

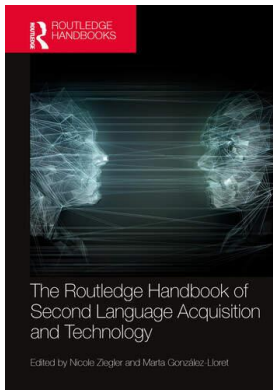
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HERITAGE LANGUAGE LEARNERS AND TECHNOLOGY-MEDIATED LEARNING

Julio Torres

Introduction

In this chapter, we examine adult heritage language (HL) learners who are typically native speakers of a family language, which is a minority language in a (multi-)bilingual setting whereby they also acquire the societal majority language(s). Due to their early bilingual experience using the HL in a naturalistic setting to engage mostly in oral communication, these HL learners arrive at an instructed setting with varying degrees of proficiency in the HL. Therefore, this prior language experience of HL learners differs from instructed late second language (L2) learners whose experience learning the L2 mostly occurs in a classroom setting. Courses for HL learners can range from mixed classes with L2 or foreign language learners to specialized courses for HL speakers (Carreira, 2017). Further, the goals of these courses, often taught in the HL, can be language-focused in which the focus is to promote language development or content-focused in which the focus is a subject matter such as literature or linguistics. But, overall, the main goal of HL education programs has been to offer a meaningful educational experience to learners who wish to connect with their family language and culture (Beaudrie, 2021). To achieve this goal, the design of HL education programs has included validating HL learners' bi/multilingual linguistic varieties and identities, raising HL learners' critical sociolinguistic awareness of language use and ideologies, assessing HL learners' learning needs and interests as well as developing appropriate classroom activities that expand the use and learning of the HL, including literacy attainment (Torres, in press). As such, due to the efforts in institutionalizing HL education programs across the globe (see Kagan et al., 2017), a need exists to design appropriate courses and curricula to serve the linguistic and socio-affective needs of HL bilinguals. In an effort to address this need, over the years, scholars and practitioners have developed a number of recommendations (e.g., sociolinguistic awareness, differentiated instruction, literacy development) that cater to HL learners' pedagogical needs (for a comprehensive review, see Beaudrie et al., 2014).

Also, of relevance for this chapter is examining the role of technology in language learning. Technology has played a critical role in education, especially in its potential effectiveness to mediate learning. One of the key findings in a study report of undergraduate students and information technology in the United States (U.S.), Galanek et al. (2018) found that undergraduate students have relatively easy access to computers and smartphones across ethnic, gender, age and socioeconomic lines. They also found that non-White students value these devices as critical for their academic success. These findings indicate that HL learners entering postsecondary contexts in the U.S. most likely have access to these devices and value their use. However, this may not

be the case with HL learners in other contexts, therefore addressing the digital divide issue for language learning is paramount (see Ortega, 2017). In educational settings with access to technology, questions have emerged into how instructors and students can benefit from the affordances of technology to promote learning. For example, technology can be used to deliver content that allows for classroom spaces to foster students' higher thinking skills (e.g., Bowen, 2012); the emergence of web 2.0 social tools that can transform collaborative learning (e.g., Solomon & Schrum, 2007); and, the design of virtual courses that can deliver content in an effective manner (e.g., Cvetkovic, 2016).

Given HL learners' educational needs and advances in technology, the goal of the current chapter is to examine how the use of technology (e.g., computer-mediated communication) can potentially mediate language learning when considering adult HL learners' prior language experience with the HL. The few studies reviewed in this chapter are based in the U.S. context because it is where most studies with HL learners have taken place, but other contexts include Europe (Bylund & Díaz, 2012). The chapter concludes with pedagogical implications and recommendations for future research.

Historical Perspectives

In the U.S. context, an interest in the field of HL education developed during the 1970s and 1980s with Spanish speakers, though the research trajectory in the field can be dated to the 1930s (Valdés, 2005). Early on, one of the main goals of HL education programs was to help students distinguish between spoken and written language (e.g., Valdés, 1978). More recently, however, a growing research interest in HLs has been ignited, especially after the tragic events of September 11th when the government articulated the existence of a 'language crisis' in the U.S. (MLA report, 2007). As such, political and security reasons have motivated initiatives that promote the value of HLs (Montrul, 2010). An example of such initiatives was the funding and inception of the National Heritage Language Resource Center hosted at the University of California, Los Angeles in 2006, whose primary mission has been to promote HL education through research and professional development (Kagan & Dillon, 2012). Also of relevance, recently, the American Academy of Arts and Sciences issued a report from a Commission on Language Learning that advocated for the support and intergenerational transmission of HLs in the U.S. (Academy of Arts & Sciences, 2017). Therefore, to understand the experience of HL bilinguals, research efforts from a number of fields such as education, linguistics, sociology and cultural anthropology have been critical to address the educational needs of these learners.

