SPEAK OUT!

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Bringing the English Articulatory Setting into the classroom: (1) the tongue

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In every sport, there is a characteristic bodily posture adopted by players from which they can easily make the strokes or movements they require. (Nobody tries to play golf, for example, using the characteristic posture of, say, a figure skater.)

In the same way, every language has a basic or default position for the tongue, lips, jaw, etc. This configuration is developed by children as they learn to speak and is called the 'articulatory setting' (AS) of the language. It has been recognised for many years that when L1 and L2 settings differ, a learner will find it impossible to pronounce L2 well if he has not adopted its AS.

While the articulatory setting (AS) of a language describes the characteristic posture of all the speech articulators, the tongue has been the focus of most research and discussion. Its setting has a special name: the 'basis of articulation' (BoA).[1]

In this article, we deal with (1) the nature of the BoA for English, (2) how to teach it, and (3) how students who adopt it can practise autonomously. This updates our earlier articles (Messum 2010, 2012) with the progress that we and others have made in the field. In a second article, we will do the same for the other aspects of the English AS.

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[1] Borissoff (2011, 2012) described the historical development of this idea in various European countries.

Part 1 – The nature of the English Basis of Articulation

Mid-sagittal drawings of the head which illustrate the tongue positions for different vowels can give the impression that the tongue floats freely in the mouth during speech whenever there is no contact for a consonant.

This is not so. For example, French speakers keep the tip of the tongue in contact with the back of the lower front teeth most of the time during speech. The body of the tongue then creates the postures required for the French vowel sounds and this sustained positioning of the tongue also determines the way that the consonants are produced. The blade of the tongue (the part that is just a little back from the tip) can easily touch the edge of the alveolar ridge (the concave 'bump' which is located a little behind the upper front teeth) and this is how consonants like /t/ or /n/ are articulated by French speakers.
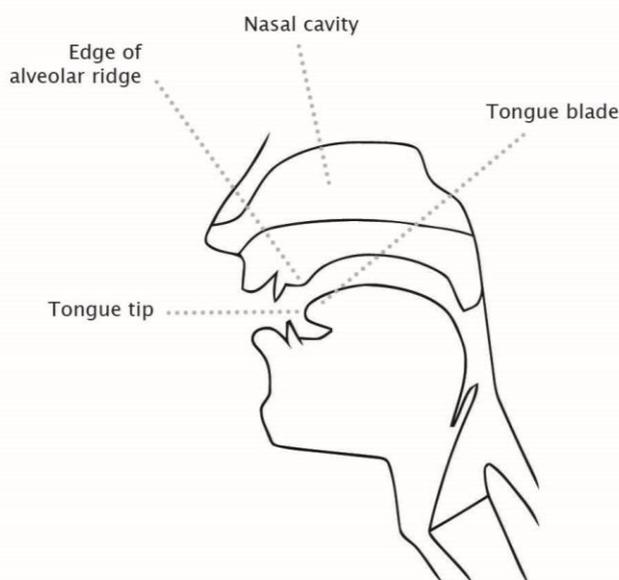
The place of a similarly pervasive tongue/mouth contact for English has been known for some time, but, as we shall see, views about its nature and its pedagogical significance have recently been changing.

First, a word about the tongue

The tongue is a 'muscular hydrostat': 'muscular' because it is made up of bundles of muscle fibres that run in different directions, and 'hydrostat' because its volume doesn't change as it moves around in the mouth. So if the tongue expands somewhere, then it must contract elsewhere. (A balloon filled with water is another hydrostat; if you press in at one point, it must expand somewhere else.)

