



## Listeners' patterns of interaction with help options: Towards empirically-based pedagogy

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### Abstract

*This multiple case study examined L2 listener patterns of interaction with help options in computer-assisted language learning (CALL) materials. Thirteen students enrolled in an initial English teacher education program interacted with six one-hour listening tasks constructed around talks on technology. Talks and associated exercises were uploaded to an online, self-regulated platform that provides listeners with different routes of interaction and access to one-click-away help options in the form of listening tips, culture/technology/biology notes, transcripts, a glossary, keywords, audio/video control bars, and an online dictionary. Interactions were recorded using screen capture technology and complemented with semi-structured interviews. Identified patterns of interaction are presented by section (pre-, while, and post-listening); type of exercise (vocabulary activation, multiple-choice, dictation-cloze, sentence completion, and extension activity); and session (1 through 6). Reasons for help option use are mapped onto identified patterns and are tested for consistency. The findings inform an underlying set of guidelines for listening pedagogy. Study limitations along with avenues for research are also discussed.*

**Keywords:** *Help Options, Technology-Mediated Listening, Listening Pedagogy*

**Language(s) Learned in This Study:** *English*

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### Introduction

Second language learners do not necessarily interact with computer-assisted language learning (CALL) applications in the ways that materials designers, computer programmers, and human-computer-interaction professionals intend or anticipate. This situation is no different when listeners interact with help options in computer-based L2 materials. Listener behavior is adjusted, modified, and refined as they familiarize themselves with ancillary elements. At times, learners interact with help options in novel ways, resulting in indiscriminate use (Cárdenas-Claros, 2011; Grgurović & Hegelheimer, 2007); or create interactional shortcuts that, in principle, meet their individual learning goals, but inadvertently result in help option neglect (Cárdenas-Claros, 2011; Garrett, 2009; Rost, 2007).

Researchers have thus long agreed that shifting listener behavior (Pujolá, 2002), idiosyncratic design practices in CALL applications (Cárdenas-Claros, 2015; Farmer & Gruba, 2006), and a lack of unified and SLA-based conceptualizations of help options (Cárdenas-Claros & Gruba, 2009; Garrett, 2009; Heift, 2013) have limited researchers' understanding of how interactional patterns affect language learning gains and/or listening skill development. Moreover, most studies that examine patterns of interaction with help options do so from a purely quantitative perspective, i.e., tracking listener behavior online, while any explanations given are mostly top-down or speculative.

Here, then, studying patterns of how learners interact with ancillary elements may lead to several gains in

CALL research (Fischer, 2012). At the design level, designers can move *fit-for-purpose* practices to create software addressing user personas or the “hypothetical archetypes of actual users” (Coalpert, 2004, p. 124). At the pedagogical level, these interaction patterns may serve as the underlying basis for learner training guidelines (Hubbard, 2004). Indeed, examining such patterns, analyzing them, and bringing guidelines together would address the concerns pointed out by Cross (2017): “there is still no concrete listening pedagogy drawn from empirical research which teachers can refer to for exploiting help options or training options in their use” (p. 546).

Accordingly, this study seeks to identify the patterns of English language learner interactions with help options for different types of exercises, to record student reasons for using these identified help option patterns, and to introduce a set of guidelines to inform instruction. We open this paper with a discussion of help options and previous studies examining L2 listener interaction patterns with listening materials. Then, we provide a rich description of the computer-based listening environment and data collection materials. After a thorough description of data analysis procedures, we present results, discuss findings, and put forward guidelines drawn from empirical research.

## Theoretical Framework

### Help Options

The use of help options relates to the ultimate goal of listening comprehension ability as L2 listeners may transfer strategies employed in two-way listening to the computer-based listening environment. Vandergrift and Goh (2012) suggest that in two-way or interactive listening, L2 learners use several tactics to recover from breakdowns in understanding. For instance, learners ask their interlocutors to repeat misunderstood texts, ask for clarification, confirm (mis)understandings, and/or rely on contextual and visual clues provided through their interlocutors’ gestures. In computer-based listening, interaction with help options may assist listening comprehension ability in similar ways. Field’s (2013) framing of listening comprehension ability, which distinguishes from lower level (input decoding, lexical search, and parsing) and higher level processes (meaning representation and discourse representation), helps clarify this.

The development of listening with the use of help options could be addressed at lower and higher-level processes alike. Listening to and reading along with transcripts may improve word-segmentation skills as listeners are able to see where one word ends and a new one begins in a stream of rapid speech (Cárdenas-Claros & Campos-Ibaceta, 2018). Audio control bars may compensate for variation in speaker accents, pitch range, and speech rate. Interaction with culture/technology notes may enable L2 listeners to understand where texts originate from and thus expand their mental representations of the aural input. Glossaries and/or dictionaries may present listeners with new word meanings that may aid schemata activation and contribute to the construction of meaning representation, and visual organizers presented through listening tips may help in discourse representation.

As noted by Field (2013), lower and higher level processes do not act in linear ways, but are recursive and complementary. The same goes for help options. It is through systematic observation of listeners’ interaction with help options that we will be able to understand how listening ability is and could be addressed.

Research on help options in computer-based L2 listening has been examined under four main perspectives: help option use/non-use, listener attitude towards help option use, frequency of help option use and performance, and help option use and listener variables (for an up-to-date review, see Cross, 2017 or Hubbard, 2017). Across the four lines of research, it is apparent that, regardless of the proven benefits of interaction with help options for comprehension and task completion, L2 listeners frequently use them ineffectively (Cárdenas-Claros, 2011; Grgurović & Hegelheimer, 2007; Hegelheimer & Tower, 2004; Hoven, 2003; Pujolà, 2002) or ignore them completely (Cárdenas-Claros, 2011; Grgurović & Hegelheimer, 2007; Hegelheimer & Tower, 2004; Pujolà, 2002).

