French Phonology Acquisition: Unit Assessment Project for the Department of World Languages ELL

Prepared by Matthew Williams

Table of Contents

Introduction

This project constitutes an imperfect attempt to answer a question: how can we help our students improve their pronunciation of French sounds? While the speech sound inventories of the French and English languages overlap, French boasts several speech sounds that do not occur in English. This is the key to the students' pronunciation challenges.

Morris Halle, considered one of the founders of the discipline of phonology,[1] describes the perception and production of words to be dependent on the students' perception and production of discreet speech sounds, known as phonemes, that make up those words.[2] It would seem, then, that the central obstacle stopping HWC students from mastering native-like pronunciation of that set of French sounds that are alien to English is difficulty in perception of those particular sounds. Clearly, if they could distinguish between oral vowels (present in both English and French) and nasal vowels (present in French but not English) via auditory means alone, this project would not be necessary. This project is designed to determine if the addition of the visual channel will facilitate the acquisition process and enable students to better meet the learning outcomes around pronunciation.

The open-source sound analysis program known as Praat uses a visual known as a spectrogram to accurately display sound signals in three dimensions: frequency in hertz, elapsed time, and signal intensity. Students, however, must be trained in how to read spectrogram data in order to take full advantage of it to improve their pronunciation.

Department buy-in and outcome definition

In mid 2018, French faculty member, Andrew Aquino-Cutcher, approached me to ask for help in training his students in the use of Praat as a tool to aid in language learning. He identified several sounds in the French sound system, including the sounds mentioned above, that Praat would help his students to recognize and to master. Professor Cutcher's enthusiasm has not flagged despite the fact that we have had to readjust the procedures several times over the 2019 - 2020 academic year.

Although Professor Cutcher accepts the premise that all assessment work be based on existing student learning outcomes, the selection of a particular SLO was the subject of intense discussion during the fall and winter of 2018 - 2019. Whereas, currently, pronunciation is not represented directly in the French curriculum through either course objectives or SLOs, Professor Cutcher has come to emphasize pronunciation as part of his conception of the French course curriculum. Therefore, this project will proceed with the following 'working' SLO:

[1] For our purposes here, phonology can be defined as the study of the nature of speech sounds and how those speech sounds are affected by the patterns they form.
[2]Halle, Morris. "The Sounds of Speech." Linguistic Society of America. Accessed April 21, 2020. https://www.linguisticsociety.org/resource/sounds-speech.

- *Pronounce French vowels and consonants with a high degree of accuracy.*

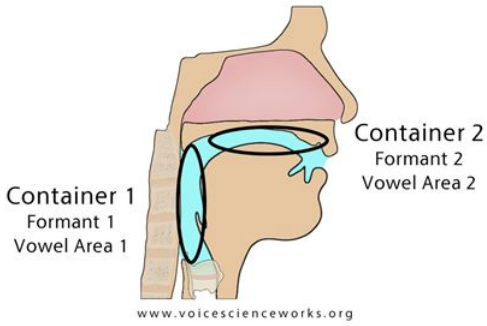
Given that the district-wide PACC process is lengthy and arduous, the plan is to postpone the protracted curriculum change process. Meanwhile, I am confident that the procedures described below will allow students to improve their pronunciation.

Assessment research and design

In Fall 2018, I became comfortable with Praat and learned how to read the spectrograms it displays.