Here are some pictures of the tongue and some other muscular hydrostats found in nature, reminding us of the versatility of such organs:
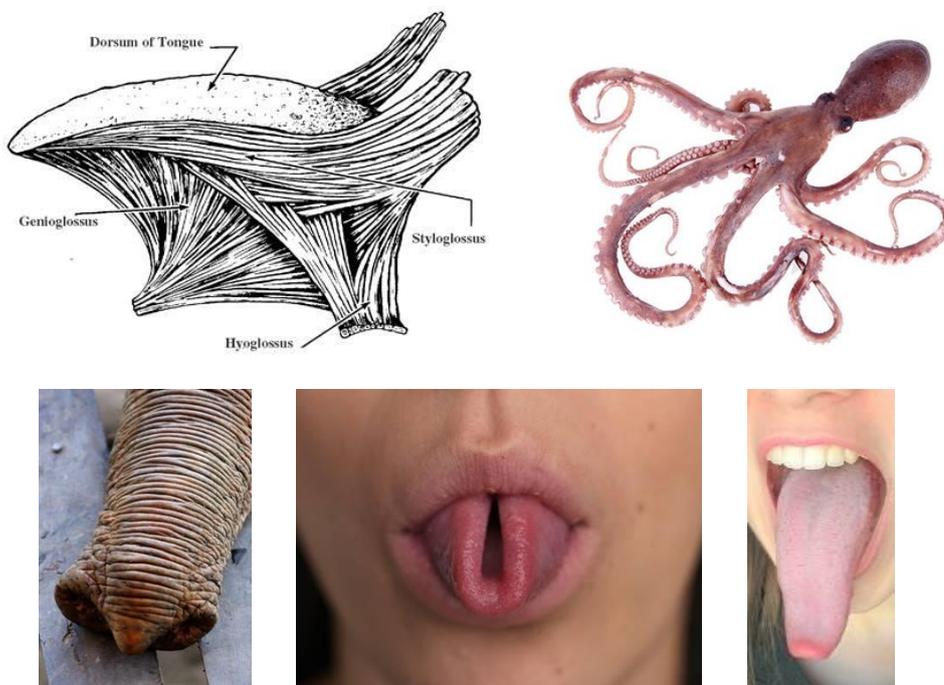
Figure 1. The extrinsic muscles of the tongue (top left). The tentacles of an octopus and the trunk of an elephant are also muscular hydrostats. Like the tongue, they are well-known for their flexibility and range of movement.

The nature of tongue/mouth contact in the English BoA

Within detailed descriptions of the English BoA, there have been several descriptions of a pervasive contact, analogous to the French contact between the tip of the tongue and the lower front teeth.

Honikman (1964) described the English contact thus (with our emphasis added in bold):

*Almost throughout English, the tongue is **tethered** laterally to the roof of the mouth by allowing the sides to rest along the inner surface of the upper lateral gums and teeth; the lateral rims of the tongue very seldom entirely leave this part of the roof of the mouth, whereas the tip constantly (or some other part of the dorsum, occasionally) moves up and down, periodically touching the central part of the roof, but generally not for very long at a time, before it comes away. Thus, one might regard the tethered part—in this case, the lateral contact—as the* **anchorage***, and the untethered part as the* free *or* operative part *of the tongue-setting.*

*By anchoring the tongue we, naturally, lessen its freedom of movement. Therefore it is important to note the extent of the anchorage, for this prescribes the range of play of the free part as well as of the tongue as a whole. **The forward limit(s) of tethering** might well serve as points of reference in describing the anchorage.*
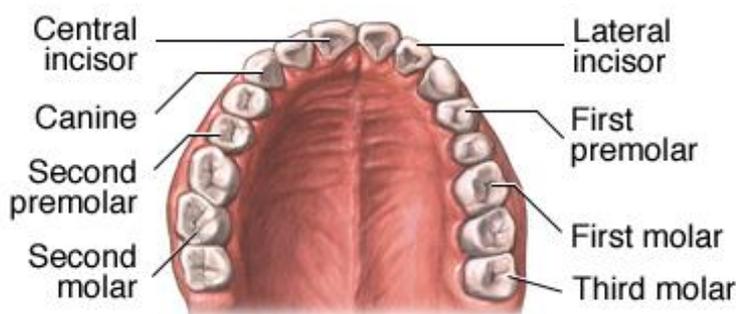
Figure 2. The upper teeth and palate seen from below.
Notice that the alveolar ridge (the bone into which the teeth are embedded) is narrower at the front than one might imagine. It has an 'edge' that is created at the change of direction between its approximately horizontal face behind the teeth and its approximately vertical face that runs up and curves into the hard palate. At the front, behind the incisors, this 'edge' is only a couple of millimetres behind the teeth. It is a prominent, easily located feature in the mouth. Most teachers refer to this edge as the alveolar ridge.
Notice, too, the striations on the 'vertical/curved' face of the alveolar ridge. Getting students to feel these striations (as a roughened texture revealed by delicate exploration with the tip of the tongue) helps to give them a sense of what it is to be present in their mouths. Such presence is essential for developing a new BoA and the articulations needed for new L2 sounds.

