# LEARNER ATTITUDES TOWARDS VISUAL FEEDBACK FOR TEACHING SECOND LANGUAGE SPANISH VOWELS: EXPLORING BEST PRACTICES

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Previous work on attitude studies reveals that learners view visual feedback (VF) as beneficial to their pronunciation learning; however, most studies on learner attitudes towards VF for Spanish as a second language (L2) focus on consonants. Twenty intermediate learners at a U.S. institution participated in four VF interventions via the program Praat to instruct the differences between Spanish (L2) monophthongs and English diphthongs in stressed position. Participants rated 19 statements on a 9-point Likert scale (1 = *disagree*, 9 = *agree*). The current study's results were additionally compared with the learner attitudes results towards VF for a set of consonants from a previous study. Learners in the current study generally indicated that VF interventions were useful to their learning, they felt more confident about their pronunciation post-activity, and they considered pronunciation learning important. However, unlike in the previous study, attitudes towards the enjoyment of the activity were mixed, and learners were unsure if VF should be used to teach these vowel differences in future classes due to the perceived difficulty of comparing vowel formants.

## INTRODUCTION

Previous work over the last several decades has established that pronunciation instruction is vital to second language (L2) teaching and learning to increase the intelligibility and comprehensibility of L2 learners (Derwing & Munro, 2005). As the field of pronunciation instruction has developed, multiple forms of intervention have been designed and tested, such as high variability phonetic training (e.g., Thomson, 2018) and articulatory training for explicit instruction (e.g., Lord, 2005), among others. While these methods have been shown to be beneficial, the current study focuses on another potentially advantageous form of pronunciation instruction, namely visual feedback (Motohashi-Saigo & Hardison 2009). The current study focuses explicitly on learner attitudes towards a visual feedback paradigm involving L2 Spanish vowels, followed by a comparative analysis involving a previous study focused on L2 Spanish consonants. Furthermore, while the current study does not report on production or perception improvements, insights on how learner attitudes may play a role in pronunciation learning and development are discussed.

### Visual Feedback

A visual feedback (VF) paradigm can be broadly defined as the use of visualizations of speech, often through soundwaves and spectrograms, to show differences between the L2 and the first language (L1) in lieu of solely relying on auditory instruction (Hardison, 2021). In other words, learners are taught to use visual cues to guide them in examining speech patterns and differences

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that may exist between the L1 and the L2, based on the assumption that if learners cannot hear the difference, they may be able to visually identify the difference.

Within VF practices, there are two types of VF, namely direct and indirect. Direct VF often incorporates the use of technology such as ultrasound machines that directly reflect articulatory movement within the oral cavity in real time (e.g., tongue placement) (Bliss et al., 2018; Chang, 2023). While direct VF may provide the most accurate depiction of articulators, it is often not considered the most practical approach in a classroom setting due to its inaccessibility (e.g., high cost) and its limitation to being individually used (i.e., only one learner can use an ultrasound machine at once). Another form of VF is indirect, which often incorporates the use of technology to display acoustic correlates of speech that reflect articulatory movements, thus being considered indirect VF. For example, waveforms and spectrograms can be used to provide learners with visual representations of their speech production at an acoustic rather than a physiological level (Kartushina et al., 2015). Typically, programs such as Praat (Boersma & Weenink, 2024), a free and widely available recording program, are used for VF interventions. These programs can be used by multiple participants at once as opposed to specialized equipment for imaging speech articulators (Offerman & Olson, 2023).

