USING PHONETICS TO TEACH THE VOWEL SOUNDS OF YOUR LANGUAGE

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What is phonetics?

- ...a branch of linguistics (which is the scientific study of language structure, use, change, etc).
- Phonetics is the study of the sounds of speech.

Three branches of phonetics:

- Articulatory phonetics: how sounds are produced.
- Acoustic phonetics: how sound waves travel through the air.
- Auditory phonetics: how sounds are heard and perceived.
A few ideas to focus on during this talk:

- Being more conscious of how you produce the vowel sounds of your language.
- Being more conscious of which vowels are distinctive, and make a difference in meaning in your language.
- The relationships between the vowels of your language, the patterns that relate them to each other.

Applications?

- Suggestions for helping your student perceive and produce important sound distinctions.
Speech production begins with airflow

How do we bring air into our lungs?
We expand our chest (the “thoracic cavity”) by lowering the diaphragm, and by expanding our ribs.
The lungs get bigger, filling in that expanded space.
Since the lungs are bigger, the air pressure inside them is lower than it is outside, in the atmosphere. So … air flows in.

http://www.youtube.com/watch?v=NB1aCBId6qA&feature=related
Then what happens?

- We relax the “intracostal muscles” (the muscles between the ribs), and we relax the diaphragm.
- Our chest cavity gets smaller, the lungs get squished, the air pressure in them increases. When air pressure inside the lungs is greater than air pressure outside, in the atmosphere, then air flows out of the lungs.
- From the lungs, air flows up the trachea, through the larynx and “vocal folds”, and out of our mouth and nose.
- We modify this airflow to produce the sounds of speech.
How does this airflow produce sound?

The air coming from our lungs bumps into other air molecules, which transfer that energy and bump into other air molecules, and so on.

The air molecules can be displaced back and forth very quickly (high frequency, or pitch/tone), and/or can be displaced back and forth really far (high amplitude, or loudness).
In order to produce speech sounds, we have to modify the air flow coming from our lungs.

What if we didn’t modify the airflow?
   All we’d get is a bunch of hot air...

So then, how do we modify the airflow?
   Lots of physical means of doing so..
Physiology: the vocal tract & larynx

www.personal.kent.edu/~manaya/Miller2.jpg (courtesy of Sam Matteson, UNT)
Laryngoscopy: Transnasal Endoscopy

http://www.youtube.com/watch?v=UPzSuh7BPKM
http://www.youtube.com/watch?v=ajbcJiYhFKY
Consonants, vowels, and “voicing”

- Consonants are produced by making a constriction somewhere in the vocal tract.

- Consonants are distinguished from each other in terms of:
  - **place of articulation**: where the constriction is made
  - **manner of articulation**: what type of constriction? a complete closure of the vocal tract? just a narrowing?
  - **voicing**: whether the vocal folds are open, closed, or vibrating.
“Voicing”

- Some consonants are voiced. (Others are not.)
- Vowels are typically voiced.
- Voicing is the component of sound contributed by the vibration of the vocal folds.
- This vibration is too fast to possibly be controlled by muscles – it’s an aerodynamic process.

(The Bernoulli principle)

http://www.youtube.com/watch?v=KCcZyW-6-50
Vowel production

- Vowels are produced without a significant constriction in the vocal tract.
- We make vowels distinct from each other ([i] vs. [a], for instance) by changing the shape of the vocal tract.
- This affects the characteristics of the sound wave coming out of our mouth.
- Some components of that sound wave are amplified, while others are “damped”, or reduced. The different patterns of amplifying or damping is what produces different vowel sounds.
- We can change the shape of the vocal tract anywhere along its length, and in our mouth.
Cross-sections of
the vocal tract

high central spread-lipped vowel

There is a great deal of variation in cross-sectional shape, but only the cross-section area -- and not the shape -- contributes strongly to vocal tract resonance.

Line drawings based on x-rays.

adapted from Fant (1960: 106)
The oral cavity, and tongue position

- The shape of the mouth has the greatest effect on which vowel we produce.

- That’s because the mouth is the biggest open space in the vocal tract, the biggest “resonating chamber” in which sound waves can bounce around and be enhanced or damped.

- It’s easy to create significant changes in the shape of the mouth. We can:
  - lower the jaw,
  - round our lips,
  - change the size, shape, and position of the tongue.
Physiology: the vocal tract & larynx

Vocal Folds

www.personal.kent.edu/~manaya/Miller2.jpg (courtesy of Sam Matteson, UNT)
Tongue movement during vowel production

http://www.phonetics.ucla.edu/vowels/chapter11/tongue.html

X-ray video of the late, great Peter Ladefoged (eminent phonetician at UCLA) producing some vowels of English.

Watch not just his tongue, but the shape of the whole vocal tract.
Vowels in American English

http://www.uiowa.edu/~acadtech/phonetics/english/frameset.html
Vowels are distinguished from each other in terms of four parameters:

- **tongue height**: high in the mouth? or mid-height? or low in the mouth?
- **tongue advancement**: toward the front of the mouth? the center of the mouth? the back of the mouth?
- **tense / lax**: you can feel this by putting your hands on your face.
- **lips rounded / unrounded**: this, in effect, lengthens the vocal tract, which has an acoustic effect.
The vowel chart reflects these four parameters.

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We use key words to teach the English vowels.

This “minimal set” of words defines the meaningful vowels of English.

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The distinctive vowels of Kansa (Siouan)

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/i/ vs. /y/: [si] si ‘foot’, [sy] su ‘seed’


/i/ vs. /ɛ/: [či] ci ‘foot’, [čɛ] ce ‘seed’
Nasalized vowels in Kansa

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/ī/ vs. /ō/ vs. /ā/

[mī]  \( mī^n \)  ‘sun’
[mā]  \( ma^n \)  ‘arrow’
[mō]  \( mo^n \)  ‘I use’
There are also long vowels in Kansa

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A near minimal pair for vowel length (tone varies, too)

sever by cutting vs. I sever by cutting

\[ [ba^h\text{se}] \] base vs. \[ [ba:\h\text{se}] \]
The Kansa vowel inventory

(To see the analyses, zoom in to at most 10 seconds,
or raise the "longest analysis" setting with "Show analyses" in the View menu.)
So for Kansa...

- Justin McBride was able to give minimal pairs (or “near minimal pairs”) to establish the distinctive vowels of the language.

- We can identify
  - five basic vowels
  - they occur as both short and long
  - three nasalized vowels
  - they also occur as both short and long

- You can make similar vowel charts for your language, to focus more clearly on how vowels are related to each other, and present them clearly to your students.
Concluding: I hope this talk...

- ...has helped you to feel more aware of how you produce the vowel sounds of your language.
- ... has given you some ideas on identifying words to demonstrate the distinctive vowels of your language.

- Language learners need to be able to perceive sound distinctions in order to be able to produce them.
- So the more exposure and the more practice, the better!
Thank you!

And special thanks to Justin McBride for the Kansa recordings.