*Thus, the alveolar consonants of English—[t, d, n, r, s, z][2] and generally [l]— require **lateral anchorage as far forward as the upper [second] pre-molars (but never beyond the [first] pre-molars)**. These teeth on either side of the roof of the mouth serve, as it were, as forward mooring-posts for the tongue, allowing the transverse part of the dorsum between them to operate as a **hinge** which enables the tip and blade to swing comfortably up and down, towards, to, and away from the alveolar ridge, but preventing the blade and tip from ranging much further forward without strain.[3] This anterior lateral contact is released for a following further back consonant or open or back vowel, and very slightly extended forward for dental sounds.[4]*

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[2] [r] is the American English flap.
[3] At this point, Honikman's footnote 12 reads, "Watching the tongue repeat quite naturally [t, d, n, l] a number of times in succession, without an intervening vowel, will show the action of the tongue."
[4] At this point, Honikman's footnote 13 reads, "Nearly all lingual sounds have a certain amount of lateral contact; the only ones that show none are open or far back vowels, far back consonants and, occasionally, clear [l]."

*Since this anchorage is not tensely held, but is rather a **pliable cushioning of the tongue-rim**, adjustments to it such as lowering, retracting, and advancing are comfortably and smoothly made when required, as for some vowels and the less frequent lingual consonants.*

In the second and third paragraphs, the words we have put in bold draw attention to Honikman's proposal that the forward limit of tethering—as far forward as the upper second pre-molars—be regarded as the point of reference for describing the anchorage. This point of reference is where we most readily have proprioceptive knowledge of the tongue's position for the English BoA.

In the first and fourth paragraphs, we have put the words 'tether', 'anchor' and 'pliable cushioning' in bold. All of these imply that there is something more than just contact between the sides of the tongue and the upper side teeth.

Borissoff (2011:60) elaborates on this, bringing in the significance of the tongue being a muscular hydrostat:

[L]ocking of the lateral parts of the dorsum to upper molars is quite natural for the specific English BoA. The tongue being a hydrostatic body any contraction needed to withdraw the tip from the teeth would be compensated by the increase of the height of the tongue body which would push the rear part of the dorsum to upper molars creating the characteristic 'anchorage'.

The secondary feature, directly relating to this anchorage, is the so-called 'grooving' which is well attested in English. … Grooving has a functional explanation. The retracted and raised English BoA causes the specific lateral anchorage. The groove in the central part of the dorsum is needed to allow the air to pass during phonation. It should be noted that this anchorage also creates an additional constriction of the air passage requiring some extra expiratory effort.

Within Speech and Language Therapy, this aspect of the English BoA has been called the 'butterfly position' (Marshalla 2009; Bowen 2011): the back of the tongue widening out to form the wings of the butterfly, leaving its centre slightly lower, like the body of a butterfly suspended between the wings. (For the same reason, the swimming stroke below was called the 'butterfly'.)

Instrumental studies

Technology is increasingly allowing questions about articulatory settings to be investigated with scientific instruments. A few years ago, Wilson and Gick (2014) used optical tracking of the lips and jaw and ultrasound imaging of the tongue to investigate the inter-speech posture (ISP) of eight French–English bilinguals in Canada. The ISP is not the AS *per se*, but can be taken as a reasonable proxy for it. The results of the study support the claim that bilinguals who sound native in each of their languages have distinct articulatory settings for each language.

The pedagogical implications were one motivation for their study:

> *One may ask … whether it is really necessary to differentiate the articulatory settings of two languages in order to sound like a native speaker ... One way to answer this question is to look at bilinguals who are perceived as native speakers of both their languages and determine whether or not they use a unique articulatory setting for each language … .*

> *If such bilinguals do differentiate their ISPs for each language, then this supports the teaching of articulatory setting to pronunciation learners, assuming that their goal is achieving accent reduction or sounding more native-like.[5]*

> *On the other hand, if a bilingual speaker who is perceived as a native speaker of both languages does not have two distinct ISPs (one for each language), then it follows that having the correct ISP (and, hence, the correct articulatory setting) is not a prerequisite for native-like pronunciation of a language.*

Their results, though, suggest that having the correct ISP and AS are likely to be such prerequisites.

