**Learning to produce L2 VOT values in “true voicing” languages**

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Objectives: Raise awareness and practice producing target-like phonetic realizations of the phonological voicing contrast (e.g., /b/ vs. /p/) in word-initial position in Spanish (or other “true voicing” languages with short-lag vs. pre-voiced/negative VOT values, such as Italian, Dutch, etc.) through a brief, multifaceted, phonetic production training session; this approach is especially suitable for novice L2 learners with limited vocabularies in basic foreign language courses, whose native language is English (or another language with short-lag vs. long-lag VOT values, such as German).

Evidence suggests that literate L2 learners’ productions in Spanish are influenced by transfer effects from L1 orthography (e.g., Rafat, 2016); this session explicitly draws learners’ attention to subtle differences in English vs. Spanish VOT values, and illustrates how these phonetic realizations map onto graphemes in Spanish vs. English. Recent evidence further suggests that L2 production training without accompanying perception training can lead to improvements in L2 sound productions (e.g., Kartushina, Hervais-Adelman, Frauenfelder, & Golestani, 2015). Further research suggests that following one brief, 30-minute, multifaceted phonetic training session, L2 learners’ VOT productions of voiceless stops can become more target-like in isolated words in subsequent weeks (Schuhmann & Huffman, 2015).

Steps:

1. Raising awareness about the voicing contrast (for /b, p/) in L1 (aspiration vs. no aspiration) and how it differs from the voicing contrast in L2 (pre-voicing vs. short-lag; no aspiration), despite the use of largely identical graphemes for these contrasts in both languages (*5-10 minutes; more time can be added if other places of articulation are also discussed and illustrated*):
	* Learners are presented with auditory information (audio recordings) and visual information (waveforms, spectrograms) using L2 examples with very clear, ‘textbook’ speech:
		+ Learners are shown differences in waveforms and spectrograms for aspirated vs. non-aspirated, short-lag voiceless stops while listening to differences in audio recordings and/or live demonstrations of these sounds in initial positions.
		+ Learners appreciate potential for misunderstandings involving short-lag stops in Spanish. (An unaspirated, unvoiced [p] in Spanish might be misidentified as /b/ by native English listeners; similarly, an unaspirated, unvoiced [p] intended as /b/ by L2 Spanish speakers might be misinterpreted as /p/ by native Spanish listeners.)
	* Possible words for illustrations:
		+ English: paces vs. bases
		+ Spanish: pesos vs. besos
2. Learners are instructed to produce target sounds while monitoring tactile feedback as they try out various techniques and behaviors to produce target-like VOT values (*10 minutes;* *more time can be added if other places of articulation are also discussed and illustrated*):
	* Learners first produce L1 long-lag, aspirated voiceless stops, then work towards producing short-lag or reduced long-lag VOT values by reducing the amount of aspiration in L2 voiceless stops:
		+ Props such as popcorn, tissue, light paper, a mirror, or a hand provide concrete feedback (beyond the auditory domain) about whether or how much aspiration is present in the production of voiceless stops.
	* Learners then work towards producing pre-voiced (‘truly voiced’) VOT values in L2 voiced stops.
		+ Performances such as covering one’s ears with both hands, placing one hand on top of one’s head (and, for some people, placing one hand on their throat) can provide heightened auditory and proprioceptive feedback about whether pre-voicing is present in the production of voiced stops.
		+ Additionally, students are instructed that, in the case of difficulties producing voiced stops, they can initially produce a nasal (e.g., [m]) prior to a voiced stop (e.g., [b]) and then continuously work on reducing the length of this nasal until there is no nasal prior to the voiced stop.
	* Possible words for practicing L2 VOT values (Spanish minimal pairs):
		+ pesos vs. besos
		+ pata vs. bata
		+ peca vs. beca
		+ besar vs. pesar
		+ brisa vs. prisa
3. Learners are recorded with a speech analysis software (e.g., Praat) while producing the target sounds in word-initial position (*10-15 minutes;* *more time can be added if other places of articulation are also discussed and illustrated*):
	* Learners are instructed to produce the previously illustrated and practiced L2 words and, time permitting, additional words provided on a list or known by the learner(s), with the same and possibly additional places of articulation (e.g., /t/ vs. /d/ below)
	* Learners are recorded in Praat (helped by the instructor and ideally, TAs)
	* The waveforms and spectrograms are then inspected to determine whether further modifications could lead to more target-like VOT productions in their L2.
	* Learners are provided with feedback and encouraged to record further repetitions or new words, incorporating any feedback received.
* Possible words for further practicing L2 VOT values (Spanish minimal pairs):
	+ - pesos vs. besos
		- pata vs. bata
		- peca vs. beca
		- besar vs. pesar
		- brisa vs. prisa
		- tia vs. dia
		- tos vs. dos
		- tan vs. dan
		- teja(r) vs. deja(r)
1. Possibilities for homework, follow-up, and extensions:
	* Overall, this brief session can be extended to include explicit discussion, illustration, and practice of the L2 vs. L1 phonological voicing contrast at other places of articulation (/t, d; k, g/); Alternatively, this brief session can be repeated as a separate session with the focus on the L2 vs. L1 phonological voicing contrast at one or both other places of articulation (/t, d; k, g/).
	* Initially, record students prior to mini-teaching activity (if students consent);
	* Save recordings from mini-teaching activity (if students consent);
	* Have students record an additional set of practice words at home, compare to examples from mini-lesson (own and/or clear L2 examples), and note down their observations about their ability to produce the target VOT values.
	* Over the next few days, have students identify 4-8 new vocabulary items in their ongoing lessons (or otherwise frequently used or known words) that begin with one of the two relevant categories (i.e., initial voiced or initial voiceless stops).
		+ Have students list these words and supply a recording of their own pronunciation of these words.
		+ Have students look up audio recordings of these words online to compare their pronunciations to the recorded versions;
		+ Ask students to assess their productions;
		+ Teachers check for completeness of these assignments, and ideally also provide feedback on the productions and students’ own evaluations.
	* Next, ask students to write a story or essay incorporating all of the newly identified vocabulary items; then, students are asked to practice reading the story/essay out loud, paying attention to the relevant sounds; finally, students can record the entire story/essay; have students analyze their speech, reflecting on their abilities, difficulties, and other observations.
	* Finally, ask students to speak spontaneously about various topics currently being discussed in class, incorporating the (previously identified) new vocabulary items; instructors and students then check for incorporation of the trained, new phonetic boundary in spontaneous speech.
	* These extensions and follow-up exercises could potentially continue for weeks without taking up class-time; individual differences can be identified (by students and/or the instructor) and specifically targeted in further pronunciation practices.

Selected References:

Kartushina, N., Hervais-Adelman, A., Frauenfelder, U. H., & Golestani, N. (2015). The effect of phonetic production training with visual feedback on the perception and production of foreign speech sounds. *The Journal of the Acoustical Society of America*, *138*(2), 817–832. <https://doi.org/10.1121/1.4926561>

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