Applying Meta-Cognitive pedagogy to issues of Vowels and Consonants

Section 1: I have found that when it comes to vowels and consonants, knowledge is power. Educating singers/students about vowel and consonant production only gives them the power of their own instruments and cultivates an ear for tuning. They are increasing their meta-cognitive skill set. This will most likely help issues of blend, balance, and diction as well. In the following diagrams there are two elements to remember with vowels, vowel height and vowel placement. The terms for vowel height, or the aperture of the mouth, ranges from *open* to *close* and includes everything in between. Vowel placement exists on a continuum of *front-central-back* and describes tongue movement. The placement of the tongue changes the overall shape of the oral cavity.

There are also two elements to remember with consonants, place of articulation and manner of articulation. This is where our tongue, lips, teeth, etc. create friction with air or each other, and how they go about it to produce a consonant. Place of articulation ranges from the lips back to the glottal area in our throat. Manner of articulation includes, tongue gliding, lip vibration, stopping of air by the tongue, and contact of the tongue with the mouth. I have also included two tables that summarize the information provided in diagram 1 and diagram 2.

In exploring this concept, lets first look at consonants. Their places of articulation are the words on the roof and front of the mouth, see Diagram 1 (labial, dental, alveolar, post-alveolar, palatal, post-palatal, and glottal). Make a couple of *t* sounds. Notice that the tongue makes contact at the alveolar, maybe dental, area. Now make an *m* sound. This is bi-labial (two lips). Make a *k* notice that the explosion of air is in the velar area of the mouth. A *g* sound is also made in the velar area. The letters *y*, and *ng* articulate in the palatal area. See the accompanying table 2 for all English consonants. It is important to notice sensations that occur in the front, center, and back of the mouth.

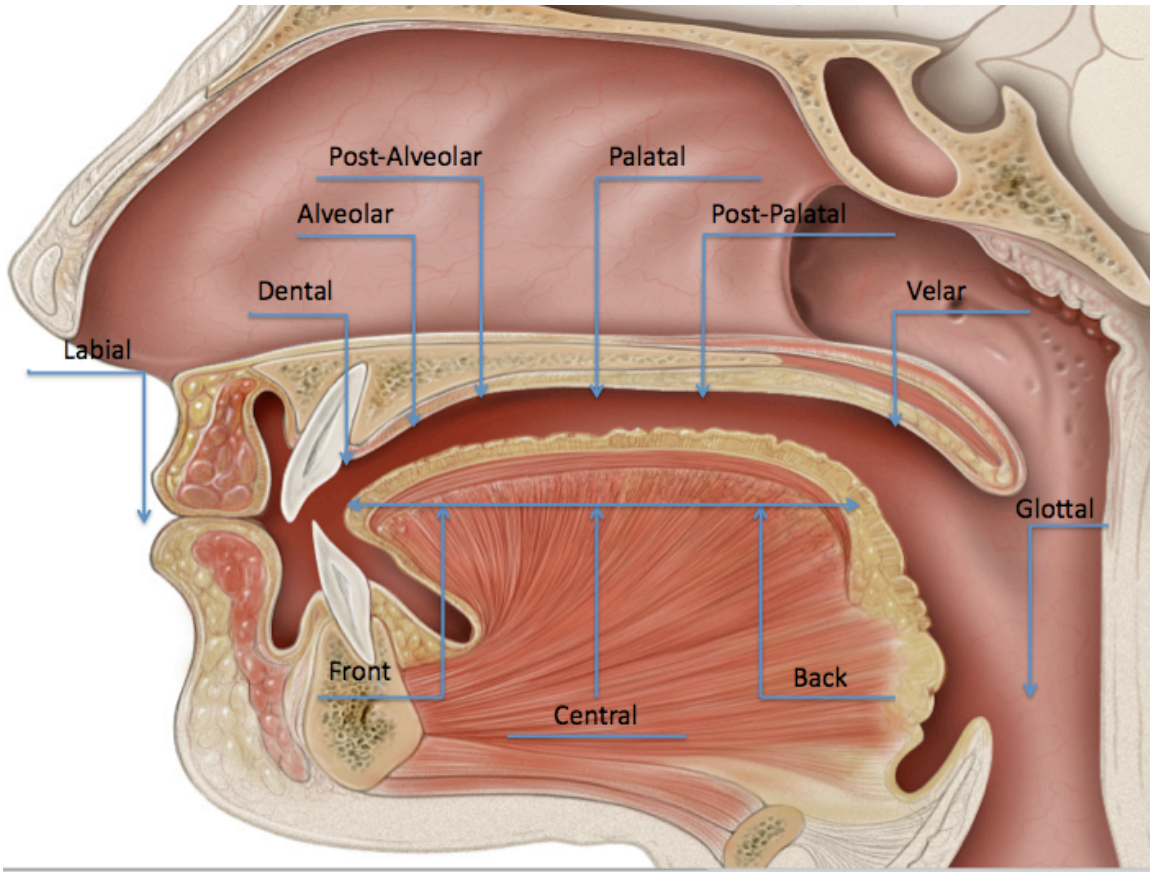
Now lets look at vowels. Glide between the vowels *i, e, a, o, u* and notice how the tongue moves from front to central to back (Diagram 1). See the accompanying table 1 for English vowels. To effect different resonances, we can move the tongue along a continuum from front to back. *Going Further:* We know that the optimal resonance will be a place where the frequency of the pharynx/oral cavity aligns with partials in the fundamental, but for now we can imagine that an *i* sound will exist in the front area, an *o* in the central-back area, and so on.

