What were the disadvantages of the activities? (if any).

7. What type of feedback did you give your students on the Communication Activities?

Section 3. Skill development of students

1. What do you think helped your students the most to develop their Spanish language skills during this quarter? (You may consider activities they did in class, homework outside of class, methods, strategies, assignments, etc.)

2. Which of the language skills do you think your students practiced and/or developed most over this academic term? Please rate them in terms of the “most developed” (4) to “least developed” (1). Please rate them in order of most developed to least developed.

You should select **only ONE** number for each skill.

	1	2	3	4
Reading	o	o	o	o
Listening	o	o	o	o
Writing	o	o	o	o
Speaking	o	o	o	o

Question 8. Is there anything else you would like to add?

Focus Group:
Question 9. You will also be asked to participate in a 50-minute focus group. The objective of the focus group is to facilitate a semi-structured discussion with guiding questions among the SPA 3 instructors in order to gain more insight into their perceptions and experiences with the Communication Activities. This focus group will take place the last week of Spring quarter 2023. I ask that all instructors participate.

I consent to participate in this focus group. I understand I may be audio- or video-recorded. I understand that this group is small and will be conducted in person, which may be too small to provide anonymity to participants. I understand that any information I share and provide during this discussion will be anonymized before data analysis and presented as such in future publications or presentations. Any comments or data shared will be pseudonymized, which entails replacing any identifying information about participants with pseudonymous or false identifiers.

Below, please check and type your name to provide your consent for the focus group.

☐ I consent. My name is _____.

_____

Question 10. Would you like to provide further feedback of your experience by performing an Exit Interview with the main researcher of this study? An Exit Interview is an opportunity to chat one-on-one with the researcher either via Zoom or in person about your experience in more detail, to gain a further understanding of your experience. Please write YES and provide your email if you would like to be contacted to set up an Exit Interview. Please write NO if you would not like to participate in an Exit Interview.

_____

¡Muchísimas gracias por tu tiempo! / Thank you very much for your time!

I consent to the information that I submit in this survey to be used for research purposes. I understand any identifying information will be removed prior to data analysis. Please write your name in the box below.

_____

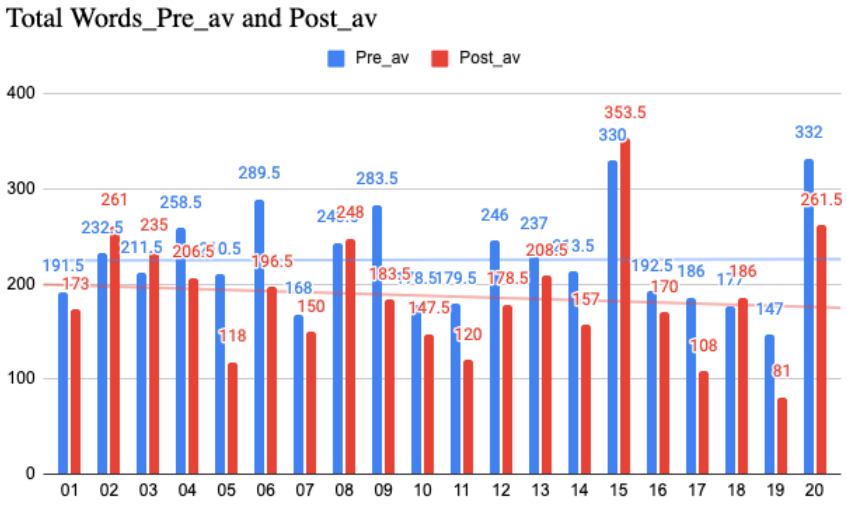
APPENDIX H. LIST OF DEMOGRAPHIC QUESTIONS ASKED TO RATERS

Español		**English translation**	
¿Cuál es su profesión?	● Profesor/maestro de español ● Profesor/maestro (de otra materia) ● Estudiante ● Otro	What is your profession?	● Spanish professor/teacher ● Professor/teacher (of another subject) ● Student ● Other
¿Cuántos años tiene?	● 18-24 ● 25-29 ● 30-39 ● 40-49 ● 50-59 ● 60+	How old are you?	● 18-24 ● 25-29 ● 30-39 ● 40-49 ● 50-59 ● 60+
¿De dónde es?	_campo abierto_ (ciudad/país)	Where are you from?	_open field_ (city/country)
¿Cómo clasificaría su nivel de español?	● Nativo ● Dominio casi nativo ● Avanzado ● Intermedio	How would you classify your level of Spanish?	● Native ● Near native ● Advanced ● Intermediate