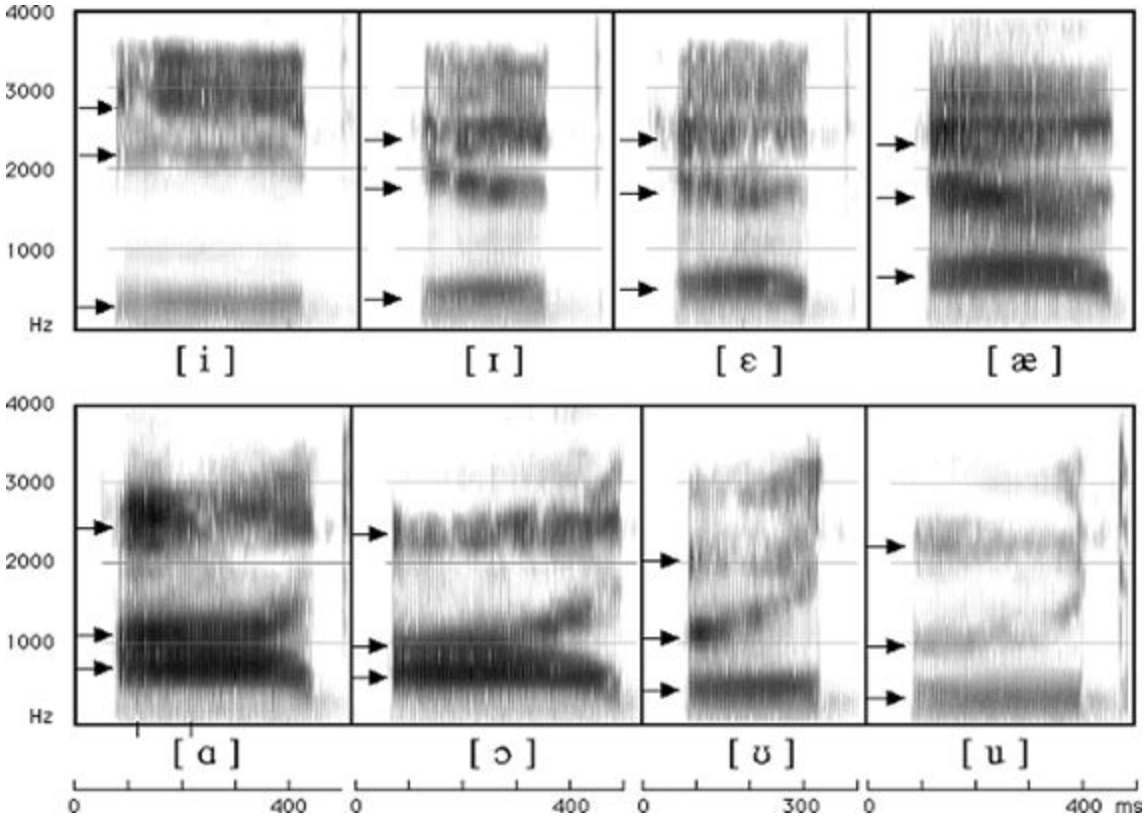
The figure below shows the areas of the mouth that are integral to the formation of sounds, especially vowels. The pharyngeal cavity and the oral cavity are labeled Formant 1 and Formant 2 respectively (the preferred term among phonologists). Between the two formants, lies the 'point of construction' at which the tongue is closest to the roof of the mouth. Within each of these two formants, particular resonances occur when a speech sound is produced, a resonance that has a specific frequency. Moving the tongue so that the point of construction moves to another part of the mouth will alter the relative sizes of the two formants which will, in turn, alter the resonance frequencies they produce. The different speech sounds that we perceive are the product of these resonance frequencies.

Figure 1- Formants within the Vocal Tract:



As stated earlier, a spectrogram displays audio data in three dimensions: frequency measured in hertz, change over time, and intensity of sound signal. The data is visualized in graph form with the Y axis showing frequency, the X axis showing elapsed time, and the shading showing intensity of the audio signal (the darker the shading, the more energetic the signal).

Figure 2 - Eight spectrograms showing eight vowels:



Praat displays this data on a spectrogram like those in Figure 2 above. Each of the eight spectrograms below shows a pattern for a particular vowel sound. Along the left edge of each spectrogram three arrows are displayed. The lowest of these arrows is formant one (F1) and the second-lowest is formant two (F2). The vowel labels below each spectrogram are rendered in the International Phonetic Alphabet (IPA). The vowel [i] as in 'sheep' displays F1 at about 300 Hz while F2 is at about 2,100 Hz.

The challenge for the student who has trouble producing the [i] sound is to produce their own spectrogram in which their F1 and F2 display nearly the same readings Hz. If they can do that, then it does not matter as much if they are able to hear that they are producing that sound. They have the visual data to verify that they are doing so.

In Spring 2019, I put together a set of preliminary procedures for students to follow in which they would use Praat to practice their pronunciation. The initial procedures were the following:

> First, I would provide a short verbal description of how to read the data on a spectrogram while showing a spectrogram of a French word on a smartboard in front of the class.
>
> Second, the students would select a French speech sound file from a list I provided and they would play that sound and display a spectrogram of it using Praat.

Third, the students would use Praat to record their own pronunciation of that same sound and display the resulting spectrogram.

Fourth, the students would compare the two spectrograms. If they discerned any differences, they were to adjust their pronunciation as they repeated the procedure. This way, students would have the auditory data of native-speaker pronouncing a French speech sound to compare with their own pronunciation, but they would also have the visual data in the spectrograms for support.