After building awareness in both areas, we can combine them to really enhance our singers/students understanding of resonance and articulation. Varying the vowel articulation directly influences the timbre of the voice. Have them aim their tongue at the dental or alveolar area for an *i*. Practice making *d*, or *t* sounds and perhaps sing the work *tea*. Make an *a* sit below the palate or velar area. Try singing the word *cow*. Move them around along the continuum. * Notice how the quality of sound changes if you place a vowel in the "wrong" spot. Add movements from the soft palate to darken or lighten the sound.

Diagram two omits many of the American diphthongs. It is a basic guide to the changing aperture and constriction (rounded or broad/open or closed) of the articulators, mainly jaw and lips, for each sung vowel sound. **Remember that a**

flexible, loose jaw should be maintained and preferred at all times. Have students/singers play around with vowel sounds and compare them to the placement on the chart. As they sing an *a* and glide to *u* point out the changing aperture and roundness. We are simply building awareness. In singing, conductors strive for purity of vowel in the English language, hence the focus on these sixteen distinct sounds. In the next section, I will address the possible pedagogy within the three different meta-cognitive domains (Cognitive, Affective, Kinesthetic).

Diagram 1. Vowels through Consonants and Consonant awareness (approximated locations)



http://upload.wikimedia.org/wikipedia/commons/5/51/Head_lateral_mouth_anatomy.jpg

Diagram 2. Relative Constriction of the Tongue, Lips, and Jaw Aperture of Sung Vowels