After working with selected listening tasks in the *Longman English Interactive* © program, participants in Cárdenas-Claros (2011) found help options to be relevant for text comprehension, task completion and learning language features (e.g., vocabulary, syntax, pronunciation, and culture). Help options also served as verification tools, compensating for lack of confidence in language knowledge, confirming comprehension of aural texts, testing knowledge of word meanings, and assessing interpretations of cultural behaviors as portrayed in aural texts. Cárdenas-Claros (2011) further noted that participants neglected help options mostly during the first encounter with listening tasks. In subsequent sessions, regular questioning of why help options were ignored seemed to have triggered a change in the participants' attitude towards their use and effective interaction increased accordingly. This observation, together with previous proposals for influencing behavior in L2 listeners through learner training (Fischer, 2012; Hubbard, 2017; Hubbard & Romeo, 2012), supports the need for listening pedagogy drawn from empirical research.

Help option research has also been made more approachable. The “CoDe” framework (Cárdenas-Claros, 2011), a theoretically-and-empirically-based framework for the conceptualization (“Co”) and design (“De”) of help options in computer-based L2 listening has been acknowledged as a comprehensive framework for further research (Cross, 2017; Heift, 2013; Hubbard, 2017). The CoDe framework extends the work of Pujolá (2002) and Hegelheimer (2003), and conceptualizes help options as operational, regulatory, compensatory, and/or explanatory. Briefly, “operational” help options assist the user with the functions of the program (user manual, training modules, etc.); “regulatory” options afford opportunities for listeners to self-regulate their learning, used either in preparation for task demands (listening tips) or after task completion (feedback); “compensatory” help options make input more accessible to learners, with modifications from aural-to-visual (transcripts, captions, subtitles), visual-to-visual (transcript to translation), or aural-to-aural (audio/video control buttons and bars); and “explanatory” options prompt learner attention to key linguistic features of the input (explanatory hints, hyperlinked elements, glossaries) and/or provide enriched input (cultural notes, technology notes, concordances, grammar explanations).

### **Patterns of Interaction with CALL Materials**

Studies examining patterns of learner interaction with help options for language learning have primarily focused on feedback for grammar-based exercises (Heift, 2002; Hwu, 2013), reading (Chun, 2013; Ma, 2013), and vocabulary learning. Heift (2002) reported on a quantitative study (n=33) where learners of German interacted with an Intelligent Language Tutoring System (ILTS) that allowed for the correct grammar-based answer to be shown as a help option. She identified four help option user types: Browsers, Frequent Peekers, Sporadic Peekers, and Adamants. She found that the majority of the students neglected the help provided in the program at least once, approached grammar difficulties on their own most of the time, and peeked at the correct answer only occasionally (sporadic peekers). Importantly, she reported that even though the correct answers were available, and though patterns of interaction varied across language proficiencies, learners did not immediately take that “quick route” as feared by instructors, rather preferring to challenge themselves.

Fischer (2012) analyzed 11 studies that investigated ancillary elements in CALL materials. He reported findings in four themes: organized/disorganized learner behavior; overuse of single ancillary elements and neglect of other ancillary components; levels of learners and individual variability; and individual learners' variability and materials learned. Fischer concluded that the greater the experience and the knowledge that L2 learners had with language/computer proficiency, the more effective their use of CALL software. He also noted that lower proficiency learners tend to overuse ancillary elements they find relevant for task completion and to overlook those they find of no value for learning. Fischer's analysis suggests the need for providing learners with sufficient interaction opportunities with CALL software for them to reap its benefits and for researchers to report on stable patterns.

In examining interaction patterns of field dependent/independent (FD/I) learners when working with two help options (transcripts and glossary), Cárdenas-Claros (2005) identified three patterns of interaction: P1 = input interaction + task completion + no help option use; P2 = input interaction + no task completion + no help option use; and P3 = input interaction + task completion + help option use. Measuring FD/I with

the CALL-based FD/FI questionnaire, Cárdenas-Claros reported that patterns 1 and 2 were mostly associated with FI learners, and pattern 3 with FD learners. Although working in three different sessions, listeners' interactions with help options were chaotic, making pattern recognition challenging.

Pujolá (2002) looked at learners working with the *ImPRESSions* program (with access to dictionary, rewind/forward features, culture notes, transcripts, subtitles, feedback, and explanations) and derived two patterns of help option usage: a "global approach", in which students completely neglected help options; and the "compulsive consultors", in which learners indiscriminately clicked on help options. Pujolá found no patterns among choice of help options used, rather reporting "varied idiosyncratic" learner behaviors (p. 253). Possibly, as in Cárdenas-Claros (2005), patterns of use had not stabilized and seemed chaotic given the limited interaction opportunities with the program.

In an experiment tracking mouse movements and time-course of paused, rewound, and forwarded texts, Roussel (2011) reported that French learners got better comprehension scores in self-regulated listening than when directed to listen to texts once or twice. Further experimentation tracked strategies used by participants at different levels (good initial, average initial, and poor initial level) as they self-regulated their listening. The authors reported four patterns: P1 = global viewing, followed by analytical viewing; P2 = analytical viewing, followed by global viewing; P3 = one or more global viewing, without regulation; and P4 = only analytical viewing. Roussel reported the first and third patterns to be particularly beneficial for learners with a good initial level, while the third pattern was problematic for poor initial level participants (it was too difficult for them to parse the speech). The fourth pattern was mostly used by poor initial level learners, where movements to pause, rewind, and forward were "numerous and disorganized" (p. 107). Although these findings are quite valuable, identification of patterns in a single session should be interpreted carefully as learners may be exploring the various features of the program.

Building on Roussel's work, Çakmak and Erçetin (2017) explored low proficiency learner (n=44) interactions with a narrative audio text. One group of participants were allowed to self-regulate the listening process with rewind, pause, and forward buttons, while the control group were not given learner control; the former were able to hear the text twice, and the control group, only once. All participants completed recall and unannounced vocabulary tasks. Listening patterns in the experimental group tended towards global and analytical equally during the first listening, and switched significantly to analytical strategies during the second listening. Results from post-interaction tasks, according to Çakmak and Erçetin, did not indicate gains as a result of learner-controlled listening in terms of text recall and incidental vocabulary learning.