**Monophthongs and Diphthongs in Spanish and English for /e/ and /o/**

With the current study focusing on L2 learners of Spanish, it is important to detail the primary differences between the vowels /e/ and /o/ in Spanish and in English, as these were the vowels of focus for the VF interventions. These vowels were chosen as they may impact comprehensibility and intelligibility more than consonants. Firstly, American English vowels in stressed position typically undergo diphthongization in which a vowel sound glides from one quality to another within the same syllable (Hammond, 2001). For example, the stressed vowel in the word “robot” is typically realized as the diphthong [oʊ], rather than a “pure vowel” or monophthong as done in Spanish. In contrast, stressed vowels in Spanish generally do not diphthongize unless diphthongization is explicitly indicated by the orthography, as in the word *reina* ([rej.na]). Alternatively, the stressed vowels /e/ in *peso* ([pe.so]) and /o/ in *topo* ([to.po]) are produced without any gliding quality typically heard in American English stressed vowels.

Previous research on L2 vowel acquisition in Spanish suggests that L1 English speakers face significant challenges in acquiring Spanish vowels (Long et al., 2018; Menke, 2015; Menke & Face, 2010). This can be a challenge for L2 learners of Spanish with L1 English, as they tend to transfer the English stressed vowel sounds to stressed Spanish vowels /e/ and /o/ due to shared graphemes <e> and <o> (Hammond, 2001). For example, learners tend to realize the stressed /e/ in *peso* as [eɪ], while the stressed /o/ in *topo* may be realized as [oʊ]. Long et al. (2018) examined the development of L2 Spanish learners’ vowel productions during a short study-abroad program and found only minimal gains in diphthongization reduction of /e/ and /o/, suggesting that these segments are particularly challenging for L1 English learners of Spanish. Therefore, the interventions in the present study focused on these two vowels. Although the interventions were production-focused, it is additionally of interest to investigate learner attitudes towards the interventions, especially given that the vowels /e/ and /o/ may pose more difficulty for L2 learners.

## Attitudes Towards Visual Feedback for Pronunciation Instruction

Recent studies have found that learners feel that pronunciation is important to their L2 learning and have at times rated pronunciation learning higher than other aspects of language learning (Huensch & Thompson, 2017; Sturm et al., 2019). As such, it is important to develop pronunciation materials that participants feel are beneficial to their learning and that they enjoy. More specifically, it has been posited that participants' motivation may be impacted (whether positively or negatively) when considering their attitudes towards a specific intervention (Nagle, 2018).

With respect to VF interventions specifically for Spanish, Olson (2014) found that learners believed VF to be useful for the learning of Spanish voiced plosives. Offerman (2020) found similar results regarding VF interventions for the voiceless plosives, and Offerman and Olson (2023) found that learners from three groups using VF for Spanish consonants (voiced and voiceless plosives) additionally revealed that they believe VF interventions to be useful for their L2 Spanish development. However, one consideration is that the Spanish plosives, both voiced and voiceless (/p t k/ and /b d g/), relate more strongly to accentedness. Therefore, the rationale behind choosing to develop VF interventions that focus on the vowels /e/ and /o/ was to provide learners with interventions aimed at improvement in intelligibility and comprehensibility rather than reducing accentedness. While the current study does not examine learner production (i.e., improvement), once again, it is important to consider learners' views, as learner attitudes may impact their language performance and their desire to improve (Nagle, 2018). As a result, the following research questions were developed below.

## Research Questions

1. Will L2 learners find the use of VF interventions for the learning of Spanish vowels /e/ and /o/ to be useful, beneficial, and enjoyable?