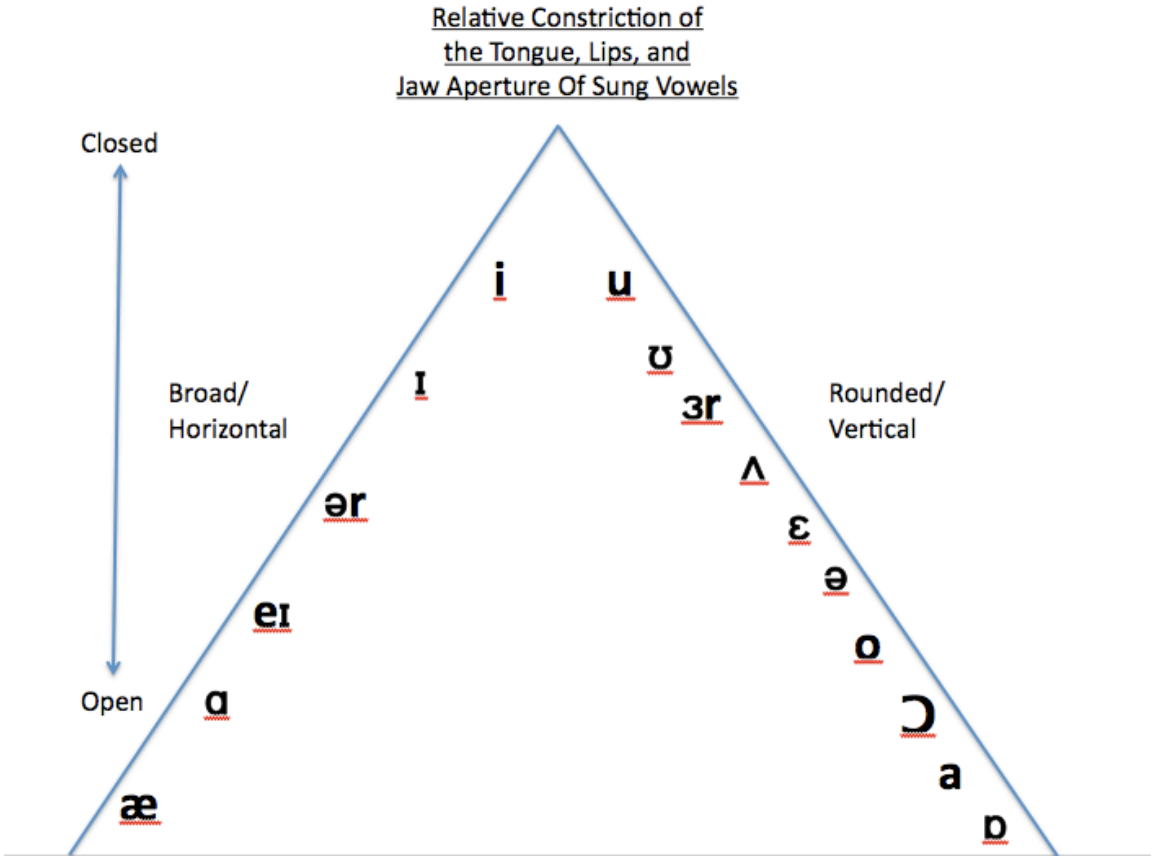


Table 1. Vowel Sounds for American English

IPA	Vowel Height	Vowel Place	Word
i	closed	front	see
ɪ	closed	front-central	sit
eɪ	mid-open/broad	front	day
ɛ	mid-open	front-central	bed
æ	open/broad	central-front	bat
a	open	central	by
ɑ	open/broad	central-back	palm
ɒ	open/rounded	central-back	b**o**ttom

ɔ	open/rounded	back-central	bawl
o	open/rounded	back-central	b**oa**t
ʊ	closed/rounded	back	book
u	closed/rounded	back	boot
ʌ	open	central-back	but
ə	open	central	**a**bout
ər	closed	central	winn**er**
ɜr	mid-open	central	bird

Table 2. Consonant Sounds for American English

IPA	**Place of Articulation**	**Manner of Articulation**	**Word**
p	labial	plosive/unvoiced	put
b	labial	plosive/voiced	but
t	alveolar	plosive/unvoiced	take
d	alveolar	plosive/voiced	dog
tʃ	post-alveolar	fricative/unvoiced	chair
dʒ	post-alveolar	fricative/voiced	gin
k	velar	plosive/unvoiced	keep
ɡ	velar	plosive/voiced	gum
f	labio-dental	fricative/unvoiced	fair
v	labio-dental	fricative/voiced	very
θ	labio-dental	fricative/unvoiced	tooth
ð	labio-dental	fricative/voiced	this
s	alveolar	fricative/unvoiced	see
z	alveolar	fricative/voiced	zebra
ʃ	post-alveolar	fricative/unvoiced	shoe
ʒ	post-alveolar	fricative/voiced	trea**s**ure
x (k)	post-alveolar	plosive/unvoiced	lo**ch**
h	glottal	fricative	happy
m	labial	nasal	met
n	alveolar	nasal	nose
ŋ	palatal	nasal	ring
l	alveolar	liquid	laugh
r	palatal	liquid/voiced	room
w	labial-velar	glide/voiced	wear
j	palatal	glide	yes
hw	velar	fricative/unvoiced	what

Section 2: In this section, I will offer pedagogical solutions that address meta-cognitive skill building in the choral rehearsal. These scenarios will not only create the conductor's desired choral experience, but also strengthen the knowledge of his/her singers. Please note that these processes are not meant to be "quick fixes", or "tricks". They are designed to enhance the meta-cognitive skills of choral singers, and may take time and repeated effort. The goal is that if the work is done, the result will be much quicker and more understood fixes in the future, or perhaps eliminate the need for many future fixes. Because the previous section dealt with both vowels and consonants, I will offer six different scenarios below.