Pilot assessment tools and processes

The piloting of this project was not done in the standard way. Instead of trying the procedures once with an entire class, I conducted small-scale pilots several times, first with individuals--faculty volunteers and work study students--and then with small groups of students. Feedback from these mini-pilots revealed several opportunities for improvement in providing instructions and administering the assessment, in particular, the inclusion of...

- a diagram (jpeg or video) of the mouth showing the tongue positions of the various French sounds to make it easier to make adjustments to vocal tract
- French words on the vowel and consonant tables (see Appendix A) to display the relevant speech sound in word-initial, word-medial, and word-final contexts.

In Fall 2019, I tried the revised procedures, but students continued to have trouble understanding what the spectrograms they were seeing represented. A further suggestion was made for the inclusion of a clear description of the connection between the sound produced in the vocal tract and the sound as it was displayed on the spectrogram. To achieve that, I included a short video description[3], but students' feedback deemed it too complex, so I decided to adapt the video content to my own description.

The revised procedures are as follows:

First, the student will pronounce all of the vocabulary words in the three rightmost columns on the vowel/consonant tables displayed in Appendix A. As the student does this, the professor listens and uses the rubrics in Appendix D to assess the accuracy of the speech sound that is featured in each row. If the student fails to pronounce the featured speech sound in two out of the three sample words in each row, then the professor will add that sound to the list of sounds--up to a maximum of five--that the student must focus on improving using the activity procedures.

Second, the student will analyze the professor-provided material on how to read a spectrogram. See Appendix B. (Starting with this step, and continuing to step eleven below are listed in the student procedures shown in Appendix C.)

[3] Handke, Jurgen. “PHO_211 - Reading Spectrograms: Vowels.” Virtual Linguistics Campus. University of Marburg. Accessed November 10th 2019. https://youtu.be/mWel5j-F8lE.

Third, the student will select a French speech sound from professors' list (from the first step above) and will analyze professor-provided materials on the vocal tract and tongue position for that sound.

Fourth, the student will practice the sound in isolation.

Fifth, the student will analyze the particular French speech sound as it occurs within the trio of words in the rightmost three columns of the relevant vowel/consonant table from Appendix A.

Sixth, the student will practice those three words.

Seventh, the student will review diagram of formant locations (from step two above)

Eighth, the student will download the relevant sound from the vowel/consonant table and will play the sound using the Praat program.

Ninth, the student will display and analyze the spectrogram of that sound. The student may review step two above if needed.

Tenth, the student will make a recording of herself pronouncing target sound with Praat.

Eleventh, the student will compare the native-French speaker spectrogram with her own. If they differ significantly, she will repeat steps nine and ten until two spectrograms mirror one another.

Twelfth, the professor will conduct a post-assessment of the student's pronunciation of each French speech sound on the list from step one above (see Appendix E).

I had planned to conduct one more round of a full pilot with the above listed procedures in Spring 2020, but the lockdown due to the COVID-19 pandemic made that impossible.

Professor Cutchter and I plan to run the full pilot during Summer 2020 instead, even though his summer course will be conducted remotely. In an effort to support the students as much as possible, I am currently producing several 'how to' videos on the following:

- Downloading and getting acquainted with Praat
- How to read a spectrogram
- Pronunciation activity procedures

While I admit that it will be very challenging to conduct the pilot remotely, and in the midst of the anxiety everyone is feeling due to the pandemic, I remain cautiously optimistic.

Administer specific assessment

I plan to conduct this phase in the Fall of 2020.

Data analysis

I plan to conduct this phase in the Spring of 2021.

Support of evidence-based change

I am optimistic that the data analysis will demonstrate the effectiveness of the above-described procedures. Once this is apparent, I expect that Professor Cutcher will support the inclusion of a pronunciation-focused SLO to all French syllabi, hopefully, by Fall 2021 or, to be more realistic given the lengthy PACC process, Spring 2022.

In the meantime, Professor Cutcher has committed to integrating the procedure as an activity into his French courses as he moves ahead with the PACC process. The linguistics faculty[4] as well as trained work-study students will be available Room 310 to assist French students who need help with using Praat as described above.

There has been significant interest among HWC faculty and students in adapting the procedures described above for use with other languages such as English--specifically standard English for academic purposes. All that would be required to achieve that would be to compile a complete inventory of sound files of standard English phonemes and to adjust the table in Appendix A for English rather than French. Such English oriented materials could augment the existing pronunciation curriculum in the Speech 413 course that is currently offered for ESL students.