More recently, Gick et al. (2017) have used electropalatography to look at the issue of tongue/mouth contact in the English BoA, specifically testing the pervasiveness of rear lateral tongue contact in continuous English speech.

Their artificial palate design covered the roof of the mouth and in this case, unusually, extended over the upper teeth as well, so the outermost ring of electrodes could be considered to be recording contact between the edge of the tongue and the upper teeth. Their "region of interest" for rear lateral contact appears to cover the first two molars, but does not include the pre-molars. In the six minutes of speech from

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[5] At this point, Wilson and Gick point out another possibility, that an AS may be an emergent property of correctly producing the sounds in a language's phonetic inventory, in which case it may not need to be taught directly. We do not believe that an AS is such an emergent property for L1 speakers (for reasons briefly described in Messum (2010)), but even if it were, our experience of learners makes us doubt that any but a very few L2 speakers will develop a new L2 AS without some explicit instruction.

one male and one female that they analysed, the tongue maintained rear lateral contact more or less continuously, except during some instances of /l/ (mainly syllable-final ones) and during some instances of the low vowel /ɑ/.[6]

We can compare this to what Honikman described in her footnote 13 (reproduced earlier) that, "open or far back vowels, far back consonants and, occasionally, clear [l]" are lingual sounds without lateral contact. There is a (minor) discrepancy here between the two accounts which may be partly explicable by examining the methodologies employed. Firstly, there will certainly be articulatory idiosyncrasies between individuals: Gick et al. report on just two speakers, and Honikman is presumably reporting on herself and any other native speakers (including phoneticians) that she may have consulted. Secondly, Gick et al. focus on contact with the molars while Honikman is more concerned with contact with the pre-molars, which may be more readily sensed points of contact but where contact may be less continuous.
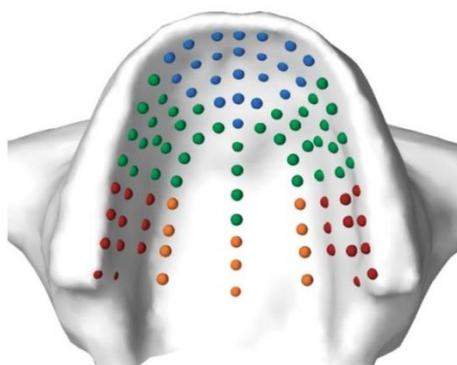
Figure 3. Gick et al.'s (2017) Fig.10. This view from below shows the four colour-coded regions of the upper palate and top teeth that were investigated. Contact between the tongue and the electrodes situated at the 22 positions shown in red (11 on each side of the rear of the mouth) was considered to reveal rear lateral bracing.
Notice that the outer electrodes shown in red appear to lie over the molars, while contact with the pre-molars would have been revealed by electrodes shown in green, but this latter data is not reported by Gick et al.

Gick and his colleagues also considered the extent to which the contact was effortful and intentional and could therefore be characterised as 'bracing' rather than just being incidental (the result of some other action such as retraction of the tongue tip). On this issue, their tongue simulations suggested that contact is active and maintained through extra muscular effort, hence justifying the description of 'bracing'.

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[6] It is perhaps noteworthy that contact wasn't always symmetrical, and would occasionally be lost on one side but sustained on the other. But more-or-less continuous rear bilateral contact was the norm (97.5% of the time).

The pedagogical implication from Gick et al.'s findings would be to tell students to brace the sides of the tongue against the molars, and to maintain this bracing almost continuously. (It may be helpful to ask students to rub the tongue quite vigorously along the cutting edge of the teeth until it hurts a little before they start; this will give them about 20 seconds during which they have a clear sense of where the sides of the tongue are.)

On this point, the pedagogical implication of Honikman's account would be to tell students to "tether" the tongue somewhere against the pre-molars (which will necessarily also lead to contact with the molars further back). It should be made clear that "tethering" implies a certain freedom for the contact to move forwards and backwards, and to be lost from time to time.