Scenario 1: Vowels in the Cognitive Domain

During a choral rehearsal, the conductor notices that his choir sounds a little "off" on the word *God*. After the second run at that section, he/she realizes that some of his singers are singing "too bright/spread", some are "too dark/covered", and some sound like they are singing "Gawd" while others sound like they are singing "Gud". The conductor decides that he/she would like the singers to experience singing the word *God* with a "unified", "balanced" tone. A cognitive approach is decided upon.

The conductor has three options. **Option 1:** The conductor explains that *God* actually consists of an ɒ (as in b*o*ttom) vowel. The singers should articulate it with a relatively open jaw with rounded lips and a central-back placed tongue. The soft palate may also be lifted. The singers practice this method in their speaking voice, on a sung pitch, or in harmony as needed. Adjustments and revisions may be required. **Option 2:** The conductor shows the choir Diagram 1. He/she explains where ɒ would be. This is followed by the placement of ɒ on Diagram 2. The choir then practices this method in their speaking voice, on a sung pitch, or in harmony as needed. Adjustments and revisions may be required. **Option 3:** The conductor chooses to model the vowel sound he/she wants explaining his/her jaw placement, lip rounding, tongue placement, and soft palate lift. The choir mimics the sound while receiving feedback and adjustment from the conductor.

The subsequent result is that the choir has achieved the desired experience of a "unified" *a* sound, and been challenged to think about their process of singing. The next time they see the word *God* they would have a strategy to use. Eventually, they would be able to carry this thinking to any ɒ vowel through their own recognition, possibly eliminating the need to stop and adjust.

Scenario 2: Vowels in the Kinesthetic Domain

During a choral rehearsal, the conductor notices that as the Tenors approach notes above B4, their tone becomes "pressed" and slightly flat. They have been singing the word *know*. On the second time through, the conductor notices that many of the tenors' necks look strained. The conductor decides that he/she would

like the singers to experience singing the word *know* with a more "lifted" and "open" tone. A kinesthetic approach is decided upon.

The conductor has three options. **Option 1:** The conductor asks the choir to yawn on an *o* vowel. On the second yawn he/she invites them to notice that their jaw swings back and their tongue lowers slightly. On the third yawn he/she invites them to notice the cool rush of air at the back of their throat and the lifting of their soft palate (they may not recognize the palate at first). They may also notice that their larynxes lower. The tenors are then asked to sing an o after preparing a yawn. They can sing it on a variety of pitches. They then apply the new technique to the song. **Option 2:** The conductor asks the choir to imagine a yawn. While they imagine the yawn, the conductor explains that the jaw swings back; the tongue lowers slightly, etc. He/she then asks the tenors to imagine that yawn when they sing the passage again. **Option 3:** This is like option one, but in addition to multiple yawns and the accompanying explanation, the singers are invited to put their hands on their jaw, on the side and front of the neck, or a finger lightly on the tongue (if desired). After this experience, the tenors are asked to sing the passage again.

The subsequent result is that the choir has achieved the desired experience of a "lifted" and "open" sound. They have developed a new technique/strategy to use the next time they approach notes in the upper portion of their ranges. They have also made a cognitive connection to their singing body that can be referenced at a later or different situation.

Scenario 3: Vowels in the Affective Domain

The conductor notices that his/her choir is singing the word *heaven* with a colloquial twang. On the second run, he/she notices that the second vowel **ɛ** (as in *bed*) is missing and the choir is closing to the n or singing a **ɪ** (as in *sit*) vowel. The conductor decides that the choir needs to experience singing the word *heaven* in a "choral style", not a colloquial one. There are three options. **Option 1**. The conductor decides to model the desired affect. The choir then self-audiates this affect. They attempt to mimic the conductor's voice (adjustments may be needed). When the desired affect is achieved, the conductor explains that for choral singing, vowels are not usually sung colloquially. For this passage, they should sing an **ɛ** vowel as it is more conducive to the style of music. **Option 2.** The conductor plays an example of the desired affect. The choir self-audiates their piece and attempts to mimic the sound. When achieved, the conductor explains similarly to option 1. **Option 3.** The conductor invites the singers to sound more "rounded", "proper", or "proud" when they sing. The choir reflects on the explanation and attempts to create the desired sound. Much revision may be needed. When the desired affect is achieved, the conductor uses a similar explanation as in option 1 and option 2.