2. Will there be a difference in learners' attitudes towards VF activities for consonants and vowels?

# METHOD

## Participants

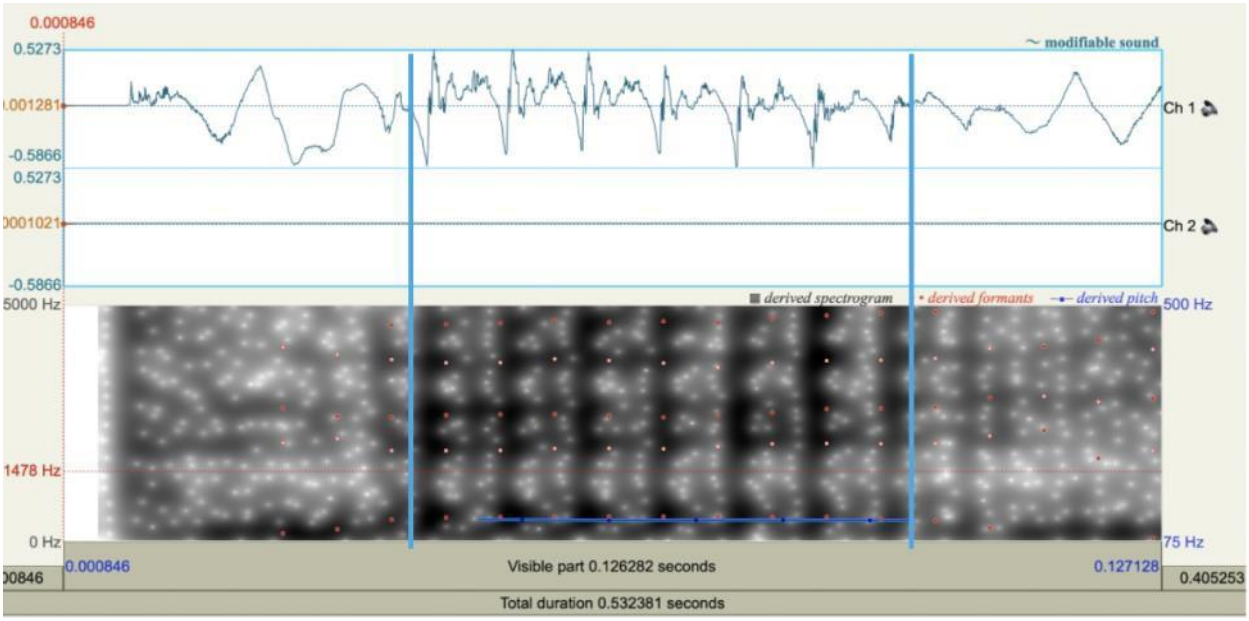
Twenty participants with L1 American English enrolled in an intermediate-level Spanish course at a large public university participated in this study. Data were collected over two semesters, with all participants being taught by the same Spanish instructor. Each participant was between the age of 18 and 22. A language background questionnaire based on the Bilingual Language Profile (Birdsong et al., 2012) was administered, including questions regarding years of exposure to Spanish, age of exposure, and Spanish use outside the classroom. Participants who had had extensive prior exposure to Spanish or languages other than English, such as growing up in a bilingual household or using a language other than English frequently outside the classroom, were excluded from the data pool.

## Materials

### *In-Class Activities*

Participants first took part in a pre-recording activity that was designed to familiarize them with the recording software. They were asked to bring their own recordings to class to be used for an in-class analysis activity. Participants then completed four in-class activities every two weeks during an eight-week period. The purpose of these activities was to have participants examine their own productions of /e/ and /o/ in Spanish and hypothesize about differences between the L1 and the L2. Praat (Boersma & Weenink, 2024) was used by the participants to examine their own L2 Spanish spectrograms in comparison with L1 Spanish spectrograms, allowing them to visually compare and contrast in small groups. The first and the third sessions were dedicated to the analysis of target words containing /e/ in stressed position, and the second and the fourth sessions focused on instances with the stressed vowel /o/. During each session, participants were guided by a worksheet, but received limited instructor guidance, following an inductive paradigm (Offerman & Olson, 2016). That is, participants were expected to discover differences between the L1 and L2 tokens themselves instead of being provided with explicit explanations about formant movements and shifts in vowel quality. To make this more accessible, descriptors such as "lighter" or "darker" and "moving a line" or "moving upward" were used to describe formant movement. Examples of L1 and L2 /e/ productions are shown in Figures 1 and 2.