Gass and Selinker (2008) pointed out that the linguistic experience of HL learners is a variable of interest in L2 acquisition research. The study of HLs through the theoretical and methodological lenses of L2 has increased in tandem with a broader interest in the field to consider non-typical learner populations in L2 research (e.g., Bigelow & Watson, 2012; Cox, 2017). Ortega (2013) also observed that one of the trends in L2 acquisition research has been the inclusion of a wider population of learners to investigate. For example, a special issue on the linguistic competence of HL speakers in the journal, *Studies in Second Language Acquisition*, gives credence to the relevance of HL speakers in the field of second language acquisition (Montrul, 2011). Recently, Montrul and Bowles (2017) and Bowles (2018) have employed the term *instructed heritage language acquisition* to describe a subfield within HL studies that aims to address the effects of pedagogical interventions on HL learners' language performance and development. Due to the infancy of the field, though, instructed HL acquisition studies still rely on theoretical frameworks and methodological considerations from the sister field of instructed L2 acquisition. However, as argued in Bowles and Torres (2021), as the field of instructed HL acquisition matures, it will need to establish its own benchmarks to develop sound theoretical explanations of observed phenomena that occur when HL learners are exposed to the HL in an instructed setting.

Critical Issues

HL learners' early acquisition of the societal majority language can be simultaneous with the HL or later on with schooling in the case of sequential HL bilinguals. Briefly put, due to this bilingual experience, crosslinguistic evidence has revealed that HL acquisition outcomes can differ significantly vis-à-vis those of monolingual speakers, particularly for certain language domains such as morphosyntax (e.g., Benmamoun et al., 2013; Montrul, 2016; Polinsky & Scontras, 2019). However, the extent to which their linguistic abilities in the HL differ from monolingual speakers is contingent on a number of variables such as quantity/quality of input, literacy development, and frequency of language use. As such, researchers acknowledge that HL speakers exhibit a wide range of proficiency levels and variable knowledge of the HL (e.g., Montrul, 2016; Polinsky & Kagan, 2007; Rothman et al., 2016; Silva-Corvalán, 1994; Zyzik, 2016). Furthermore, their access to linguistic knowledge in the HL depends also on the explicitness and modality of the experimental task, with findings demonstrating that HL speakers perform better on aural and less explicit experimental tasks such as an elicited imitation task (Bowles, 2011a; Montrul et al., 2014; Torres et al., 2019). Therefore, HL speakers' prior language experience with the HL leads to a linguistic system that can be mostly characterized as implicit, aural, and variable.

Understanding the prior language experience of HL bilinguals is critical, as this experience most likely bears consequences on how adult HL speakers respond to pedagogical interventions when they decide to (re)learn the HL in an instructed context. That is, unlike adult L2 learners, HL learners bring functional knowledge of the HL into the classroom setting (Valdés, 2001). HL learners' functional knowledge can range from receptive knowledge to varying degrees of literacy in the HL. What remains unclear, however, is how HL learner's prior language experience affects their socio-cognitive response to different types of instruction. To tackle this issue, research efforts have begun to document HL learners' responses to instruction (for reviews, see Bowles, 2018; Montrul, 2016; Montrul & Bowles, 2017; Sanz & Torres, 2018). In a recent exploratory meta-analysis, Bowles and Torres (2021) found a moderate effect size ($d = .57$) for the role of instruction on HL learning outcomes based on 8 empirical studies that provided a total of 46 effect sizes. While preliminary evidence suggests that HL learners can benefit from instruction, they do seem to respond differently to pedagogical interventions, as they often rely on their prior language experience. Therefore, as pointed out by Sanz and Torres (2018), we need to better understand "how do (if at all) pedagogical interventions override an entrenched linguistic system resulting from a prolonged experience of living with two grammars?" (p. 90). That is, research in this area needs to shed light on the pedagogical interventions that can more efficiently advance HL development, especially given that many HL learners enroll in courses to acquire an academic register or literacy skills in the HL (e.g., Ducar, 2008; Hyland, 2011; Mikulski, 2006).