In the affective domain, there is always more room for error. Affective jargon is imprecise and can at times be counterproductive or misleading to singers, especially when used without cognitive explanations. When used successfully, the choir can build a lexicon of shared musical and expressive meaning. They may begin to exercise this creativity on their own if given the opportunity.

Scenario 4: Consonants in the Cognitive Domain

The conductor notices that he/she cannot hear final d's at the end of words. He/she decides that the choir needs to experience efficient diction. There are three options. **Option 1.** The conductor explains that the consonant d is called a plosive and alveolar consonant. The tongue stops the air by placing itself against the alveolar ridge. It is also a voiced consonant, meaning that unlike the consonant t (which is the unvoiced pair) sound from the vocal folds accompanies it. The conductor invites the choir to access this information when d comes at the end of the word. The choir practices some t's and d's and sings again. **Option 2.** The conductor shows the choir where d is placed on Diagram 1. He or she explains that it is the voiced partner of t, another plosive-alveolar consonant. The students practice making the consonant sound and apply the information to the next time they sing. **Option 3.** The conductor models d and t sounds at the beginning, middle, and ends of words. He/she explains how the consonant is formed and executed. The choir practices this technique and uses it in singing.

The resulting development is a cognitive awareness of consonant production. By introducing the singers to the cognitive aspect, they are invited to consider this information when singing. The next time the conductor or an audience member mentions that it was hard to understand the words; the singer may consider how efficiently they are making their consonant sound.

Scenario 5: Consonants in the Kinesthetic Domain

Then conductor notices that when he/she is running warm-ups, it can be hard to tell if the choir is singing back the correct sound. Is it nah, mah, sweet, sweed, etc? Continuing the warm-ups, the conductor realizes that the choir is making consonant sounds, but they are unclear or ambiguous. He/she decides the choir should experience more clearly how consonants are produced. There are two options. **Option 1 (covers the first and last routes).** The conductor invites the singers to slowly run their tongues along the roofs of their mouths. As they are directed to move the tongue back, the conductor notes when they have reached the dental, alveolar, palatal, velar, etc. region. The conductor then picks a number of consonants and explains where along the roof of the mouth they are placed. The choir practices this. The conductor couples voiced and unvoiced pairs to explain the manner of articulation (plosive, glottal, etc.). Note: the tongue is not used in all consonants. The choir continues practicing and tries the warm-up exercise having had the new experience. **Option 2.** The conductor invites the singers to imagine the clearest consonant sound (t, p, k, whichever) they can. Information about how the consonant is produced is fed into the imagination process. The choir reflects and re-tries the warm-up.

The resulting development is a cognitive awareness of consonant production. By experientially introducing the singers to the cognitive aspect, they are invited to consider this information when singing, to play with it. The next time the conductor or an audience member mentions that it was hard to understand the words; the singer may consider how the consonant is made.

Scenario 6: Consonants in the Affective Domain

The choir is rehearsing the second movement of Berstein's *Chichester Psalms* and the fast men's text is lost. The conductor realizes that he/she would like "crisper", "faster", "cleaner" consonants. The choir needs to experience this type of consonant production. There are three options. **Option 1**. The conductor models the desired sound. The choir self-audiates and attempts to mimic the conductor. When successful, the conductor follows up with the appropriate cognitive information about how the singers produced the desired sound. **Option 2.** The conductor plays a recording of the affect they desire. The singers self-audiate and attempt to recreate the sound. When successful, the conductor follows up with the appropriate cognitive information. **Option 3.** The conductor invites the choir sings their words "crisply", "cleanly" in the affect he/she intends. The choir self-audiates and attempts to recreate the sound. When successful, the conductor follows up with the appropriate cognitive information.

As mentioned earlier, the affective domain almost always leaves the most room for error. It is crucial to allow the singers' time to internalize/audiate the experience. This is how they attach new meaning to a word, sound, or experience. When the experience is successful, it needs to be solidified with fact so that it can be recreated healthily, accurately, and consistently. Otherwise bad habits, misconceptions, and miscommunication may arise.