**Figure 1**
/e/ in *techo* Produced by an L1 Spanish Speaker ([te] from [te.tʃo])




The worksheet acted as a guide for participants during the sessions and presented a spectrogram reflecting the target vowel produced by an L1 speaker (as seen in Figure 1), which the participants were instructed to compare with the spectrogram of their own vowel productions (similar to Figure 2). This was accompanied by guiding questions, as shown in Table 1. Participants were then asked to share their observations with their groupmates and hypothesize about the differences between their own and the L1 speaker's realizations of the target vowel.

**Figure 2**
/e/ in *techo* Produced by an L2 Spanish Speaker ([teɪ] from [teɪ.ʧo])

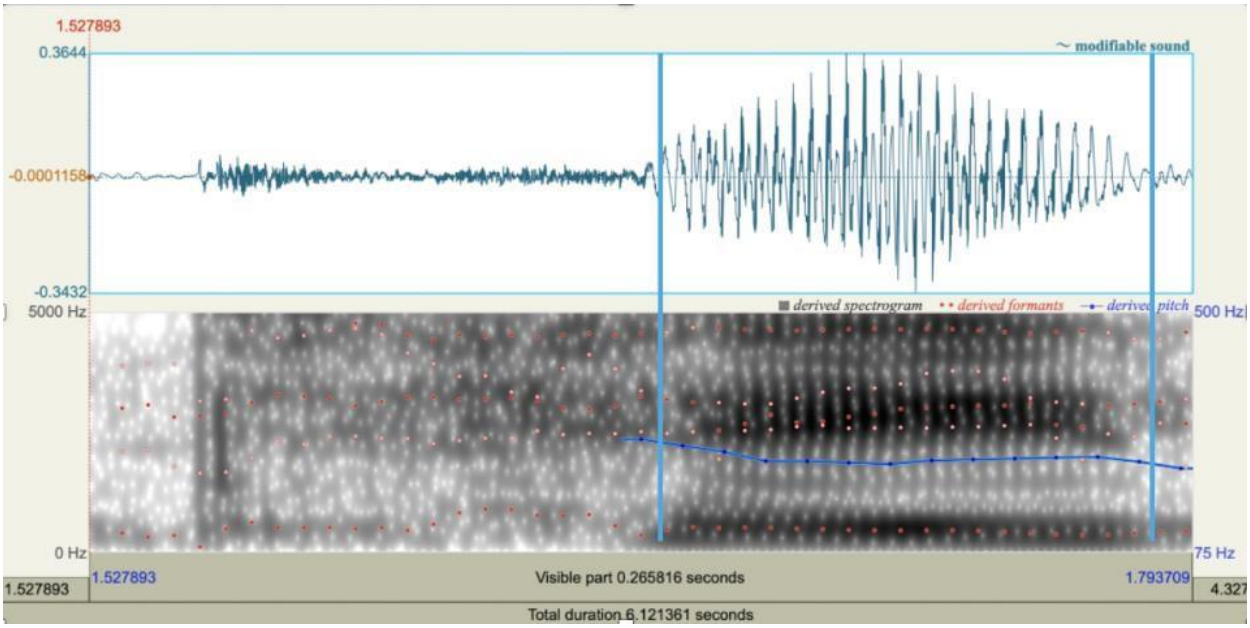


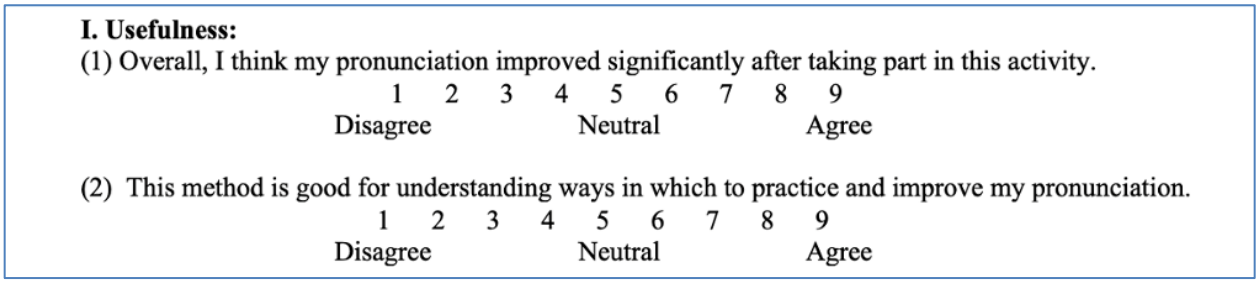

**Table 1**
*Sample Questions from the In-Class Worksheet*

| Sample questions | English translation |
|---|---|
| ¿Cómo se ve la "e" de "techo" en el espectrograma de la Figura 1? | *What does the "e" in "techo" in the spectrogram (Figure 1) look like?* |
| La Figura 1 muestra cómo un hablante nativo pronuncia la palabra "techo". Ahora mira tu espectrograma. ¿Has notado algo diferente entre tu "e" y la del hablante nativo? | *Figure 1 shows how a native speaker pronounces the word "techo." Now look at your spectrogram. Do you notice any difference between your "e" and the native speaker's?* |

### *Survey Design*

Nineteen Likert-scale statements using a 1 (*disagree*) to 9 (*agree*) scale were developed to assess participants' attitudes for the following categories: (1) usefulness, (2) likeability, (3) attitudes towards pronunciation learning, and (4) attitudes towards their own pronunciation. Figure 3 shows a sample of the survey statements used (Olson, 2014). These categories will be broken down in Tables 2–5, grouping statements by the previously mentioned categories.

**Figure 3**
*Survey Sample*


**I. Usefulness:**
(1) Overall, I think my pronunciation improved significantly after taking part in this activity.
1 2 3 4 5 6 7 8 9
Disagree Neutral Agree

(2) This method is good for understanding ways in which to practice and improve my pronunciation.
1 2 3 4 5 6 7 8 9
Disagree Neutral Agree