Though the discussed studies are valuable, they have primarily relied on logs to track behaviors (Çakmak & Erçetin, 2017; Roussel, 2011); tend to focus on single exercise type (Çakmak & Erçetin, 2017) with one help option (Çakmak & Erçetin, 2017; Roussel, 2011) or a set of options (Cárdenas-Claros, 2005); collect data over one (Roussel, 2011) or three sessions (Cárdenas-Claros, 2011). In studies in which more options are available (Pujolá, 2002), pattern identification has been chaotic and too general. No study has, to date, examined help option use over different exercise types, tracked behavior over various sessions, or mapped behavior patterns onto learner-offered reasons behind such behaviors. This study addresses those gaps.

## Research Design

The following research questions guided the design of this study:

1. What are the patterns of interaction with help options in a computer-based L2 listening environment for high-intermediate learners of English?
2. Do interaction patterns vary across sessions and exercises?
3. What are participant reasons for exhibiting such patterns?

The study reported here was part of a larger study that investigated characteristics of input texts that negatively interfered with learner comprehension of computer-based L2 listening materials. As part of that larger study, participants filled a form with words and expressions they were unable to understand from six different talks. The patterns of interaction reported here were identified in that context. To that end, Camtasia 10.0 was used to unobtrusively observe listener behaviors (Fischer, 2007), and semi-structured interviews were conducted after the completion of each lesson.

## Participants

Participants were 13 high-intermediate (HI) Chilean learners of English, ages 18-22. This number of participants was accepted under the premise that “a well-designed qualitative study requires a relatively small number of respondents to yield the saturated and rich data that is needed to understand even subtle meaning in the phenomenon under focus” (Dörnyei, 2007, p. 127). Language proficiency was determined from the results of the Cambridge Placement Test and an in-house interview conducted by faculty members from the Initial English Teacher Education (IETE) program where the study took place. Other than working with computers for learning vocabulary and/or for watching YouTube videos, the participants had no experience with computer-based listening or help options. Students from an IETE program were favored because their experiences were expected to be grounded in both learning language and their training as language teachers. We note that data from ten students (seven female, three male) is reported because three screen-captured videos presented technical difficulties that hindered analysis (Table 1).

**Table 1**

### *Participants*

<b>Participants*</b>	<b>Age range</b>	<b>CPT score average (points)</b>
Sammy, Leo, Betsy, Carol, Rita, Fionna, Jessie, Cora, Sergio, & Max.	18-22	78.3

*Note.* Pseudonyms have been used to protect participants' identities.

## Materials and Instrumentation

Listening materials were developed around six video segments from the Technology, Education, and Design (TED) talk series that addressed the topic of technology, since this was a syllabus requirement for the HI learners at the university program where the study was conducted. This topic selection also addressed a favorite topic of the students and a keen interest of the main researcher. Additionally, to cater to participant interests within the umbrella term of technology, we selected topics in which listeners lacked familiarity, but were engaging enough to sustain their drive throughout the entire study.

The selected talks were: Engineering and Evolution (EE), Tracking the Trackers (TT), Abundance is our Future (AF), How TV Affects Children (HTC), Power Outlets (PO), and Bioengineering (BE). The talks were in the range of 4.48-5.09 syllables per second and had lengths that ranged between 511 and 1720 words. For more information on input text characteristics, see Cárdenas-Claros et al. (2020).

The talks were linked to the *Improve Your Listening Skills* (IYLS) platform, a primarily research-based

environment that exploits the capabilities of the computer to provide L2 listeners with help options presented as listening tips; transcripts; keywords; glossaries and dictionaries; technology, biology, and cultural notes; and audio/video control buttons (Figure 1).

The design of help options in the IYLS platform was based on a previous study making use of the CoDe framework (Cárdenas-Claros, 2015) which concluded the following five design criteria were found most helpful for students: (a) except for keywords located on top of the video, help options are grouped in a single tool bar located on the top frame of the site, and are visible and accessible at all times; (b) help options are sequenced in increased order of importance for L2 listening, and so listening tips, culture/technology/biology notes are presented first, while glossary and dictionary options are presented on the far right; (c) help options are one click away from the user, where learners can access them regardless of the section (pre-, while-, or post-listening) that they are working on; (d) some help options are offered through different paths of interaction, e.g., the glossary is accessible through the tool bar or the transcripts; and (e) help options are offered to keep learners on task, i.e., dictionaries open as pop-up windows and listeners do not wade through unnecessary interactions to get help.

**Figure 1**

### Help Options in the IYLS

The screenshot shows the IYLS platform interface for a lesson titled "Talk 4 - How TV affects Children" by Dimitri Christakis. The interface is divided into several sections:

- Top Navigation Bar:** Includes "HOME" and a series of help options: "Listening Tips", "Cultural Notes", "Technology Notes", "Biology Notes", "Transcript", "Glossary", and "Dictionary".
- Main Content Area:** Divided into "Pre-listening", "While-listening", and "Post-listening" sections.
- Pre-listening Section:** Contains instructions for listening to Dimitri Christakis's talk and choosing the right option for each question. A "Keywords" box is overlaid on a video player, listing "Over-stimulated", "Fragging", "Inhibited", and "Reading".
- While-listening Section:** Features a video player with a "Help Options" box overlaid. The box contains a "Good Job!" message and a "Listen again to find the correct answer" instruction.
- Post-listening Section:** Contains a "Transcript" section with a red arrow pointing to it from the "Help Options" box.

Exercises were adapted to the IYLS platform following Richards and Rodgers' (2001) framework for pre-, while-, and post-listening sections. In the pre-listening section, listeners work on a set of schema activation exercises through a series of drag-and-drop, prediction, and evaluation statements that focus on vocabulary and schemata activation (Table 2). The while-listening section makes use of checking understanding and dictation-cloze exercises: the checking understanding is presented in a four-item multiple-choice format, while the dictation-cloze requires listeners to type in missing words and/or expressions as they listen to audio only texts. The post-listening section features vocabulary practice, sentence completion, and extension activities. In vocabulary practice, students match words with definitions; in sentence completion, listeners complete sentences using new vocabulary items presented in the talk; and in extension activities, listeners react to and/or give their opinions on a series of complementary readings and/or documentary viewings that thoroughly explore the context in which the discussed technology was developed.