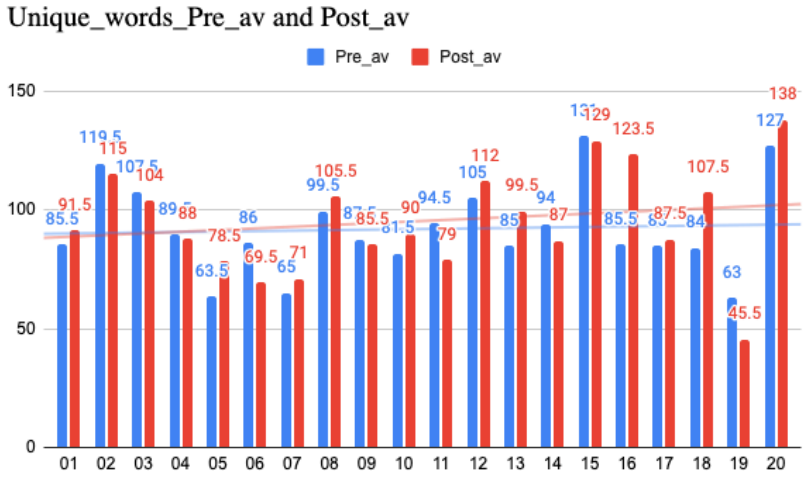
¿A qué edad empezó a hablar/aprender el español?	• Nacimiento - 7 años de edad • 7 - 12 años de edad • 13 - 18 años de edad • 19 - 24 años de edad • 25+ años de edad	At what age did you begin to speak/learn Spanish?	• Birth - 7 years of age • Between 7 - 12 years of age • Between 13 - 18 years of age • Between 19 - 24 years of age • 25+ years of age
¿Cómo clasificaría su nivel de inglés?	• Nativo • Dominio casi nativo • Avanzado • Intermedio • Principiante	How would you classify your level of English?	• Native • Near native • Advanced • Intermediate • Beginner
¿Cuán cómodo/a se siente al hablar con hablantes no nativos / aprendices del español?	• Muy confortable - lo hago todos los días. • Más o menos confortable - lo hago cada dos días. • Algo confortable - lo hago unas veces durante la semana. • No muy confortable - casi siempre interactúo con hablantes nativos	How comfortable do you feel speaking with non-native speakers/learners of Spanish?	• Very comfortable - I do it every day. • More or less comfortable - I do it every day. • Somewhat comfortable - I do it often throughout the week. • Not very comfortable - I almost always interact only with native speakers.

APPENDIX I. INDIVIDUAL PARTICIPANT BEHAVIOR REGARDING THE FIVE FLUENCY VARIABLES.

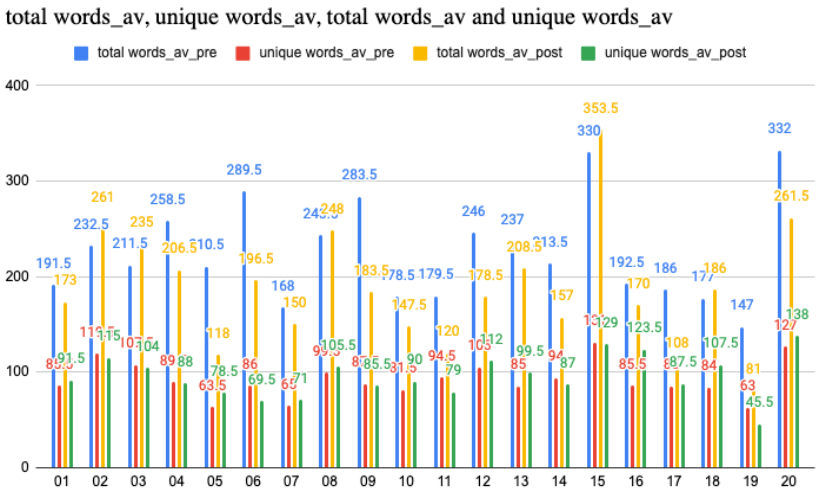
Average Total words before and after treatment for all participants (1-20).