Due to the interest in promoting the sustainability of HLs across communities worldwide (Kagan et al., 2017), HL educators have developed a number of pedagogical strategies to support classroom practices for HL learners (e.g., Beaudrie et al., 2014; Fairclough & Beaudrie, 2016; Pascual y Cabo, 2016; Zapata & Lacorte, 2018). Among these recommended classroom practices, educators have addressed praxis issues informed by sociolinguistic principles (Beaudrie et al., 2014), critical pedagogy (Leeman & Serafini, 2016), differentiated instruction (Carreira & Chik, 2018a), a pedagogy of learning by design (Zapata & Lacorte, 2018), task-based language teaching (Torres & Baralt, 2022) and project-based learning (Carreira & Chik, 2018b). Of relevance as well, and in line with the goals of this handbook, the use of technology with HL learners has also received some attention in both research and practice. In what follows, this chapter provides an overview of the adaptation of technology with classroom HL learners, research findings of technology-mediated task-based studies, pedagogical implications, and future research considerations.

Current Research

The Role of Technology in Language Learning

Despite the documented benefits of technology in promoting L2 learning (e.g., Golonka et al., 2014; Grgurovic et al., 2013; Peterson, 2010; Zhao, 2003; Ziegler, 2015), little is known about whether and how technology can mediate language learning among HL learners. That is, how does the prior language experience of HL learners, which entails linguistic and sociocultural factors, interact with technologies to advance language development? Given the increasing role of technology in language learning settings (e.g., Blake & Guillén, 2020), the field of instructed HL acquisition still needs to investigate systematically how technology is utilized to mediate instruction for the purpose of HL development. For example, given the rise of social media technologies (e.g., GoogleDocs), it is critical to better understand the effects of these digital platforms on HL writing performance and development (e.g., Elola & Oskoz, 2017; Elola et al., 2022).

However, the effects of technology-mediated learning with a HL population remains largely understudied. This underdeveloped area is not a surprise because the field is only beginning to understand how HL learners respond to pedagogical interventions (see above). Nevertheless, a few studies have explored how HL learners respond to technology-mediated instruction. In what follows, two types of research are described, specifically classroom-based studies and technology-mediated task-based language teaching.

Classroom-Based HL Studies

The classroom-based studies below are mostly descriptive in nature with small sample sizes, and they tap more into HL learners' perceptions of their learning experience. Therefore, making generalizable observations about HL learners' learning experiences with technologies is not possible, but the studies do point to a number of areas that deserve further exploration. It is important to note that many of the studies below addressed sociocultural, affective and linguistic dimensions of HL learners' experiences using these technologies while engaging with the HL in an instructed context.

Lee (2006) examined the participation of two Korean HL learners in *Cyworld*, a Korean social network site, in which they interacted with an online Korean speech community. Their motivation for participating in this social network was mostly to maintain linguistic, sociocultural and personal connections with the Korean community. With regards to the linguistic dimension of their experience, they reported that the online platform provided a safe space for them to use Korean freely without feeling embarrassed about their Hangeul language skills to compose written posts. This is largely due to the relaxed online environment in which HL speakers are not too concerned with prescriptive language forms. This was evidenced by their flexible and creative use of language forms, which included, for instance, shortening words and using emoticons to communicate efficiently in an online platform. According to the informants, this online experience had positive effects on their Korean proficiency, as they acquired vocabulary and grammar that benefited their writing and speaking abilities. Their interaction with monolingual native Korean speakers provided them with positive evidence and feedback on their language use. One caveat of this experience is that it became increasingly difficult for the informants to make distinctions between the language variety used in the social network and the more prescriptive variety. These findings suggest that an online environment can provide HL learners with a sense of security to freely deploy their linguistic resources to communicate with monolingual natives. The learners perceived this experience as beneficial to their learning experience.