For this study, we used an entry-survey, logs of system-listener interactions, and a set of semi-structured interviews. The "entry-survey" inquired both about basic participant demographic information and about learner familiarity with computer-based L2 listening and help options; "interaction logs" were captured with Camtasia 10.0 (Techsmith, 2020) as soon as the participant clicked on any part of the IYLS platform and stopped right before the semi-structured interview took place; and the "semi-structured interview

protocol” asked learners to reflect if, when, and how help options were used when interacting with each talk.

Semi-structured interviews were conducted to inquire about the in-depth reasons behind student behaviors. Sessions one through five used the same interviewing protocol, but the last session asked students additionally to assess what made listening texts difficult, and to assess their overall experience with the IYLS platform.

**Table 2**

*Exercises in the Platform*

<b>Section</b>	<b>Name in the IYLS</b>	<b>Exercise Description</b>
Pre-listening	Drag and drop	Drag and drop words and pictures
	Vocabulary activation	Match word and definition
	Evaluating statements	Checking true/false to predict content
While-listening	Checking understanding	4-item multiple choice
	Dictation cloze	Gap filling
Post-listening	Vocabulary practice	Match word and definition
	Sentence completion	Sentence completion
	Extension activities	Read/listen to and react to

### **Procedures**

Data was collected in one group and six individual sessions. The first session had all participants (a) read and sign informed consent forms to comply with ethics regulations, (b) complete the entry-survey, and (c) be shown how to navigate the IYLS environment. No emphasis was made on when or why to use help options.

Individual sessions (one through six) were one-hour each, conducted at about five-day intervals over a two-month period. During each session, participants (a) interacted with texts and associated exercises, (b) completed a task-directed listening questionnaire and a vocabulary form, and (c) were interviewed. No time pressure was imposed on any of the interactions, and listeners were free to partially or completely replay texts. Student interaction with texts and help options was unobtrusively recorded with Camtasia 10.0. (Techsmith, 2020). Participants selected their preferred language for interviews (Spanish or English). Across 60 interviews conducted, 7 interviews were conducted in English as requested by the participants.

### **Data Analysis**

To construct interaction logs, 60 Camtasia files (28.03 minutes on average) were viewed by six trained coders. In group sessions, logs were refined and coalesced into coding categories ([Appendix A](#). coding



categories), from which listener profiles were constructed in Excel books and VBA macros.

Listener profiles were constructed for each participant across sessions and exercises. Excel-produced macros were used to identify recurring patterns of interaction. To be considered a salient pattern, each pattern had to comply with three of the four criteria below:

1. The pattern emerged in three or more sessions to ensure regularity of behavior.
2. The pattern was exhibited in sessions four, five, and six, since three first sessions were considered exploratory in nature.
3. The pattern accounts for at least 10% of the total number of pattern use.
4. The pattern was exhibited by a minimum of three participants to ensure variability in the data.

Once behaviors were established, the semi-structured interviews were transcribed and analyzed to understand the reasons behind them. In the interest of readability, extraneous features, like hesitations, false starts, and fillers, were removed (Davidson, 2009). Otherwise, interview samples are verbatim transcriptions.

## Results and Discussion

In this section, the first two research questions are addressed simultaneously. These are stated as: (a) What are the patterns of interaction with help options in a computer-based L2 listening environment for high-intermediate learners of English? and (b) Do interaction patterns vary across sessions and exercises? Patterns are presented by section (pre-, while-, and post-listening), by exercise (matching, drag and drop, true/false, multiple-choice, dictation-cloze, sentence completion, and extension activity), and by session (one through six).

Analysis of the screen-captured data resulted in the identification of 16 learner-system interaction patterns. Two pattern types were exhibited during pre-listening, ten in the while-listening, and four in the post-listening section, all of which were exhibited a total of 939 times. Tables 3 through 8 summarize the identified patterns, provide definitions, report the total frequency of use, and list the participants with their respective frequencies of use.

### Patterns of Interaction Exhibited in the Pre-listening Section

No help option was exclusively associated with any of the three exercise types presented in the pre-listening section. That noted, [Table 3](#) summarizes the two predominant patterns: PL1 and PL2, which were exhibited a total of 72 times. The most recurrent pattern was PL2, in which listeners interacted with biology/culture/technology notes and/or keywords before listening to the talk.



**Table 3***Patterns Identified in the Pre-listening Section*

<b>Pattern Code</b>	<b>Pattern Definition</b>	<b>Frequency of Pattern Use</b>	<b>Participants and Number of Times*</b>
PL1	Listeners use transcripts before listening to the input texts	29	Sammy 17, Max 8, Jessie 3, Sergio 1.
PL2	Listeners use biology/culture /technology notes, and/or keywords before listening to the input texts	43	Rita 14, Sergio 7, Cora 6, Sammy 6, Carol 6, Leo 2, Betsy 2.

*Note.* \*Participants presented in decreasing frequency of pattern exhibition

**Table 4** shows PL1 and PL2 pattern frequency throughout the six sessions. Participants tended to depart from the PL1 pattern, from repeated interaction with transcripts to just a few instances of interaction as listeners advance in sessions, dropping from 18 and 9 times in the first two sessions, to 0, 1, and 0 in the last three sessions. In the PL2 pattern, participants increased the use of explanatory options toward the last three sessions. Interestingly, listeners overlooked keywords in four consecutive sessions despite their prime location immediately above the video.