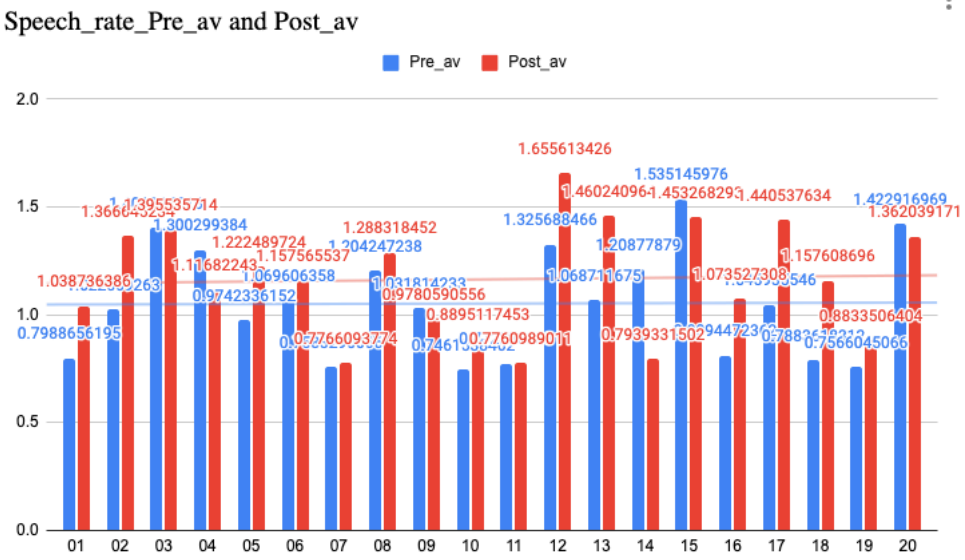
Average Unique words before and after treatment for all participants (1-20).



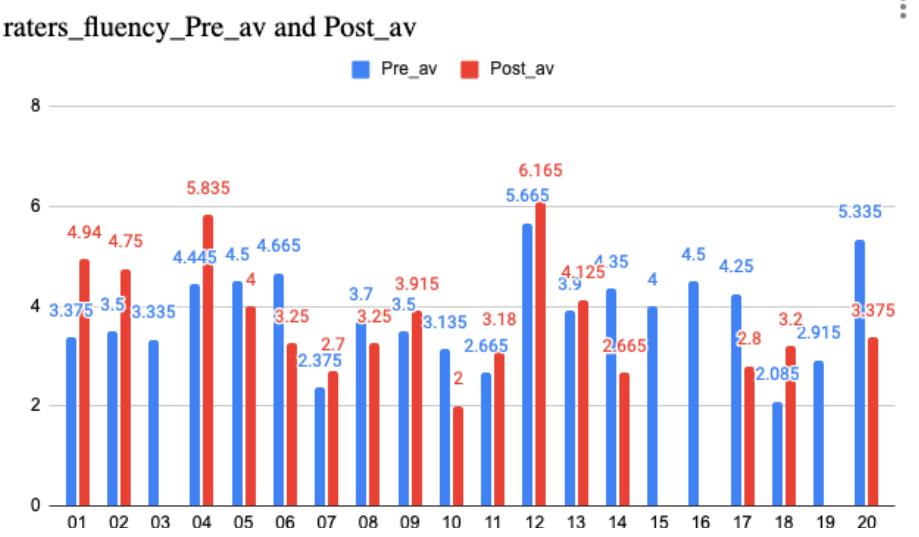
Average Total words and unique words, before and after treatment for all participants (1-20).



Average Speech Rate (words per second) before and after treatment for all participants (1-20).



Average fluency scale rating (perception from the human raters) before and after treatment for all participants (1-20).



Average percentage of impediment of comprehension (perception from the human raters) before and after treatment for all participants (1-20).