Meskill and Anthony (2008) investigated the learning perceptions of five Russian HL learners, who were enrolled in a mixed HL-L2 hybrid university course, through computer mediated communication (CMC). The goal of the course was to support the attainment of academic literacy in the HL. The learners engaged in asynchronous CMC text-based interactions with peers and

the instructor to discuss a number of topics relevant to Russian culture. Overall, the HL learners reported that this experience favored their learning, retention and spelling of Russian vocabulary words based primarily on their peers' posts. The asynchronous CMC environment also facilitated their attention to producing more accurate written forms, as the platform provided them with more time to plan their responses.

Coryell and Clark (2009) were interested in examining how 12 Spanish HL and L2 learners viewed their learning experience in online Spanish courses. Importantly, these adult learners were non-traditional students who enrolled in college courses while maintaining work and family responsibilities and wanted to take Spanish courses to establish closer links with their Spanish-speaking community. The online courses were designed for self-pace autonomous learning. Students had access to online materials, posted oral recordings, and received feedback and grades from instructors. A qualitative analysis of interviews about learners' affective response to their learning experience revealed learners' high level of anxiety throughout the online course. According to the analysis, the main trigger for learners' anxiety levels was related to an expectation of accurate language production, which forced learners to engage in rote memorization of language forms. In the specific case of the HL learners, their experience in the online course heightened their linguistic insecurities about their Spanish variety. In another study with HL learners enrolled in online courses, Coryell et al. (2010) reported interview data from seven Spanish HL learners' perceptions about their learning experiences in an online Spanish course. Similar to the previous study, these learners were non-traditional students and were enrolled in an online Spanish course that was based on self-pace autonomous learning. Their analysis of participants' metanarratives highlighted that learners were motivated to acquire a "true" Spanish variety that differed from their local "Tex-Mex" variety. The authors characterized "true Spanish" as "an imagined norm [that] participants define as that spoken by Mexican nationals and Spanish teachers..." (p. 459). The informants also reported that the online course reduced their anxiety levels, as they felt more comfortable making mistakes without feeling embarrassed than in face-to-face environments.

Zhang's (2009) classroom-based study examined peer interactions among 16 L2, Chinese-American HL, and international HL learners enrolled in a second-year Mandarin course through the use of an online discussion board. The international HL participants were characterized as learners who had spent time studying Chinese in their home countries, and as a result, were highly proficient in Mandarin. On the other hand, the Chinese-American HL learners grew up exclusively in the U.S. The researcher was interested in the effectiveness of the online discussion board to create a positive learning environment between HL and L2 learners and to promote learners' essay writing skills. Zhang's analysis of a number of data sources indicated that interactions in the online discussion board fostered a positive learning community between HL and L2 learners. In addition, the learners reported that peer interactions were positive in promoting their writing skills. For instance, the international HL learners perceived that even helping the L2 and Chinese-American HL learners was beneficial to the development of their writing skills. Zhang also reported that students' final essays overall were longer than the first essays they wrote at the beginning of the course, which she interprets as evidence of progress in their writing.

Henshaw (2016) compared the performance of 12 HL and 15 L2 learners enrolled in separate Spanish composition courses by examining their grades and course evaluations. One key difference between the two courses is that HL learners took the course fully online whereas L2 learners were in a traditional face-to-face section. Henshaw found that the average final grades for the HL learners ($M = 86.7$, $SD = 5.9$) and L2 learners ($M = 88.5$, $SD = 5.9$) were comparable. This implies that the virtual course for HL learners did not hinder their class performance. Further, both groups of learners expressed an overall satisfaction with the class in their course evaluations.

Torres (2016) reported on 15 HL learners' perceptions on the design of a HL writing course following a flipped classroom approach. Students were exposed to content about writing conventions (e.g., thesis statements) through videos that they watched at home rather than receiving

a lecture in class. At the end of the course, the students were asked to answer the following two questions: (1) Did you find watching these videos (ex: on thesis statement, introduction paragraphs...) beneficial? Please explain briefly how they were or were not beneficial; (2) Did they help improve your writing skills? If so, how? Overall, the students reported that the videos were beneficial to their learning because of their ability to review the content by re-watching the videos. Further, they reported being more aware of writing conventions and the use of different strategies while composing argumentative essays, which they attributed to the content in the videos.