**Table 4***Patterns Across Sessions in Pre-Listening Exercises*

<b>Pattern</b>	<b>PL1</b>		<b>PL2</b>		
	<b>TRC</b>	<b>BN</b>	<b>CN</b>	<b>TN</b>	<b>KW</b>
1	18	0	0	0	0
2	9	0	1	2	0
3	1	0	1	1	0
4	0	2	2	2	0
5	1	3	5	4	6
6	0	3	3	3	5

**Patterns of Interaction Exhibited in the While-listening Section**

The while-listening section had multiple-choice and dictation-cloze exercises. Four predominant patterns were exhibited by participants during the multiple-choice exercises, labelled WMC one through four, and exhibited a total of 446 times (Table 5). For the multiple-choice exercise, the best answer could not be selected without understanding the text. Students were prompted to click on a feedback button that

displayed green check marks for correct answers and red crosses for incorrect ones. When marked as incorrect, the system offered an audio segment with the texts that led the listener to arrive at the correct answer.

**Table 5**

*Patterns Identified in Multiple-choice Exercises*

Pattern Code	Pattern Definition	Frequency of Pattern Use							Participants and # of Times
		S1	S2	S3	S4	S5	S6	Total	
WMC1	Listeners use feedback after completing comprehension questions	58	31	39	42	64	47	281	Sergio 59, Max 44, Sammy 39, Leo 39, Betsy 35, Fiona 29, Jessie 16, Cora 14, Rita 3, Carol 3
WMC2	Listeners use transcript as they complete comprehension questions	7	0	6	0	3	10	26	Sammy 13, Betsy 5, Max 5, Fiona 3
WMC3	Listeners use the video control bar (rewind /forward) as they complete comprehension questions	12	11	8	13	4	16	64	Max 18, Sammy 13, Fiona 6, Cora 6, Sergio 6, Betsy 4, Jessie 3, Rita 3, Carol 3, Leo 2
WMC4	Listeners use video control bar (pause) as they complete comprehension questions	3	19	15	12	6	20	75	Max 20, Sammy 14, Fiona 11, Leo 10, Betsy 7, Cora 7, Sergio 4, Rita 1, Jessie 1

Table 5 also shows that the more students exhibited the WMC1 pattern, the less they relied on video control bars, as seen in the WMC3 and the WMC4 patterns and vice-versa. There seems to be a negative relationship between feedback and video control usage, a strong candidate for a preferred pattern of interaction.

Regarding patterns exhibited by participants while working with the dictation-cloze, Table 6 details six predominant patterns. These are labelled WDC 1 through 6 and are exhibited a total of 355 times. Patterns WDC1 and WDC2 describe listener interactions with transcripts while and after they complete dictation-cloze exercises and were exhibited a total of 16 and 20 times, respectively. Interestingly, using transcripts in the dictation-cloze was to no avail, since the textual support offered was for the video segment previously displayed during multiple-choice exercises, and did not include the deleted word or phrase. Despite becoming aware of this, some students continued to resort to transcripts after completing the dictation-cloze. Next, the WDC3 and WDC4 patterns entail the use of the audio control bar for rewinding, forwarding, and pausing actions. These actions are essential for the completion of dictation-cloze exercises requiring listeners to type words missing from the text. Pattern WDC3 was exhibited by all participants, and eight participants exhibited pattern WDC4 at least once. In patterns WDC5 and WDC6, listeners accessed the dictionary and/or glossary as they completed the dictation-cloze. Table 6 shows that pattern WDC5 was mostly exhibited in session four and almost entirely neglected in session six, while pattern WDC6 was used almost exclusively in session two.

**Table 6**

*Patterns Identified in Dictation-cloze Exercises*

Pattern Code	Pattern Definition	Frequency of Pattern Use						Participants and # of Times	
		S1	S2	S3	S4	S5	S6	Total	
WDC1	Listeners interact with transcripts as they complete the dictation-cloze	6	6	0	0	1	3	16	Max 9, Leo 4, Sergio 1, Carol 1, Sammy 1
WDC2	Listeners interact with transcripts after completing the dictation-cloze	5	4	3	4	4	0	20	Max 6, Sergio 3, Betsy 2, Fiona 2, Jessie 2, Rita 2, Carol 1, Leo 1, Sammy 1
WDC3	Listeners use audio control bar-rewind/forward- as they complete the dictation-cloze	19	39	16	25	8	16	123	Sergio 22, Carol 19, Max 19, Leo 18, Fiona 15, Betsy 11, Jessie 8, Cora 4, Sammy 4, Rita 3
WDC4	Listeners use audio control bar- pause- as they complete the dictation-cloze	20	37	16	22	27	19	141	Fiona 45, Betsy 28, Leo 22, Max 19, Cora 16, Rita 4, Sergio 4, Carol 3

WDC5	Listeners use the dictionary as they complete the dictation-cloze	5	4	4	23	6	1	43	Betsy 15, Max 12, Carol 9, Sergio 5, Rita 1, Jessie 1
WDC6	Listeners use the glossary as they complete the dictation-cloze	1	9	1	0	0	1	12	Sergio 6, Carol 4, Leo 1, Max 1

### Patterns of Interaction Exhibited in the Post-listening Section

Four patterns were exhibited in the post-listening section: one for the sentence completion (POSC) and three for the extension activities POLEA 1 to 3 (Table 7 and Table 8).

**Table 7**

#### *Patterns Identified in the Post-listening Section*

Pattern Code	Pattern Definition	Frequency of Pattern Use	Participants and # of Times
POSC	Listeners use glossary after completing the sentence completion activity.	16	Sergio 6, Sammy 6, Betsy 2, Leo 1, Max 1.
POLEA1	Listeners use transcripts as they complete the extension activity.	14	Betsy 8, Cora 4, Leo 1, Max 1.
POLEA2	Listeners use culture/biology/technology notes and a dictionary as they complete the extension activity.	21	Max 6, Fionna 4, Cora 3, Betsy 3, Carol 1, Leo 2, Jessie 1, Sergio 1.
POLEA3	Listeners use culture/biology/technology notes and dictionary after completing the extension activity.	15	Fionna 6, Jessie 4, Sergio 2, Max 1, Cora 1, Rita 1.