Conclusion

While it is very unfortunate that the effects of the COVID-19 pandemic have disrupted our progress, I have been spending this time deepening my knowledge of phonological analysis and of Praat. This situation is also forcing me to be creative in how I plan to convey to Professor Cutcher's students the information they will need to carry out these procedures effectively. I anticipate some hiccups and unexpected issues in the remote learning environment, but I believe we will ultimately be successful.

[4] Karen Smith holds a Masters in Linguistics and Matthew Williams holds a Masters in Applied Linguistics. Both faculty members work as part-part time tutors for linguistics and ESL and are based in Room 310, the computer lab dedicated to students of the Department of World Languages / ELL. All world languages courses use Room 310 for computer-assisted language learning.

A note regarding program assessment

During City College's Reinvention under Chancellor Cheryl Hyman's leadership, administration decided to discontinue the foreign language requirement for the associate's degree. At the same time, pathways were created to guide students toward completion of degrees that had specific concentrations. One such pathway was for world languages. However, that pathway was dropped along with all other pathways after the 2017-2018 academic year. Currently, therefore, the Department of World Languages and English Language Learning offers no programs ending in a degree or certificate.

The Linguistics Committee, led by linguistics professor Karen Smith (World Languages and English Language Learning), is developing a proposal for a new program for world languages, which would resemble the old world languages pathway. Required courses would include a sequence of level-one (beginning) to level-four (advanced) in a language as well as two courses in linguistics. A meeting was held in March 2020 between the linguistics committee, the Unit Liaison, and the chair of the curriculum committee, Prof.Gabriella Cambiasso (World Languages and English Language Learning) to discuss the Linguistics Committee's progress.

The next step would be gaining the approval of the Department of World Languages and ELL to proceed to the initiation of a PACC proposal to create the program. Once that process is completed, work could begin on developing student learning outcomes for it. Such work would be carried out by department faculty with the aid and support of the Unit Liaison for World Languages and English Language Learning.

Appendix A

French Vowel and Consonant Inventories

Table 1 - Oral Vowels in French:
(View this first: https://www.youtube.com/watch?v=dbyKzUM9H5c&feature=youtu.be)

IPA	**FPA**	**Time stamp**	**Sound File** (click link to download sound file)	**At the beginning of a word** (click link to view video clip)	**In the middle of a word** (click link to view video clip)	**At the end of a word** (click link to view video clip)
[a]	a	2:11	link	année [ane] [ané]	travail [tʁavaj] [travaj]	moi [mwa] [mwa]
[e]	é	2:55	link	été [ete] [été]	général [ʒeneʁal] [Zénéral]	vérité [veʁite] [vérité]
[i]	i	1:30	link	ici [isi] [isi]	ville [vil] [vil]	qui [ki] [ki]
[o]	o	3:09	link	aucune [okyn] [okyn]	côté [kote] [koté]	nouveau [nuvo] [nuvo]
[u]	u	1:41	link	ouverte [uvɛʁt] [uvèrt]	souvent [suvɑ̃] [suvâ]	coup [ku] [ku]
[y]	y	3:40	link	unique [ynik] [ynik]	étude [etyd] [étyd]	pu [py] [py]
[ø]	ö	4:45	link	Europe [øʁɔp] [öròp]	deuxième [døzjɛm] [dözjèm]	lieu [ljø] [ljö]
[œ]	ë	4:13	link	œil [œːj] [ëːj]	seul [sœːl] [sëːl]	-
[ɔ]	ò	4:25	link	homme [ɔm] [òm]	comme [kɔm] [kòm]	-
[ə]	e	5:00	link	-	besoin [bəzwɛ̃] [bezwê]	ne [nə] [ne]
[ɛ]	è	1:20	link	elle [ɛl] [èl]	nouvelle [nuvɛl] [nuvèl]	sujet [syʒɛ] [syZè]

Table 2 - Nasal Vowels in French:
(View this first: https://www.youtube.com/watch?v=dbyKzUM9H5c&feature=youtu.be)

IPA	FPA	Time stamp	Sound File (click link to download sound file)	At the beginning of a word (click link to view video clip)	In the middle of a word (click link to view video clip)	At the end of a word (click link to view video clip)
[ɑ̃]	â	6:02	link	ensuite [ɑ̃sɥit] [âsÿit]	exemple [ɛgzɑ̃ːpl] [ègzâːpl]	seulement [sœlmɑ̃] [sëlmâ]
[ɔ̃]	ô	6:28	link	oncle [ɔ̃kl] [ôkl]	longtemps [lɔ̃tɑ̃] [lôtâ]	nom [nɔ̃] [nô]
[ɛ̃]	ê	6:16	link	ainsi [ɛ̃si] [êsi]	principe [pʁɛ̃sip] [prêsip]	loin [lwɛ̃] [lwê]