In sum, these seven classroom-based studies (Table 26.1) reveal that the use of technology is a promising tool for promoting HL learners' development of vocabulary, grammar and writing strategies. However, contrary to beliefs that online platforms reduce students' anxiety levels (e.g., Kern, 1995), the findings from Coryell and Clark (2009) suggest that HL learners can experience anxiety and insecurity in online platforms. In fact, this observation is also supported by research that has revealed that CMC environments do not necessarily reduce L2 learners' anxiety levels (e.g., Baralt & Gurzynski-Weiss, 2011). This suggests that virtual courses for HL learners do not necessarily provide them with a shield to feel more confident about using the HL in an instructed setting. As such, similar to face-to-face environments, instructors need to be aware of addressing HL learners' socio-affective needs in online platforms. While classroom-based studies are helpful to address these issues, more (quasi-)experimental studies are necessary to provide more generalizable findings on the efficacy of technology on mediating learning among HL speakers. In what follows, I provide a summary of up-to-date studies that have implemented the use of technology to deliver instruction to HL learners through a task-based language teaching (TBLT) framework.

Technology-Mediated Task-Based Language Teaching

González-Lloret and Ortega (2014) introduced a new framework coined *technology-mediated task-based language teaching*, which they characterized as an integration of technology and TBLT. TBLT is an evidence-based educational framework that aims to understand the theory and practice of teaching second languages through the use of tasks at all levels, including curriculum design and assessment (e.g., Van den Branden et al., 2009). González-Lloret and Ortega (2014) considered tasks as activities that have the following features: (1) a primary focus on meaning; (2) a communicative purpose; (3) learners use their own resources (e.g., linguistic) and skills; (4) proxy to the use of language in the real world; and, (5) grants opportunities for self-reflection on the learning process. HL researchers and practitioners have adapted a TBLT framework to investigate the effects of instruction on HL learners, especially in their interactions with L2 peers (e.g., Bowles, 2011b; Bowles et al., 2014; Henshaw, 2015; Kim et al., 2018). These studies have begun to elucidate how HL learners' early bilingual experience can influence their recruitment of linguistic resources to reach the communicative goals of pedagogic tasks with findings demonstrating that HL learners can benefit from task-based instruction and respond differently to task features. Furthermore, the adaptation of TBLT principles and methodology has been proposed as a viable pedagogical framework for HL learners. Torres and Baralt (2022) argued that TBLT as an educational framework provides a blueprint for curriculum design and assessment that can be adapted to instructed HL contexts. These include the design of a needs analysis that takes into account local HL learners' bi/multilingual practices, the sequencing of tasks that begin with validating their bi/multilingual uses and identities as well as the examination of linguistic forms during a post-task phase given the documented variability found in HL grammars, which can present a challenge to design a priori grammar instruction. While TBLT is a promising pedagogical model for HL development, more research is needed that considers the interplay between HL learners' prior language experience and task-design features along with TBLT methodology (e.g., pre-task phase). Certainly, this also includes the synergy between technology and a TBLT framework to HL learning. To the best of my knowledge, only four empirical studies have investigated technology-mediated TBLT on

Table 26.1 Classroom-based Studies

<i>Study</i>	<i>Description</i>	<i>Measure(s)</i>	<i>Outcome(s)</i>
Lee (2006)	A case study of two Korean HL learners' perceptions on their language learning process as a result of their interaction on a Korean social network website.	Interviews	HL learners reported improvements in vocabulary, syntax and typing skills. They were also more comfortable with making errors and receiving feedback on their writing. However, they also experienced more confusion between social network and prescriptive Korean language forms.
Meskill & Anthony (2008)	A case study of four Russian HL learners' perception on the use of computer mediated communication (CMC) to support the attainment of academic literacy.	Questionnaire; Interview	HL learners reported overall that CMC prompted them to pay more attention to language features such as spelling, vocabulary, grammar and punctuation. CMC also allotted them more time to plan and compose messages.
Coryell & Clark (2009)	A study of 12 Spanish HL and L2 learners' anxiety levels while enrolled in an online Spanish course.	Interviews	Both types of learners reported anxiety levels mostly due to the expectation of having to produce accurately the language variety taught in the course.
Zhang (2009)	A study of 16 Chinese HL (Chinese-American and international) and L2 learners' peer interactions and their writing development through an online discussion board.	Essay drafts; Peer reviewers; Students' reflections; Instructors' lesson plans and class notes; Instructors' reflections and survey of essay writing	Both HL and L2 learners' online peer reviews led to positive attitudes about their interactions and improvements in writing as measured by the production of longer essays at the end of the course.
Coryell, Clark, & Pomerantz (2010)	A case study of seven Spanish HL learners' perceptions of their language learning experience in an online Spanish course.	Interviews	HL learners reported the importance of attaining "proper Spanish" instead of their local variety. The online platform reduced their anxiety to make mistakes in the HL.
Henshaw (2016)	A comparison of Spanish HL learners' performance and perception of an online writing course vis-à-vis L2 learners in a traditional course.	Course grades; Course evaluation	Both HL and L2 learners attained similar grade averages and reported satisfaction with the online and traditional courses.
Torres (2016)	Spanish HL learners' perception on the flipped classroom approach on their development of writing conventions skills.	Questionnaire	HL learners perceived the flipped classroom approach as beneficial to review mini-lectures delivered through video format. They reported being more aware of writing conventions.