As we explain later, rather than bracing against the molars, tethering against the pre-molars is the instruction we actually prefer.

Gick et al. pointed out that,

> [the findings] challenge prevalent conceptions of tongue motor control. Rather than the tongue functioning as a free-floating, tentacle-like structure moving as a mass into more or less high–low or front–back positions through the action of extrinsic muscles[7], the tongue in this view remains by and large stable, with constrictions formed largely through changes in shape effected by the actions of intrinsic muscles.

Pedagogical descriptions of the English BoA

In English, the alveolar consonants /t/ /d/ /n/ and /l/ are pronounced with the tip of the tongue touching the edge of the alveolar ridge. In most other languages, it is the blade that makes contact for these consonants. (This latter articulation is sometimes alternatively described as the tip being in contact with the teeth—which is also the case—but this is a consequence of the laminal gesture.)

Honikman (1964:75) made this point as follows:

> The distribution of sounds in one's own language can, to some extent, be ascertained by concentrating on the feel of the oral cavity during utterance. For instance, one becomes aware in speaking English of the constant rapping of the tongue-tip against the alveolar ridge and intermittent closing and opening and

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[7] The extrinsic muscles extend outside the tongue and move it bodily; the intrinsic muscles lie wholly within it and alter its shape. In the labelled picture of the tongue in Figure 1, all the named muscles are extrinsic.

other slight motions of the lips; whereas this is not the case in French, where the tongue-tip is hardly palpable and certainly less active than the blade and front and the constantly moving (rounding and spreading) lips. In both these languages, as in utterance generally, the sides of the tongue are almost impalpable.

Most people are insensitive to the actions of their tongue during speech. Once their attention has been drawn to its movements, the easiest thing for students to notice is a change in contact: when a part of the tongue either makes or breaks contact with another part of the mouth. (For many consonants, of course, these actions define their 'place of articulation'.)

For this reason perhaps, it is the activity of the tongue tip rather than the lateral spreading of the tongue that one reads about in the few descriptions of the English BoA written for teachers.[8]

However, since the tongue is a muscular hydrostat—only able to take shapes which preserve its volume—there are at least two ways in which causation could operate: either (1) the active retraction of the tongue tip leads to lateral spreading, or (2) the active spreading leads to the retraction of the tongue tip.

Nobody knows for sure which of these gestures best characterises the way that an adult English speaker maintains the BoA, but we note that the Gick et al. (2017) study is supportive of the idea that active spreading is the primary gesture.[9]

Having experimented with instructions to L2 learners based on each characterisation, we do have a pedagogical preference: to teach active spreading as the primary gesture, rather than tongue-tip retraction.

We do this because during running speech it is possible to remain present to a more-or-less continuous contact like that created by active spreading for English or by the tip being braced against the back of the lower front teeth for French. One's presence enables one to maintain what is not yet an automatic gesture, and to receive proprioceptive feedback that the gesture is being maintained.

On the other hand, it is hard to remain present to the relationship between the tip and the alveolar ridge in English when there is only intermittent contact, during the production of alveolar consonants. (During classroom exercises or homework, intermittent contact can be attended to, but running speech makes too many other demands on attention.)

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[8] E.g. O'Connor (1973); Jenner and Bradford (1982); Collins and Mees (1995).
[9] For L2 teaching, there is another question of interest: which gesture do child learners of English use to develop the BoA? This area is completely unexplored.

As well as this, given the instruction to "produce alveolar consonants with the tip of the tongue," some students will not retract the tip but instead will curl it up and backwards, as if for retroflexion.[10]

Part 2 – Presenting the English Basis of Articulation to students

Preparing yourself to start

From our experience as teacher trainers, we know that many teachers have little awareness of what their tongue is doing during speech. As you have been reading this article so far, and as you continue to read, we assume you will be checking what you read against your personal experience. To increase your sensitivity to the use of your tongue, you may find it helpful to go beyond activities that you can propose in class.

1. Marshalla (2011) describes the following activity for speech therapy with children to help them to learn to actively spread the sides of the tongue laterally. We have slightly adapted it for language teachers, and have found it helps to develop a sense of the muscularity and versatility of the tongue.