Table 3 - Consonants in French:
(View this first: https://www.youtube.com/watch?v=83sTgHd5Iw0:

IPA	FPA	Time stamp	Sound File (click link to download sound file)	At the beginning of a word (click link to view video clip)	In the middle of a word (click link to view video clip)	At the end of a word (click link to view video clip)
[b]	b	1:10	link	beaucoup [boku] [boku]	début [deby] [déby]	tombe [tɔ̃ːb] [tôːb]
[d]	d	1:14	link	de [də] [de]	idée [ide] [idé]	grande [gʁɑ̃ːd] [grâːd]
[f]	f	1:30	link	femme [fam] [fam]	enfin [ɑ̃fɛ̃] [âfê]	neuf [nœːf] [nëːf]
[k]	k	2:20 & 2:22	link	que [kə] [ke]	lequel [ləkɛl] [lekèl]	chaque [ʃak] [Sak]
[l]	l	2:55	link	le [lə] [le]	celui [səlɥi] [selÿi]	il [il] [il]
[m]	m	1:20	link	même [mɛm] [mèm]	famille [famij] [famij]	système [sistɛm] [sistèm]
[n]	n	1:24	link	nous [nu] [nu]	donner [dɔne] [dòné]	une [yn] [yn]

[p]	p	2:15 & 2:22	link	peu [pø] [pö]	époque [epɔk] [épòk]	type [tip] [tip]
[s]	s	1:27	link	si [si] [si]	aussi [osi] [osi]	place [plas] [plas]
[t]	t	2:17 & 2:22	link	temps [tɑ̃] [tâ]	était [etɛ] [étè]	toute [tut] [tut]
[v]	v	1:36	link	vous [vu] [vu]	avec [avɛk] [avèk]	arrive [aʁiːv] [ariːv]
[z]	z	1:30	link	zone [zoːn] [zoːn]	maison [mɛzɔ̃] [mèzô]	quinze [kɛ̃ːz] [kêːz]
[g]	g	1:18	link	gauche [goːʃ] [goːS]	également [egalmɑ̃] [égalmâ]	vague [vag] [vag]
[ɲ]	N	4:15	link	-	gagner [gaɲe] [gaNé]	ligne [liɲ] [liN]
[ʁ]	r	5:15	link	raison [ʁɛzɔ̃] [rèzô]	sera [səʁa] [sera]	jour [ʒuːʁ] [Zuːr]
[ʃ]	S	3:28	link	chef [ʃɛf] [Sèf]	échapper [eʃape] [éSapé]	riche [ʁiʃ] [riS]
[ʒ]	Z	3:35	link	jamais [ʒamɛ] [Zamè]	déjà [deʒa] [déZa]	rouge [ʁuːʒ] [ruːZ]
[dʒ]	dZ	-	link	Djibouti [dʒibuti] [dZibuti]	budget [bydʒɛ] [bydZè]	Cambodge [kɑ̃bɔdʒ] [kâbòdZ]
[tʃ]	tS	-	link	tchèque [tʃɛk] [tSèk]	caoutchouc [kautʃu] [kautSu]	match [matʃ] [matS]
[ŋ]	G	3:44	link	-	-	meeting [mitiŋ] [mitiG]

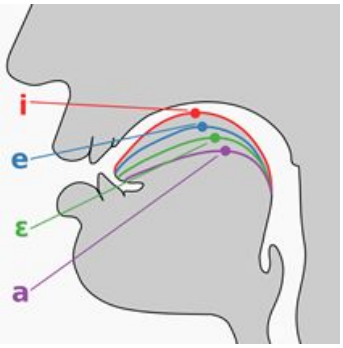
[w] is not on this chart, but it can be found at time stamp 1:40 on the link at the top of the chart.
[j] is not on this chart, but it can be found at time stamp 4:05 on the link at the top of the chart.
[ɥ] is not on this chart, but it can be found at time stamp 4:42 on the link at the top of the chart.

Appendix B

How to read a spectrogram (to be used with Step 1 below)

Figure 1 below shows various tongue positions along with the vowel sounds that they correspond to.