HL development and performance highlighting the need for future research (Blake & Zyzik, 2003; Torres, 2018; Torres, 2020; Torres & Cung, 2019;).

As an example of a task-based study for HL linguistic development, Torres (2018) designed a computer-assisted language learning task-based intervention that promoted the use of the Spanish subjunctive in adjectival clauses for intermediate-level HL and L2 learners. Participants had to play the role of a resident director at a university, and their task goal was to explain the misbehavior going on in the dormitories. In addition to a control group, participants were randomly assigned to two different task versions—a complex and a simple condition. The difference between the two versions lies in that participants in the complex version had to figure out the reason for the misbehavior from a set of four pictures, whereas the reason (one picture) was provided to the participants in the simple condition. Participants received corrective feedback through a written recast when they chose the incorrect verb form (i.e., indicative vs. subjunctive) to formulate their response. The results for the HL learners demonstrated that the simple condition was more effective in driving the development and retention of the target form. Conversely, the HL complex group did not enjoy the same learning gains. Participants' responses from a debriefing questionnaire revealed that HL learners approached the task in a more communicative way rather than hypothesis testing of the target form as the L2 learners did. Therefore, the complex condition pushed the HL learners to engage their attentional resources in reaching the task goal, which limited their attentional resources to make stronger form-meaning connections. This can explain the lesser learning gains observed for the HL complex group vis-à-vis the HL simple group.

Moving to task-based peer interaction studies, Blake and Zyzik (2003) was the first study to examine the learning opportunities (e.g., language related episodes, corrective feedback) that emerged during task-based peer interactions between HL and L2 learners through written CMC. The participants were enrolled in intermediate-level Spanish language courses at the time of the study. For this study, participants' task goal was to agree on selecting an apartment that would meet their preferences (i.e., an apartment-hunting task). Their results demonstrated that HL and L2 pairs generated language opportunities (e.g., negotiation of meaning, corrective feedback) in a synchronous CMC environment while engaging in a meaning-oriented task. This was also the first study that showed that HL learners assist L2 learner peers more frequently, especially with interactions targeting lexical items. The fact that L2 learners benefited more from the interactions is most likely related to HL learners' greater lexical knowledge. Nevertheless, these findings indicate that HL learners can benefit from interactional moves that potentially lead to language development as a result of task-based interaction in CMC mode.

More recently, along the lines of task-based peer interaction research via a synchronous CMC environment, Torres and Cung (2019) examined learning opportunities that resulted from interaction modes (i.e., face-to-face, CMC) and pair types (HL-HL, HL-L2) among learners enrolled in advanced Spanish content courses. Each dyad completed two distinct decision-making/collaborative writing tasks across face-to-face and CMC modes in which they played the role of business consultants for two known Spanish companies. For one task version, participants' task goal was to recommend the hiring of a candidate from a pool of six applicants, whereas the other task version required participants to recommend the laying off an individual. Once participants reached a consensus on the person to hire or lay off, they needed to write a business letter to the CEO of the company to justify their selection. With regards to task-based interaction in the CMC mode, the main findings revealed that both pair types triggered significantly fewer language related episodes in CMC mode, a finding that aligns with previous literature on the contrasting effects of face-to-face and CMC modes (e.g., Baralt, 2014). Further, HL-HL pairs only self-repaired non-targetlike utterances in CMC mode, and not in face-to-face mode. HL-L2 pairs resolved language related episodes to a lesser extent in CMC mode than in face-to-face. In this study, then, the CMC mode was conducive to the noticing of non-targetlike structures among HL learners. As such, CMC

environments are perhaps critical to push HL learners to notice and process linguistic forms that may go unnoticed during face-to-face interactions.