## ANALYSIS AND RESULTS

### Survey Results

For categorizing these results on a range from negative to positive, we adopt the approach from Offerman (2020) that categorizes the Likert-scale ratings as agree-to-disagree using the same numerical ranges. We have added terms like "positive" and "negative" to accompany the categorizations "agree" to "disagree" utilizing the following numerical ranges from Offerman (2020): 1.0–3.0 = agree/positive, 3.1–4.5 = somewhat agree/somewhat positive, 4.6–5.4 = neutral/neither positive nor negative, 5.5–6.9 = somewhat disagree/somewhat negative, and 7.0–9.0 = disagree/negative. Since the current study's scale is flipped in its ratings (1 = *disagree*, 9 = *agree*), we have reversed the scale as the following: 7.0-9.0 = Agree/ Positive; 5.5-6.9 = Somewhat Agree/ Somewhat Positive; 4.6-5.4 = Neutral/ Neither Positive nor Negative; 3.1-4.5 = Somewhat Disagree/ Somewhat Negative; and 1.0-3.0 = Disagree/ Negative.

The first part of the survey addressed the concept of usefulness, which can be found in Statements 1–5 in Table 2.

**Table 2**
*Descriptive Results for Usefulness Statements*

| Statement | *M* | *SD* |
|---|---|---|
| 1. Overall, I think my pronunciation improved significantly after taking part in this activity. | 5.25 | 1.81 |
| 2. This method is good for understanding ways in which to practice and improve my pronunciation. | 6.55 | 2.06 |
| 3. This activity made me think consciously about my pronunciation. | 7.25 | 2.02 |
| 4. The visual feedback activities I learned about were useful for improving my pronunciation. | 5.60 | 2.37 |
| 5. The teacher's guided instruction with this activity was useful for improving my pronunciation. | 7.55 | 1.43 |

Participants' responses reveal that they generally felt that the VF sessions were moderately useful or felt that they were neither useful nor not useful (a more neutral response). However, it

should be noted that for each statement, the standard deviation was large, indicating variability in participants' responses (*SD* > 1.00 = large; Jarosz, 2022; Quesada Vázquez, 2024). Additionally, Statement 4 shows a much larger standard deviation (2.37), implying there was more difference across participants' responses for this statement.