******Going Further: Articulators and the Pharynx as it pertains to Vowel Resonance, Diction and Text, Blend and Balance, and Tuning**

A basic rule of resonance is this: In each sound wave there is a fundamental frequency (pitch) with its compliment of overtones. This fundamental frequency is determined by the dimensions and constitution of the vocal folds and the combination of subglottic air pressure and muscular activity within the larynx (Thurman and Welch, 410). The sound or timbre of our voice is then made up of six essential ingredients: number of partials in our sound spectrum (overtones), distribution of partials in the spectrum, relative intensity or strength of partials, inharmonic partials that are not part of the harmonic series for a given tone, the fundamental tone, and overall intensity of the tone. Here are some general rules: the more partials, the richer and more brilliant the sound (flutes have few upper ones, violins have lots), each voice has its own unique distribution of partials (like fingerprints), our relative intensity can be unique and manipulated, inharmonic partials are due to inefficiency or damage, low tones tend to sound darker and high tones brighter, and louder tones usually have more present partials (Doscher, 96-97). We resonate by adjusting the relationship between our two vibrating sources, the larynx and the pharynx/oral cavity. Basically, when you change the shape of the vocal tract, the voice spectra (overtone distribution) changes. When this leaves your lips, it carries qualities that people perceive as the pitch, volume, and timbre of your voice (Thurman and Welch, 450). A vocal tract made larger amplifies lower partials/overtones, and a smaller one amplified higher ones. Our resonance is at its best when the two spots are tuned to the same frequencies and their partials (Doscher, 98). Our voice works such that the vibrations created in the larynx are

superimposed on the pharynx/oral cavity. The good news is that our secondary vibrator is tunable and can produce optimal resonance for any fundamental frequency and its partials. Some basic rules for tuning are that taught walls brighten the tone and soft walls darken it. We change the shape and size of the pharynx/throat and mouth/oral cavity by adjusting the tongue, lips, soft palate, and the jaw.

The pharynx extends from the back of the nose to the cricoid cartilage. Because we tune it with the mouth, we consider it, for the most part, a single vibrator. The first six partials are amplified in the pharynx (Doscher, 111). A jutting neck is often a sign of pharyngeal tension and should be avoided. Depressing the root of the tongue and lifting the larynx also causes constriction of the pharynx. There are no other cavities that adjust the sound of our voice. We do feel sympathetic vibrations in places like the forehead, sinuses, chest, etc. These can be guides (like Braille) to efficient resonance, but not sources.

The Tongue

The tongue is the most important articulator as it is the most flexible and takes up the most space in the mouth. Adjustments in the tongue allow for coupling of the pharynx and mouth (Doscher, 113). The back of the tongue is attached to the hyoid bone, the epiglottis, and the soft palate. Its front and sides are free. When resting, the tongue tip should touch the bottom teeth and ride high nearly against the hard and soft palate (Doscher, 114). If the tongue root becomes depressed, it can lower the larynx unwontedly forcing the hyoid bone down and producing a heavy, dark tone and poor diction.

Tongue Root Exercises:

Exercise1: Put out tongue as far as possible and snap back into mouth to lie against the lower front teeth.

Exercise 2: With the tip of the tongue in place against the lower teeth, push forward to roll the tongue up and out. Return to initial position.

The Palate Hard and Soft

The palate is supposed to separate the esophagus from the nose during swallowing. Its resting position is like a lowered curtain. It can be moved forward, backwards, up, down, and tensed. It is important to note that the palate is attached via muscles to the tongue, base of the skull, and behind the ears. Bright and dark resonance (with lots of amplified high partials, and without them) is adjusted through the oppositional relationship between the soft palate and larynx. When the soft palate is up, the larynx lowers and vice versa. A low arch in the palate makes a brighter tone, and a high arch a dark one. We strive to balance the natural timbre of our voice for whatever resonance is desired. This articulator most directly effects what conductors and singers often call an “open throat sound”. It looks like this:

a. Lifting the palate enough to bring out low partials and preserve the character of the tone (tension in soft palate).

b. Maintaining enough softness in the palate to adjust to different tones and absorb unwanted high partials (flexibility in soft palate).
c. Allowing a nearly inaudible inspiration.
d. Natural lowering of the larynx without tension. This increases the size of the throat and relaxes the pharyngeal walls. It also helps to relax the "strap muscles" (McKinney, 130, 131).

Finding the Soft Palate:
Exercise 1: Yawn. The soft palate lifts and the larynx falls.