**Table 8***Patterns Across Sessions in Sentence Completion and Extension Exercises*

Pattern Session	POSC	POLEA1	POLEA2			POLEA3				
	GLO	TRC	CN	BN	TN	DIC	CN	BN	TN	DIC
1	0	2	0	2	2	3	0	0	0	0
2	1	10	0	0	1	3	2	0	2	0
3	7	0	0	0	0	0	0	0	0	0
4	4	0	1	1	1	0	1	0	1	2
5	0	0	0	0	0	2	0	0	1	1
6	4	2	0	0	0	5	1	1	2	1

To identify why participants exhibited their respective patterns of interaction with help options, complete interview sets underwent three cycles of qualitative data analysis (Miles et al., 2014). Categories that were not easily identified were discussed with two senior researchers familiar with the investigation, and the coding was refined accordingly. The inter-coder reliability index was calculated at 0.93. Triangulation of sources (six interviews per participant) and coders (three coders) was also done to comply with systematic interrogation of qualitative data. Participant reasons were coalesced into three themes: relevance, recovery, and practical issues. Themes and their associated clusters are explained.

**Relevance: The Perceived Value of Help Options**

Relevance refers to the perceived value a learner assigns to help options. This theme is made up of four clusters: preparing for listening, improving comprehension, language learning, and listening reinforcement (Table 9).

The first cluster in relevance, “preparing for listening”, explains behaviors where listeners make use of lists of words that serve as schema activation exercises in preparation for the while-listening activities, e.g., the PL2 pattern (the use of culture/technology/biology notes, dictionary, and keywords before listening to the input text). No study to our knowledge has reported the use of help options in preparation for listening comprehension demands. Possibly, listeners used their knowledge as teachers-to-be to their advantage: they are trained to activate background knowledge, with emphasis on vocabulary previews.

The second cluster in this theme, “improving comprehension”, is defined as how help options, and the pause button in particular, was used to segment texts to give listeners time to digest information. This cluster is most closely related to patterns WMC4 and WDC4, in which listeners used the pause bar when completing multiple choice and dictation-cloze activities. This finding has precedents in Cárdenas-Claros (2011), Rivens Mompean and Guichon (2009) and Rousell (2011), who surmised that intermediate learners may pause video clips to parse speech and/or recognize chunks of discourse.

The third cluster, “language learning”, refers to how compensatory help options (transcripts, video control bars) are used by participants in while-listening exercises as a means to learn vocabulary, spelling, and pronunciation. This cluster is mapped to patterns WMC2, WDC1, and WDC2, which describe instances of transcript use in while-listening activities. “Language learning” was suggested as a possibility by Cárdenas-Claros (2011), Grgurović and Hegelheimer (2007), and Rost (2007), who noted that learners used transcripts, and likely did so to learn different aspects of the language. This cluster is also mapped to patterns WMC3 and WDC3, which describe the use of audio control bars. Hegelheimer and Tower (2004) had suggested the use of audio/control bars as potentially helping learners become aware of pronunciation as a consequence of repeated listening to texts. As a corollary, this cluster also entails how explanatory options (particularly, notes, dictionary, and glossary options) are used by listeners to learn different aspects of the language. This factor is explained by participants in their usage of patterns WDC5, WDC6, POSC, and

## POLEA3.

The last cluster, “listening reinforcement”, explains how interaction with feedback, as described in the WMC1 pattern, helps listeners clarify ideas not understood in the text. This reason was given as a possibility in the work of Pujolá (2002), where participants found feedback helpful in not only assessing their performance, but also in clarifying content not understood in the input. The “listening reinforcement” cluster also explains how the availability of audio/video control bars allowed students to choose the number of times to listen to a text. This reason cluster is mapped into patterns WMC3 and WDC3 (repeated use of audio control buttons in multiple choice and dictation cloze exercises) and aligns with the suppositions reported by Çakmak and Erçetin (2017), Hegelheimer and Tower (2004), and Rousell (2011), who noted student preferences for learner control afforded through audio/video bars.

**Table 9***Theme One: Relevance*

Cluster	# of Coding Entries	# of Learners	Definition	Pattern	Sample
Preparing for listening	31	7	Culture/technology/biology notes, dictionary, glossary and keywords are used before listening to the input text as a pre-listening activity	PL2	R: What I've changed throughout the sessions is that now I use the help options before listening to the talk. For example, today I checked the keywords, culture notes, biology notes, technology notes... I used the dictionary before doing anything else, before the pre listening, before everything. I: Why? R: Because I've realized that they are helpful to do all the activities, mostly the ones I know I have difficulties with. (Rita S5 L42-44)
Improving comprehension	47	10	Pause button is used to digest information	WMC4 WDC4	C: It works better for me if I pause it. [...] Because I have more time to read the question again and think about the answer; otherwise, I can miss the information that is after or before. So,

Language learning	55	10	Transcripts, A/V control bars used to learn different aspects of the language	WMC2 WMC3 WDC1 WDC2 WDC3	then I resume the video and I don't miss the answer nor the information (Cora S4 L68-70) C: I used [the transcript] because I had some doubts...I didn't understand the pronunciation of certain words, so I looked at that part of the text in the transcript. I read it and then I understood (Carol S4 L60)
			Culture/biology/technology notes, glossary, and dictionary used to learn different aspects of the language	WDC5 WDC6 POSC1 POLEA3	J: I like the glossary, it's not like the dictionary that gives you the definition but not the context, which is quite important. It has been highly useful to learn several words I didn't know (Jessie S5 L34)
Listening reinforcement	10	27	Feedback button is used to clarify comprehension	WMC1	F: The feedback is useful because, when I listened to the complete talk, sometimes I didn't get some words or ideas the speaker said. With the feedback, I could clarify some ideas and understand better (Fionna S2 L30)



A/V buttons are used to clarify comprehension	WMC3 WDC3	J: The forward and rewind buttons are of great importance. In a test, you have the option to listen to the text once or twice and that's it...the audio bar allows you to listen as many times as you want, you can go back to a specific segment, listen to it again, and clarify things you were unable to understand in one go. (Jessie S5 L32)
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The second theme, “recovery”, is understood as the learner response to perceived comprehension breakdowns. In this data set, recovery encompasses two clusters: “confirmation of information” and “short-term memory capacity issues” (Table 10). “Confirmation of information” refers to how participants interact with help options to double check whether the information they first came across was correct. These reasons are mapped to patterns POLEA2 and POLEA3. This reason was discussed in Cárdenas-Claros (2011) who noted that students used help options to compensate for lack of confidence in their language knowledge and text understanding.