The second part of the survey addressed participants' thoughts about the VF activity, shown in Table 3 for Statements 6–8.

**Table 3**
*Descriptive Results for Participants' Thoughts About the Activity*

| Statement | *M* | *SD* |
|---|---|---|
| 6. I put a lot of effort into accurately completing the pronunciation activities | 6.55 | 1.77 |
| 7. I thought this activity was enjoyable. | 4.50 | 2.04 |
| 8. I think this activity should be used again for future Spanish courses. | 5.85 | 2.20 |

Responses reveal that participants felt slightly negative to somewhat positive regarding thoughts about the activities and their potential to be used again in future classes. Specifically, participants believed that VF was somewhat not enjoyable (*M* = 3.1–4.5, somewhat disagree/somewhat negative). However, it is once again seen that the standard deviations are considered large for each statement, and slightly larger for Statements 7 and 8, implying more variance in responses for these statements.

The third section addressed participants' attitudes towards their own pronunciation in Statements 9–13 shown in Table 4.

**Table 4**
*Descriptive Results for Participants' Attitudes Towards Their Own Pronunciation*

| Statement | *M* | *SD* |
|---|---|---|
| 9. I feel very confident about my pronunciation in Spanish after taking part in this activity. | 5.75 | 1.75 |
| 10. I would be comfortable having a native speaker listen to my pronunciation and rate me. | 5.50 | 2.84 |
| 11. I am more confident now having a native speaker listen to my pronunciation than I was at the beginning of the semester. | 6.80 | 1.57 |
| 12. Fear of having an American accent when I speak Spanish is something that hinders me from interacting with native speakers. | 5.40 | 2.63 |
| 13. Overall, how would you rate your accent in Spanish? | 5.45 | 1.32 |

Participants only felt moderately positive (*M* = 6.80) regarding being more confident having an L1 speaker listen to them post-VF interventions (Statement 11). Responses for Statements 9, 10, 12, and 13 were either neutral or only somewhat positive (*M* = 4.6–5.4, neutral/neither positive

nor negative; *M* = 5.5–6.9, somewhat agree/somewhat positive) with large standard deviations, although the largest standard deviation was observed for the statement regarding being comfortable having an L1 speaker listen to them. Although L1-like pronunciation is not necessarily the goal for pronunciation instruction, these statements were included to assess the sense of confidence post-VF sessions and to additionally assess how much importance participants attributed to L1 speaker views.

The last section of the survey assessed the importance of pronunciation in general through Statements 14–19, as shown in Table 5.

**Table 5**
*Descriptive Results for Participants' Feelings of Importance About Pronunciation*

| **Statement** | *M* | *SD* |
|---|---|---|
| 14. My pronunciation in Spanish is very important to me. | 7.05 | 1.53 |
| 15. Sounding like a native speaker when I pronounce Spanish is a desirable goal. | 7.10 | 1.95 |
| 16. Being intelligible is the most important thing to me; I don't need to have native-like pronunciation. | 5.65 | 2.22 |
| 17. Not having a strong American accent when speaking Spanish is important to me. | 6.65 | 2.06 |
| 18. Knowing vocabulary and grammar is more important than having good pronunciation. | 7.55 | 1.43 |
| 19. I believe that my American accent when speaking Spanish is tied to my identity; I don't think it's necessary to modify it if I am understood by a native speaker. | 3.80 | 2.04 |

Although we observe greater variance in responses (as indicated by larger standard deviations for each statement), participants generally felt positive that their pronunciation in Spanish is important to them. Participants additionally showed desire to attain an L1-like pronunciation, which is also re-emphasized by the approaching neutral and somewhat positive (*M* = 5.65) response regarding intelligibility being more important than having L1-like pronunciation and the response to not feeling the need to modify their accent.