Exercise 2: The cold spot. Have singers/students breath into the mouth and feel a cold ring of air behind the teeth. With each new breath, have them move the cold spot back in their mouth. This is the soft palate lifting.

Exercise 3: Kinesthetic motions that lift the hands and arms up and over the head from behind tend to lift the palate unconsciously.

The Jaw

The jaw should be free, not positioned. It lowers and swings back to open. Many muscles attach to the jaw and should generally be relaxed. Tight and pressed sounds are often due to excessive jaw tension. Lowering and closing of the jaw greatly impacts resonance in the voice. Generally singers strive for a loose and open jaw.

The Lips

The lips should only be positioned based upon the vowel being sung. One general position is faulty and negatively impacts resonance. The lips and the muscle surrounding them should generally be relaxed and flexible for proper vowel formation. Most front vowels show more teeth (Doscher, 124). A basic rule for articulators is that they should be moved with minimum effort and maximum efficiency. Too much work creates undue tension elsewhere. To close an introduction to resonance and the articulators, consider this quote:

> As the sound passes through the resonating cavities of the throat and mouth, the profile of the spectrum changes, since each cavity resonates to some of the tones in the spectrum more readily than to others and each ads its own characteristics to such tones. This reinforcement gives the partials greater energy at the point of cavity resonance (Appleman, 126).

Exercises in articulation/vocal tract adjustment awareness from Thurman and Welch (453-454)

Exercise 1 (the Ten Foot Tall Giant): Have students/singers speak like a TFTG. Have them observe the sensations in their mouth, throat, chest, and body during this exercise. Generally this happens: 1. Muscles below the larynx pull it down as far as it

goes, lengthening the vocal tract. 2. Lips protrude forward and are rounded to lengthen the vocal tract. 3. The jaw lowers and tongue tenses down to the bottom of the mouth. There is usually a hump in the back making maximum space in the mouth. 4. The soft palate is pulled back forcibly to seal off the nasal cavity. Muscles around the pharynx contract and make it larger.

Exercise 2 (Bugs Bunny): Have students/singers speak like Bugs Bunny. Have them observe the sensations in their mouth, throat, chest, and body during this exercise. Generally this happens: 1. Muscles above the larynx pull it up as far as it can go to shorten the vocal tract. 2. The lips retract to further shorten the vocal tract. 3. The jaw rises and tenses and the tongue tenses and arches up high, curved inside the mouth. This makes the space minimized. 4. The soft palate is tense and lowered to open up the nasal cavity. Muscles around the pharynx are contracted to narrow it.

Further Consideration of Resonance including vowels, consonants for tuning, blend and balance.

We now know that if a resonating space is shaped a certain way, it will have an optimum frequency that augments the partials in the tone matching the produced frequency. When these frequencies (the one produced and the one supporting it through articulation and harmonic amplification) coincide, the voice gains in quality and projection (Doscher, 134, 136). We do this through vowels; their formation has pitch within our oral cavity. Please note that for choral singing, optimal resonance is not always desired, in fact, a singer has the ability to create a multitude of timbres, many of them more or less resonant than others. It is best to discover a wide palate of timbres/resonances that can be used in choral singing. One of the basic skills/goals of singing, however is to maintain a relatively close similarity of voice quality throughout changing pitches and volumes. Healthy, optimized phonation should be more desired than timbre.

Exercises to discover Vowel Pitch

Exercise 1. Thump with a finger on the base of the tongue below the jaw and form each vowel. Notice a change in pitch. This is the first band of frequencies we're dealing with and trying to amplify.

Exercise 2. Whisper each vowel notice the change in pitch for each vowel. These frequencies are higher and are the second band we're trying to amplify.

Simply stated, if we want to sing a certain vowel at its optimal resonance, we much adjust the articulators so that the resonating frequency of our pharynx and oral cavity amplify the partials in the natural harmonic series of the sung tone. It generally looks like this:

1. The vocal folds resist the breath stream strongly enough to form long glottal closure (firm adduction), which makes a richer tone.
2. The movement (narrowing and widening) of the tongue and lips is greater than for speaking (choral speaking).
3. The tongue, jaw, and soft palate are moved to adjust the resonant frequencies in the secondary vibrator.

A beneficial result is that singers will find that once they've achieved better resonance, they are able to adduct their folds less and sing healthier.

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