The second cluster, “short-term memory capacity issues”, describes how transcripts and A/V buttons are used to compensate for student inability to hold information in their short-term memory and it is mapped to patterns WDC1, WDC2, WDC3, WMC3, and WMC4. The above reasons have been suggested by previous studies: Cárdenas-Claros (2011) and Goh (2000) found that listeners had problems remembering words they listen to and suggested this was possibly due to excessive demands from unfamiliar input on limited processing capacity. Similarly, Rivens Mompean and Guichon (2009) reported that intermediate learners pause texts to take notes to seemingly compensate for self-perceived limitations in memory capacity.

**Table 10***Theme Two: Recovery*

Cluster	# of Coding Entries	# of Participant	Definition	Pattern	Sample
Confirming information	17	6	Culture/ biology/ technology notes, glossary, and dictionary are used to confirm information due to insecurity issues	POLEA2 POLEA3	C: The biology notes and the glossary were useful, also... there were words that I knew but I wasn't sure about, so I used the help options to check them (Cora S1 L82-84)
Addressing short-term memory capacity issues	7	3	Transcript and A/V buttons are used to compensate for short-term memory capacity issues	WDC1 WDC2 WDC3 WMC3 WMC4	S: My memory fails a lot... I can listen to the talk and everything is clear, but I tend to forget key details. For example, now the question was about the number of people who had accidents. I was clear on a lot of people having had accidents, but not the number, so I had to listen again (Sergio S5 L166-170)

The practical issues theme is explained by students' ensuring smooth completion of the listening task. This reason was mapped to pattern WMC1, in which listeners use feedback as a means to speed up the interaction process and complete the task. This finding has not been reported by previous studies (Table 11).

**Table 11***Theme Three: Practical Issues*

Factor	# of Coding Entries	# of Participants	Definition	Pattern	Sample
Saving time	11	7	Feedback is used to save time	WMC1	C: Feedback is useful because when I look for info in the video, I get lost, I don't find it, and I waste time (Carol S1 L52)

**Guidelines for Working with Help Options in Blended Environments**

Addressing the concerns in Cross (2017) regarding a lack of concrete computer-based listening pedagogy drawn from empirical research, we put forward a set of guidelines to inform instruction when working with

high-intermediate listeners in listening environments rich with help options. We do not expect that all computer-based listening researchers or all language teachers will agree with them. We hope, though, that they will provide a basis for argument, reflection, and new research initiatives that allow us to advance the current knowledge of help options in computer-based environments. We also acknowledge that the suggested guidelines may primarily work in contexts with some degree of face-to-face instruction, and that further adaptations may be required for other contexts.

**G1:** Group options according to their affordances. Most internet-based applications, such as YouTube, Edmodo, Vimeo, and listening sites exclusively devoted to listening comprehension development (e.g., Randall-Cyber Listening lab) offer a number of help options. It is thus advisable for teachers to group options and present them progressively, instead of giving learners too many options. In this study, listening tips and keywords remained neglected despite their prime location. Participants also started using options familiar to them (transcript) but found culture/biology/technology notes to be useful for their listening goals as they got to know the learning environment. This might be an indicator that teachers need to gradually familiarize students with the affordances of certain options before moving onto new ones.

**G2:** Allow limitless opportunities for students to interact with select options. As Hubbard (2004) pointed out, repeated interactions with help options allow learners to accrete ideas about their usage. Although we are careful not to claim that six instances could be considered “extensive” exposure, this study did provide learners with opportunities to interact with unfamiliar help options and to test out novel ways to approach the ones they were familiar with. In our study, culture/technology/biology notes were mostly overlooked during the first sessions, but as sessions advanced, learners used them in preparation for task demands as exhibited in pattern PL2.

**G3:** Vary not only the type of texts, but also the type of exercises. Different types of exercises call for the use of different help options. In this study, comprehension exercises presented in a multiple-choice format predominantly called for the use of feedback as exhibited in pattern WMC1; the dictation-cloze called for the use of video control bars for forwarding, rewinding, and pausing, as described in patterns WDC3 and WDC4; and notes were mostly used in preparation for task demands, as exhibited in pattern PL2.

**G4:** Encourage individual reflections where students take note of what help options work best for them and under what circumstances. In our study, this was encouraged through systematic interviewing after each session. Teachers can resort to written/oral open learning diaries that students keep and which serve as the basis for further reflection and identification of what patterns are more useful and under what circumstances, with what type of exercises and types of texts.

**G5:** Foster small group and whole class reflection. Extending the work of Hubbard (2004) for collaborative debriefings, have students set up listening goals, identify the help options they find the most beneficial to address such goals, and explain the reasons in small groups first. Then, as a class, group the most common responses across listeners, listening goals, and help options.

**G6:** Challenge students to try out new ways to use help options based on their own listening goals and the identified reasons. Then, have students compare and contrast the benefits or lack thereof. In this study, and as Cárdenas-Claros (2011) noted, constant questioning of why certain options had been neglected (as in the case of listening tips) encouraged listeners to effectively use them towards the last sessions.

### **Guidelines for Working with Help Options in Self-Assess Environments**

Indiscriminate use of help options may lead to listener frustration if, in spite of their efforts, no progress in language competence is made. As such, we suggest the following set of guidelines to encourage effective use of help options when working in self-regulated environments that offer options similar to the ones described in the study.

**G1:** Advise that students use explanatory options (e.g., notes) as pre-listening activities to address issues related to limited background knowledge and lack of vocabulary.

**G2:** Have students rely on compensatory options (e.g., aural-to-visual like transcripts, captions, and subtitles) after completing comprehension checking exercises. Aural-to-visual type compensatory options counteract the ephemeral nature of listening texts and allow listeners to revise and confirm text segments they have understood or failed to understand.