Fold your middle, ring and little fingers down, and put your hands together so that your index fingers stand out. They will be separated from each other by a space that is approximately equal to the width of your mouth.

Slide your index fingers into your mouth, either side of your tongue. Press inwards on the sides of your tongue with your fingers, squeezing the tongue body towards

the midline. Then use the tongue muscles to force both sides of the tongue outwards at the same time.

Experiment with the various pressures and directions of movement that your tongue can create. (To what extent can you experience the tongue as a muscular hydrostat? When the sides are spread, what happens to the tip? When you stick your tongue out, what happens to its width at the back?)

2.   Honikman described the reference point for the tethering of the tongue as being the upper posterior pre-molars, and clearly there will be some room for personal differences in this. It is worth experimenting with tethering your tongue further forward and further back, to discover how easy or difficult normal speech is in either case.

3.   Produce a selection of English vowels in isolation, /iː ɪ e æ ʌ uː/ etc, in brief and sustained versions. Do you brace the tip of your tongue against the back of your lower front teeth for any of these? If you do, say the same vowel in a short stretch of running speech. We think that you will now say it using the BoA of English.

We don't believe in teaching vowels by modelling them, but if you do, be aware that you may mislead your students if they see your tongue in a position that is not natural for running speech.

When to start with your class

We introduce the English BoA at the start of any course, at the same time as we introduce the sounds. As we say elsewhere (Young and Messum 2017, this issue), the AS of a language is one of its 'specificities'. These,

… should not be taught as an afterthought, or an add-on to the sounds; in native speakers they are the system through which the sounds are produced, and are learnt in parallel with them. These phenomena can only be worked on using sequences of sounds, which are then produced through the system that the specificities create, meaning that sounds and system are learnt together.

However, we do not start our work on the English AS with work on the English BoA. In our next article, we will describe the work on speech breathing and lip tension that we actually do first, and explain why. Although it might have been logical to deal with that in this first article, we have to acknowledge that, at present, most teachers are

more interested in helping students to work on their tongue posture and tongue gestures.[11]

Introducing the English Basis of Articulation

Creating mental images

When learning a motor skill, it is necessary to have a mental image of the target action. For students to create mental images of the BoA, we have created some 3-D models using Cuisenaire rods. Students understand that the models are indicative rather than anatomically correct, and that they will have to develop the English BoA through experimentation and proprioception, but the models give them a starting point for this.
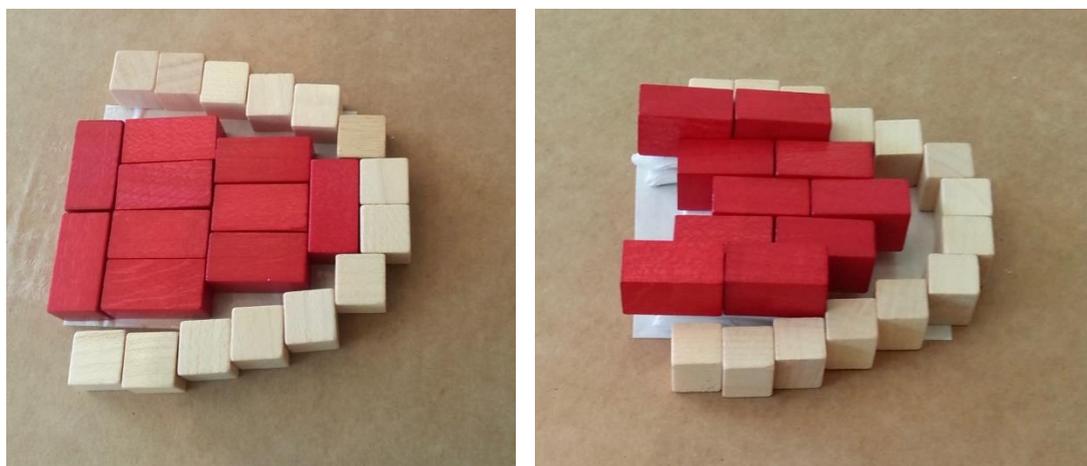
Figure 4. Two Bases of Articulation created for a French class learning English: French BoA left and English BoA right. The white rods are the lower teeth and the red rods make up the tongue. One advantage of using rods is that we can use the same number of red rods (ten) when portraying the two BoA's, making the point that the tongue is a hydrostat. The models are indicative; not to scale.