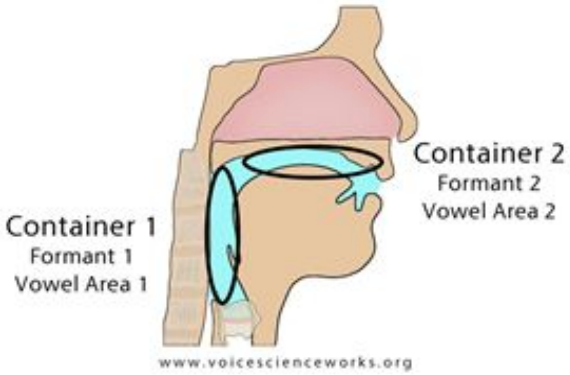
Figure 1 - Tongue positions for different vowels.



Try producing all four vowels in descending order. As you do so, pay attention to how your tongue changes position as you shift from one vowel to another. With each tongue position, one part of the tongue is closest to the roof of the mouth. The narrow space your tongue creates this way is called the 'point of construction'.. As you pronounce the vowels in succession, from i to a, the point of construction moves steadily further back in your mouth, thus enlarging the space in front and diminishing the space at the back. These two spaces are known as 'formants' because in these spaces special resonances occur when you vocalize.

As you pronounce each vowel, notice how the formant in the back of your mouth that the air passes through first (Formant 1, or F1) and the formant at the front of your mouth that the air passes through second (Formant 2 or F2) change in size. Figure 2 below shows these formants are for the lowest vowel shown in Figure 1 above.

Figure 2 - Formants in the vocal tract.



As the sizes of F1 and F2 change, so do the resonance frequencies being produced inside them as you vocalize. These changes in resonance frequency is what you perceive as the different vowel sounds. Sonorous consonants such as l and r produce strong resonance frequencies as well, and this is what a spectrogram shows us.

Figure 3 - Spectrogram showing four vowels

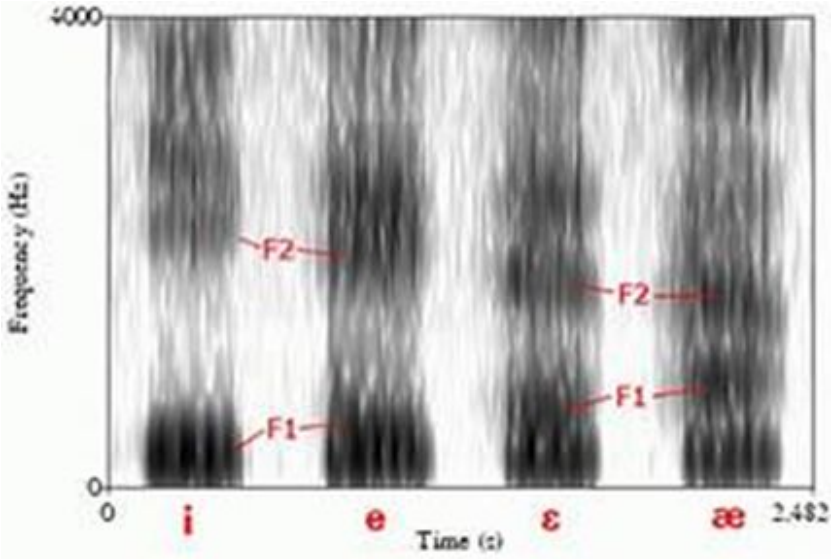


Figure 3 above displays for us vowel sounds that correspond with the tongue positions shown in Figure 1. The formants are labeled in red. The Y axis displays frequency in hertz, so for the vowel i, F1, the resonance frequency occurring in the back of the mouth, is about 300 Hz whereas the resonance frequency occurring in the front of the mouth, F2, is a bit higher than 2000 Hz. And that constitutes the vowel sound i. Notice how the resonance frequencies of R1 and F2 move closer together the lower the vowel sound becomes (and the lower the tongue is placed in the mouth).

This works for all speech sounds produced by speakers of all human languages!

Now, you are ready to see a spectrogram of a French vowel sound produced by a native speaker of French. Once you produce a spectrogram of that same sound, you can measure the exact F1 and F2 resonance frequencies. Then, all you have to do is produce that sound yourself and compare the F1 and F2 frequencies on your spectrogram with the F1 and F2 frequencies of the French speaker's spectrogram. If the spectrograms do not match, shift your tongue position a bit and try again.'