## Comparison with Previous Consonant Study

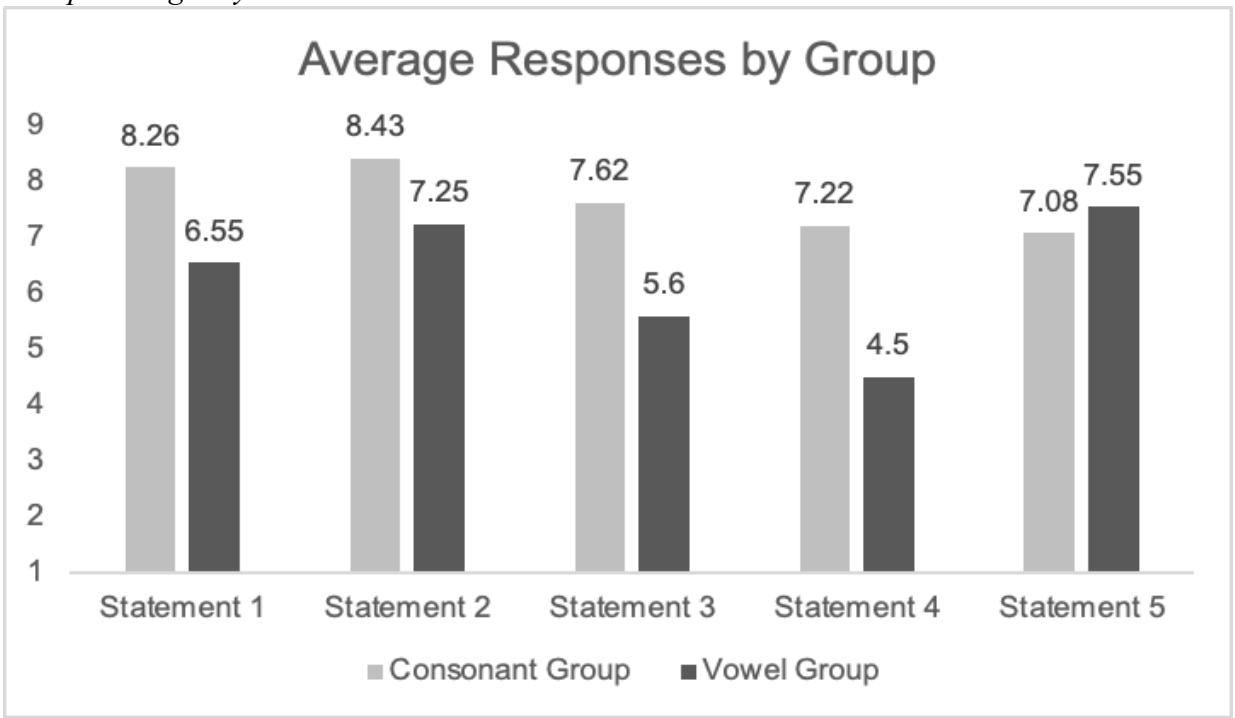
In a previous study by Offerman and Olson (2023), three groups of intermediate L2 Spanish learners received VF on their pronunciation of Spanish plosives (two groups received VF for /p t k/ and one group received VF for /b d g/), with data from all groups being collapsed into one VF group for consonants. As the Likert-scale for the consonant study was on a reverse scale of 1 (*agree*) to 9 (*disagree*), the averages of the consonant data were therefore transposed to match the scale of the current survey. For example, an average of 3.8 was transposed to 7.2. With the transposed averages, five statements were specifically compared across both surveys to identify differences in usefulness, teacher-guided instruction, and likeability. These five statements are shown in Table 6. Additionally, a two-tailed independent-samples Welch's *t* test was conducted

for each statement to compare the groups. The results in Table 6 reveal that there was statistical significance for all statements regarding usefulness and likeability, whereas there was no significant difference for teacher guided instruction. For usefulness and likeability, Table 6 and Figure 4 reveal significantly higher positive scores for the consonant group than the vowel group for usefulness and likeability.