Based on the same dataset from Torres and Cung (2019), Torres (2020) analyzed the business letters that HL-HL and HL-L2 pairs composed for syntactic complexity and accuracy, as measured by product-based indicators such as error-free T-units and mean clause length. First, HL-L2 pairs produced a higher ratio of coordinate phrases per T-unit in the CMC mode, which is a characteristic of lesser syntactic complexity; whereas, HL-HL pairs produced more complex written texts, as indicated by a greater ratio of syntactic subordination, especially in the face-to-face mode. Second, while not a significant result, a small effect size did show a trend in which the HL-HL pairs produced more morphosyntactic (e.g., Spanish gender agreement) accurate texts across both modes. Lastly, debriefing questionnaire data revealed that HL learners reported that interacting in the CMC mode was more challenging for them (e.g., I learned that it is easier for me to communicate with people face-to-face as opposed to messaging them through the computer.). These results imply that both interaction mode and pair type can have an impact on HL learners' writing performance during task execution.

The preceding four studies only begin to provide a window into how technology-mediated TBLT may play a role in HL learners' development and performance of their family language during the execution of meaning-oriented tasks. As such, to date, it is difficult to make firm observations because more research is needed to provide a comprehensive picture of the issues at stake. However, as noted in González-Lloret and Ortega (2014), researchers and practitioners that use technology to deliver pedagogical interventions such as task-based instruction ought to consider "viable educational and language developmental rationales" (p. 3). The findings in Torres (2018) support this claim, as computer-assisted language learning can be limiting when the design of technology-mediated task-based instruction does not consider HL learners' prior language experience. In this case, given HL learners' use of the HL in authentic communicative events in their bilingual communities, HL learners prioritized reaching the task goal in a more communicative way. This implies that it is important to determine the task-design features (e.g., task complexity) that can compete for HL learners' cognitive resources that draw their attention to form and meaning. Given HL learners' default to focus on the communicative aspects of a task, Torres and Cung (2019) demonstrated that peer interactions in a CMC environment can be more effective to guide HL learners' monitoring of their language production, and thereby, provide opportunities for modified output such as self-repairs. In a nutshell, these preliminary findings imply that a technology-mediated TBLT framework serves as a useful lens to better understand the role of technology in mediating learning within a HL learner population.

Recommendations for Practice

While more research is needed to draw firm conclusions to make evidence-based pedagogical recommendations on the use of technology with HL learners, a few observations can be made from the available findings. First, in designing virtual learning environments for HL learners, instructors must address students' socioaffective needs, as a CMC environment does not necessarily mitigate HL learners' anxiety levels, especially when they are expected to produce a prescriptive variety of the HL. As such, recommendations for HL pedagogy that take into account raising awareness of sociolinguistic and bilingualism principles must be extended to virtual courses (e.g., Beaudrie et al., 2014; Leeman & Serafini, 2016).

Second, adopting a TBLT approach to HL pedagogy, the current evidence suggests that HL learners primarily approach computer-assisted language learning tasks as a meaning-oriented activity, and do not prioritize attention to language forms. Therefore, the design of such tasks must minimize complex task goals that deplete HL learners' attentional resources to engage in hypothesis testing of target forms. Alternatively, in the case of tasks with complex goals, it is highly

recommended that instructors design appropriate activities before HL learners complete the task (i.e., pre-task phase) that facilitate the organization of their cognitive resources to efficiently address communicative content during task completion, with the aim to free attentional resources that allow for hypothesis testing of target forms.