Using this method frees you of reliance only on sound. You now have a way of verifying if the sound you think you are producing is on target or not.

If you need further information on how to do this, watch the two videos below.

- Reading Spectrograms - Vowels (https://youtu.be/mWel5j-F8lE)
- Reading Spectrograms - Consonants (https://youtu.be/J-RVpvofhSY)

Appendix C

Student Procedures (Revised Fall 2019 and Spring 2020)

Instructions- This activity is designed to help you hone your French accent. The steps outlined below will allow you to use Praat to improve your pronunciation of difficult French speech sounds. You will begin by reviewing the list of French sounds your professor gave to you after the pronunciation diagnostic. Please ask for assistance from your professor and / or from lab staff if needed.

1. Do the 'pre-assessment' with the professor at the beginning of the course. Pronounce each French sound on the lists of French vowels and consonants.
2. Analyze material on how to read a spectrogram including the diagram of formant locations
3. Select a target sound from professors' list of challenging sounds for you (from the pre-assessment diagnostic)
4. Analyze reference video atop each vowel/consonant table for that sound
5. Practice the sound in isolation
6. Practice the sound in the environments provided on the vowel/consonant table
7. Review diagram of formant locations (from step 2)
8. Download target sound from vowel/consonant table and play sound w/ Praat
9. Analyze spectrogram (back to step 8 in needed)
10. Record yourself pronouncing target sound w/ Praat
11. Compare the target spectrogram with your own.
12. If they differ significantly, repeat steps 9 and 10 until your spectrogram mirrors that of the target sound.

Repeat this process with all of the sounds your professor listed for you in there-assessment.

Appendix D

Pre-Assessment Rubric for Table 1 - Oral Vowels in French:
Instructions: As the student pronounces each sound in each phonetic environment (beginning, middle, end) as either 'okay' (with an X) or 'needs work' (with a 'check'). If two or three scores for each sound are marked 'needs work'/'check', put that sound on a list (maximum of five sounds) for the student to use for pronunciation practice.

IPA	FPA	At the beginning of a word	Score	In the middle of a word	Score	At the end of a word	Score
[a]	a	année [ane] [ané]		travail [tʁavaj] [travaj]		moi [mwa] [mwa]	
[e]	é	été [ete] [été]		général [ʒeneʁal] [Zénéral]		vérité [veʁite] [vérité]	
[i]	i	ici [isi] [isi]		ville [vil] [vil]		qui [ki] [ki]	
[o]	o	aucune [okyn] [okyn]		côté [kote] [koté]		nouveau [nuvo] [nuvo]	
[u]	u	ouverte [uvɛʁt] [uvèrt]		souvent [suvɑ̃] [suvâ]		coup [ku] [ku]	
[y]	y	unique [ynik] [ynik]		étude [etyd] [étyd]		pu [py] [py]	
[ø]	ö	Europe [øʁɔp] [öròp]		deuxième [døzjɛm] [dözjèm]		lieu [ljø] [ljö]	
[œ]	ë	œil [œːj] [ëːj]		seul [sœːl] [sëːl]		-	-
[ɔ]	ò	homme [ɔm] [òm]		comme [kɔm] [kòm]		-	-
[ə]	e	-	-	besoin [bəzwɛ̃] [bezwê]		ne [nə] [ne]	
[ɛ]	è	elle [ɛl] [èl]		nouvelle [nuvɛl] [nuvèl]		sujet [syʒɛ] [syZè]	

Pre-Assessment Rubric for Table 2 - Nasal Vowels in French:
Instructions: As the student pronounces each sound in each phonetic environment (beginning, middle, end) as either ‘okay’ (with an X) or ‘needs work’ (with a ‘check’). If two or three scores for each sound are marked ‘needs work’/’check’, put that sound on a list (maximum of five sounds) for the student to use for pronunciation practice.

IPA	FPA	At the beginning of a word	Score	In the middle of a word	Score	At the end of a word	Score
[ɑ̃]	â	ensuite [ɑ̃sɬit] [âsÿit]		exemple [ɛgzɑ̃ːpl] [ègzâːpl]		seulement [sœlmɑ̃] [sëlmâ]	
[ɔ̃]	ô	oncle [ɔ̃kl] [ôkl]		longtemps [lɔ̃tɑ̃] [lôtâ]		nom [nɔ̃] [nô]	
[ɛ̃]	ê	ainsi [ɛ̃si] [êsi]		principe [pʁɛ̃sip] [prêsip]		loin [lwɛ̃] [lwê]	

Pre-Assessment Rubric for Table 3 - Consonants in French:
Instructions: As the student pronounces each sound in each phonetic environment (beginning, middle, end) as either ‘okay’ (with an X) or ‘needs work’ (with a ‘check’). If two or three scores for each sound are marked ‘needs work’/’check’, put that sound on a list (maximum of five sounds) for the student to use for pronunciation practice.