**Table 6**
*Shared Statements Between the Current Study and Offerman and Olson (2023) and t test Results*

| Category | Statement | *p* value |
|---|---|---|
| Usefulness | This method is good for understanding ways in which to practice and improve my pronunciation. | .003 |
| Usefulness | This activity made me think consciously about my pronunciation. | .028 |
| Usefulness | The visual analysis software we learned about was useful for improving my pronunciation. | .003 |
| Likeability | I thought this activity was enjoyable. | < .001 |
| Guided instruction | The teacher's guided instruction for this activity was useful for improving my pronunciation. | .445 |

**Figure 4**
*Group Averages by Statement*



## DISCUSSION AND CONCLUSIONS

Results have revealed that, overall, participants' attitudes in the current study ranged from primarily neutral ($M$ = 4.6-5.4) to somewhat positive ($M$ = 5.5-6.9), with limited statements being rated as positive ($M$ = 7.0-9.0) towards the VF interventions for the vowels /e/ and /o/. More notably, likeability/enjoyment of the activity was rated as somewhat negative ($M$ = 3.1-4.5). Although participants reported more neutral or approaching neutral/somewhat positive attitudes towards the interventions, they expressed a desire to learn pronunciation and that it is an important topic to them. Results additionally showed that most participants preferred to develop an L1-like pronunciation. This aligns with previous research, which suggests that learners at times consider pronunciation learning to be more essential than other linguistic skills and express a desire to achieve L1-like pronunciation, even if this is not necessarily their primary goal (Huensch & Thompson, 2017; Sturm et al., 2019). Once again, although L1-like pronunciation is not considered essential for learners, it is worth highlighting that this appears to be a goal for many participants in the current study.

When compared to the consonant group from Offerman and Olson (2023), we see a clear preference for consonant-focused VF with respect to its usefulness and likeability. One consideration here is that, as formant structures tend not to be as easily viewed as other acoustic cues in addition to being combined with the inductive approach, this could create more cognitive load than using the VF inductive approach with some consonantal features (Gorbunova et al., 2023). Furthermore, the voiced and voiceless Spanish plosives are thought to be more easily viewed due to their durational aspects; in other words, there is a clear start and end point for plosives. However, since visualizing vowels inherently includes assessing formants, these are not as easily distinguished as features like duration for voice onset time in the Spanish plosives. Therefore, it may not necessarily mean that consonants in general are more suitable for VF, but perhaps features in any language that pertain to durational values are more suitable (voice onset time in Spanish and English; hiatus and vowel length in Japanese, etc.). This interpretation is consistent not only with the gain in L2 Spanish voice onset time, but also with previous VF research demonstrating strong effects for other durational contrasts, such as the improvement in L2 Japanese singleton/geminate distinctions (Motohashi-Saigo & Hardison 2009; Offerman & Olson, 2016). However, given that the previous consonant study was conducted with larger participant groups in addition to being conducted in a different instructional context (e.g., different university, instructors, and number of interventions), the results from the comparative analysis should be taken cautiously. Further research should be conducted to determine whether VF is viewed as more beneficial for consonants in Spanish or solely for durational differences.

Another consideration regarding these findings is whether production improvement is correlated with the less positive views regarding VF for vowels. That is, if participant views are mostly neutral, will their performance decline or suffer? This question is pertinent as this could provide further insight into whether attitudes towards instruction impact or influence participant performance. Future research should (1) assess pronunciation improvement with VF for the vowels in the current study and (2) examine what relationship there is, if any, between learner attitudes and performance.

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