Third, the inclusion of text CMC for task-based peer interaction in both virtual and face-to-face courses is advisable, as this interaction mode can promote HL learners' noticing of non-target like utterances with the potential for further processing that can lead to learning. Instructors must also be aware that HL learners' language performance may be compromised given their stronger oral production skills. As such, scaffolding activities during the pre-task phase in an oral mode may be critical to prepare HL learners' engagement with interactive tasks via text CMC. These pre-task scaffolding activities can include vocabulary, task models and brainstorming activities. Finally, in mixed HL and L2 learner courses, instructors ought to reflect on task goals and interaction mode when deciding to pair HL learners with other HL or L2 peers. Given that HL learners enter the instructed setting with linguistic resources they have acquired in their local bilingual environments, HL learners are generally more proficient than L2 learners. As such, HL learners are often positioned as language experts by L2 learners, and thereby, address most language issues during task-based interaction, especially in face-to-face interactions. In text CMC, however, L2 learners seem to not generate as many questions regarding language issues because they have more time to formulate their language production. Potentially, then, pairing HL and L2 in text CMC could help level the field for both types of learners.

Future Directions

As can be noted from the review of studies, quantitative and qualitative research are very much needed to reliably address how technology can be exploited to meet the learning goals and needs of HL learners. In what follows, I will mention four key areas. First, the studies described above need to be replicated to confirm the findings in laboratory and classroom settings, and particularly with other HL learner populations from different ethnolinguistic communities and including HLs with writing systems that differ from the majority language(s). As such, to echo Bowles and Torres (2021), the need to conduct experimental and replication studies with other HLs across different settings is critical to make sound pedagogical recommendations. Second, studies adopting a technology-mediated TBLT approach must also address HL learners' engagement with one-way and interactive tasks across other CMC modalities (i.e., audio, video) to further disentangle the issue of modality in learning a HL.

Furthermore, since the current evidence has revealed that HL learners primarily view tasks as a communicative activity, a need exists to explore how explicit instruction or focus-on-form interventions during pre or post task phases can drive HL learners' attention to ensure form-meaning connections resulting from task execution. Third, given the rise of newer technologies in language learning such as mobile applications and digital gamification, HL scholars must expand their research programs to include these technologies. Research with mobile applications is receiving an increasing amount of scholarly attention given the flexibility and support mobile applications can provide for language instruction in classroom settings (Lord, 2016). To develop and conduct studies with mobile applications catered to adult HL learners is an important step forward given learners' access to this technology, at least in the U.S. context among undergraduate students (Galanek et al., 2018). Another unexplored territory with HL learners is the use of technology for gamification to promote language learning (e.g., Reinhardt, 2019). Reinhardt (2019) argued that gamification has followed a robust tradition of theoretical and methodological studies. For example, Cerezo et al., (2016) found that guided inductive instruction through a digital game was beneficial in promoting the production of Spanish morphosyntax among beginning L2 learners of Spanish. Therefore, given the arguments for differentiated instruction, especially for mixed HL and L2 courses (Carreira &

Chik, 2018a), both mobile applications and digital gaming are examples of promising tools that can address HL learners' specific needs and goals.

Further Reading

Beaudrie, S., Ducar, C., & Potowski, K. (2014). *Heritage language teaching: Research and practice*. McGraw-Hill.

This book is a comprehensive overview of heritage language pedagogy. The topics include defining heritage language learner, sociolinguistic principles in heritage language teaching, and reading and writing skills among others. The book synthesizes research in all of these areas

Fairclough, M., & Beaudrie, S. M. (Eds.) (2016). *Innovative strategies for heritage language teaching: A practical guide for the classroom*. Georgetown University Press.

This edited volume is targeted for teachers and curriculum designers. It consists of 12 chapters on different research-based topics that address heritage language speakers in the classroom. The goal of the chapters is to provide instructors with tools for innovative teaching in the heritage language classroom.

Pascual y Cabo, D. (Ed.) (2016). *Advances in Spanish as a heritage language*. John Benjamins.

This edited volume provides the readers with a broad view of research and practice with heritage bilinguals of Spanish. The volume is divided into three sections: formal/theoretical linguistics, heritage language education and heritage language instruction. The last section includes chapters on creating online courses and following a flipped classroom approach for heritage language instruction.

Pascual y Cabo, D., & Torres, J. (Eds.) (2022). *Aproximaciones al estudio de español como lengua de herencia*. Routledge Press.

This edited volume provides a comprehensive view of the latest on linguistic approaches, pedagogical models and programmatic innovations in the teaching of heritage language learners of Spanish. The pedagogic topics of the volume include task-based language teaching, learning by design, translanguaging and virtual social tools among others. It is a resource for individuals who wish to provide a meaningful educational experience for heritage language learners.

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