IPA	FPA	At the beginning of a word	Score	In the middle of a word	Score	At the end of a word	Score
[b]	b	beaucoup [boku] [boku]		début [deby] [déby]		tombe [tõːb] [tôːb]	
[d]	d	de [də] [de]		idée [ide] [idé]		grande [gʁɑ̃ːd] [grâːd]	
[f]	f	femme [fam] [fam]		enfin [ɑ̃fɛ̃] [âfê]		neuf [nœːf] [nëːf]	
[k]	k	que [kə] [ke]		lequel [ləkɛl] [lekèl]		chaque [ʃak] [Sak]	
[l]	l	le [lə] [le]		celui [səlɥi] [selÿi]		il [il] [il]	
[m]	m	même [mɛm] [mèm]		famille [famij] [famij]		système [sistɛm] [sistèm]	
[n]	n	nous [nu] [nu]		donner [dɔne] [dòné]		une [yn] [yn]	
[p]	p	peu [pø] [pö]		époque [epɔk] [épòk]		type [tip] [tip]	
[s]	s	si [si] [si]		aussi [osi] [osi]		place [plas] [plas]	
[t]	t	temps [tɑ̃] [tâ]		était [etɛ] [étè]		toute [tut] [tut]	
[v]	v	vous [vu] [vu]		avec [avɛk] [avèk]		arrive [aʁiːv] [ariːv]	
[z]	z	zone [zoːn] [zoːn]		maison [mɛzɔ̃] [mèzô]		quinze [kɛ̃ːz] [kêːz]	
[g]	g	gauche [goːʃ] [goːS]		également [egalmɑ̃] [égalmâ]		vague [vag] [vag]	

[ɲ]	N	-	-	gagner [gaɲe] [gaNé]		ligne [liɲ] [liN]	
[ʁ]	r	raison [ʁɛzɔ̃] [rèzô]		sera [səʁa] [sera]		jour [ʒuːʁ] [ZuːR]	
[ʃ]	S	chef [ʃɛf] [Sèf]		échapper [eʃape] [éSapé]		riche [ʁiʃ] [riS]	
[ʒ]	Z	jamais [ʒamɛ] [Zamè]		déjà [deʒa] [déZa]		rouge [ʁuːʒ] [ruːZ]	
[dʒ]	dZ	Djibouti [dʒibuti] [dZibuti]		budget [bydʒɛ] [bydZè]		Cambodge [kɑ̃bɔdʒ] [kâbòdZ]	
[tʃ]	tS	tchèque [tʃɛk] [tSèk]		caoutchouc [kautʃu] [kautSu]		match [matʃ] [matS]	
[ŋ]	G	-	-	-	-	meeting [mitiŋ] [mitiG]	

[w] is not on this chart, but it can be found at time stamp 1:40 on the link at the top of the chart.
[j] is not on this chart, but it can be found at time stamp 4:05 on the link at the top of the chart.
[ɥ] is not on this chart, but it can be found at time stamp 4:42 on the link at the top of the chart.

Appendix E

The professor would use this tool at the beginning and the end of the semester to assess the pronunciation of French speech sounds that are on the lists generated by the pronunciation diagnostic pre-assessment the professor carried out with each student.

Post Assessment Rubric
French Phonology Acquisition
World Languages / ELL Department
Unit Assessment Project

Student Number:	
Course:	
Section:	
Date:	

	Beginner (1)	Developing (2)	Proficient (3)	Accomplished (4)	Total Points (20)
	Unclear articulation of most gestures[5] rendering the wrong sound	Clear articulation of some gestures renders an ambiguous sound that could be one of two possible target sounds	Clear articulation of most gestures renders a non-native-like target sound	Very clear articulation of all gestures renders a native-like target sound	
Challenging Phonemes for the student (shown here in IPA[6])					

[5] An articulatory **gesture** is one of several elements that make up the articulation of a sound such as tongue placement, breath, lip-rounding, jaw opening, etc.
[6] The phonemes listed in this column are the French vowels and / or consonants that the student had trouble with in the pre-assessment survey conducted by the professor at the beginning of the term.