**G3:** Have students use feedback to their advantage. Most listeners swiftly change exercises after getting feedback on their performance without necessarily taking the time to revise and understand why their selection was correct or incorrect. In our study, we found that listeners preferred to use feedback than listen to the whole text in the multiple-choice exercise. This may be an indicator of the increasing need to thoroughly conceptualize and design feedback in computer-based L2 listening in order to increase L2 learners' interaction with aural input.

**G4:** Encourage repeated interaction with texts through the use of A/V bars, particularly after a comprehension problem has been solved, to increase the possibilities for new words and expressions to be instilled in learner lexicons. A key requirement of vocabulary learning is the provision of repeated encounters with the same word, even if this is presented incidentally through the same segment (Van Zeeland & Schmitt, 2013). Moreover, bimodal exposure to new words (written and aural) seems to aid pronunciation awareness (Abobaker, 2017; Cárdenas-Claros & Campos-Ibaceta, 2018).

**G5:** Favor activities that require simultaneous use of compensatory options (transcripts and A/V bars) to encourage word segmentation skill development. A major challenge for L2 listeners is to recognize where some words end and where new words begin in a stream of speech (Vandergrift & Goh, 2012). For L2 listeners whose first language sound and written systems are similar to English, this could be done through transcripts. With L2 learners whose L1s writing scripts are very different (as with Arabic, Hebrew, Japanese, Chinese, or Korean) a more active intervention would be required. Also, transcripts may be beneficial in contexts where reading has long been the basis of language instruction (Cárdenas-Claros & Campos-Ibaceta, 2018).

**G6:** Promote the use of the pause button to encourage students to stop and think about their processes. Rousell (2011) and Pujolá (2002) described learner self-regulation as chaotic, where movements to rewind and forward text segments were disorganized and idiosyncratic. Using the pause button may help listeners take the time to monitor how much they have been (un)able to understand and plan accordingly.

## **Caveats and Suggestions for Further Research**

As future ELT professionals, the participants in this study have developed techniques to help them cope with new texts. In a way, they were motivated to be cooperative in the study both to amplify their own language learning and to gain tools to help them in their upcoming teaching careers. In our data, we detected transference of classroom behaviors to the computer-based L2 listening environment. As our data analysis shows, participants used explanatory help options as pre-listening activities, a finding that had not been reported in previous studies. We also found that, despite the breadth of options available to L2 listeners in our study, they at first relied on those they were familiar with (transcript) and, as they became familiarized with the listening environment, adjusted their patterns of behavior to ensure text comprehension and learning. Educator fears of having students indiscriminately use help options, at the expense of comprehension, were shown to be unfounded. In fact, the opposite pattern was exhibited in this study.

The above findings should be interpreted with a number of limitations in mind. Listener behaviors were tracked with screen capturing software from which profiles were constructed. Although as a research team, we took every possible measure to ensure reliable coding, we acknowledge that the data may not be exempt from human error. In its newest version, the IYLS platform has incorporated a tracking system. This new addition will deploy error-free logs and will cut researcher viewing time by one-third. Also, although TED talks are directed to general and non-specialized audiences, the topic of "technology" necessarily relates to the description of technologies that have an impact on society and, therefore, are loaded with topic-specific vocabulary, a potential trigger for help option use.

We invite researchers and scholars to test out if and how the identified patterns have an impact on comprehension and to use the guidelines put forward in other language settings and with learners of other language backgrounds. Other initiatives could address standing invitations (i.e., Cross, 2017; Hubbard, 2017) to link listening theory (metacognition, listener variables) to patterns of interaction.

## Conclusion

In this study, a change in patterns of behavior was noted as the participants advanced in sessions. Explanatory options (notes) that were neglected at first were used effectively and predominantly in preparation for task-demands towards the last three sessions. Compensatory options (transcripts) that were used in the first two sessions as reading texts were later used for confirmation, task completion, and learning different aspects of the language. A/V bars that were sporadically used in the first encounters were better regulated as listeners made use of input provided through the feedback. In short, more than controlling the availability of help options and forcing listeners to follow what CALL scholars and software designers believe they should do, there is a need for training in help option use. The patterns identified here are indicative of what a selected group of participants from a Spanish speaking background can do when given the opportunities to freely interact with help options. Listeners will be empowered if proper training is given, though to what extent the benefits may reach remains speculative.

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## Appendix A. Coding categories

Name of Code	Definition
Changes answer	Used while the listener is completing an exercise After the listener checks for exercise correctness
Changes to website	When the listeners are directed to work with an external link. Exclusively in an extension activity
Changes to platform	When the listener gets back from an external link
Checks	When the listener uses the help options located on the toolbar When the listeners check correctness of an exercise
Clears exercise	When the listener resets the exercise
Clicks	When the listener browses the exercise, but does not work on it. It usually takes from 0-3 seconds.
Closes help	When the listener closes any type of help option except for audio/video control buttons
Completes	When the listener finishes responding/ completing an exercise
Corrects wrong answer	When the listeners gets feedback and corrects a wrong answer
Fills in word	When the listener fills in a word. Exclusively associated to the dictation cloze exercise
Interaction starts	When the listener starts the interaction with the platform
Interaction ends	When the listener finishes the interaction with the platform
Looks up word	When the listener uses the dictionary embedded in the platform
Plays	When the listener plays audio and/or video segments
Previews	When the listener approaches the exercise (reading questions, instructions, etc). An indicator is that the listener remains in the exercise for 4 or more seconds.
Replays	When the listener replays audio and/or video segments
Resumes	When the listener resumes audio and/or video segment
Reviews	After the listener has completed an exercise. Mostly employed at the end of the unit. Listeners double check that they have done everything.
Rewinds	When the listener rewinds audio and/or video segments
Selects answer	When the listener selects an answer. Exclusive for checking understanding exercise
Starts	When the listener starts completing an exercise.
Uses Google	When the listener leaves the platform to look for information other than the one presented in an extension activity

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