In the French BoA, the tip of the tongue is in contact with the lower front teeth and French speakers have no sensation of contact around the sides of the tongue.

In the English BoA, the sides of the tongue are raised and spread. This spreading leads to the tip of the tongue being retracted. Note that the upper pre-molars cannot be shown in the model, but the raising is visible and Honikman's 'point of

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[11] Piers Messum described the initial work we do to begin any course at the joint PronSIG/Natecla 'Accentuate' conference held at the British Council in February 2015. The video of his presentation, "What to do before you teach sounds", can be seen at https://www.pronunciationscience.com/videos/. The discussion of the BoA starts at around 30'50'', but prior to that he describes our preparatory work.

reference'—the forward limit of tethering—would be somewhere in the region of the upper first and second pre-molars.

After students have seen the relationship between the back of the tongue and the rear molars in the English BoA, we add the two upper canine teeth and place an alveolar ridge across the mouth using a dark green rod.
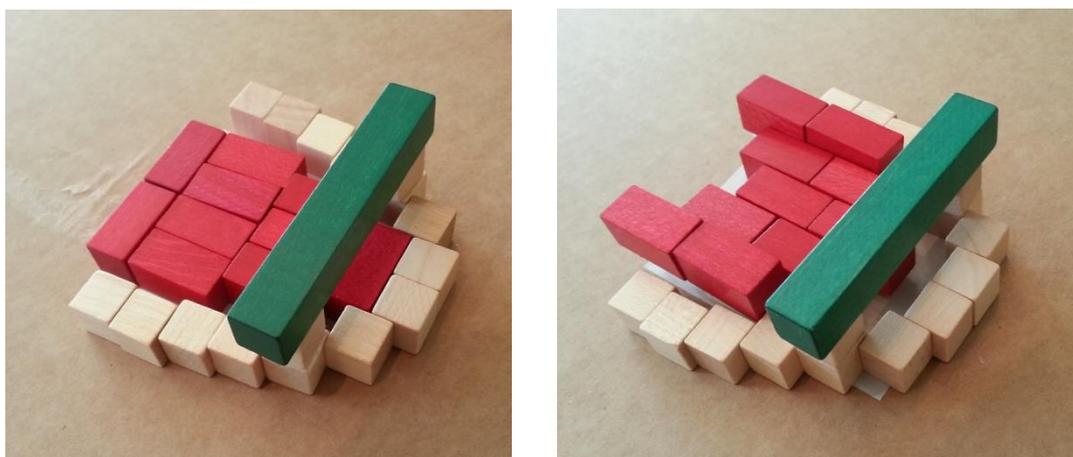
Figure 5. The green rod represents the alveolar ridge.

The addition of the alveolar ridge make it clear to French speakers why they use the blade of the tongue for alveolar consonants like /t/, /d/ and /n/, and why English speakers use the tip. These are the parts of the tongue which naturally make contact when the tongue is raised within the respective BoA's.

Articulatory instructions

For the reasons we explained earlier, we now teach the English BoA as if the lateral spreading of the tongue is the primary gesture, and the retraction of the tip a consequence of this.

Make sure your students know which of their teeth are the upper pre-molars (the fourth and fifth from the centre point). Ask them to put a fingernail between them, so that they have a clear point of reference, and then to spread the sides of their tongue to make contact with the inner, cutting edge of the upper teeth, as far forward as the pre-molars. Tell them to place the tip of their tongue against their alveolar ridge and then to drop it away, a couple of millimetres. This is the English BoA.

Introductory work

Ultimately, students have to be able to maintain the BoA throughout the complex sequences of sounds in running speech. The ability to do this has to be built up. We

start with sequences of voiceless consonants, because the students can concentrate on the tongue and other movements involved without the distraction of hearing the noise of voicing.

1   We first want students to get a feel for Honikman's 'hinge'. We ask them to,

- become present to the contact of their tongue to the upper pre-molars and to keep enough of their presence there to make sure that the contact is maintained;

- stiffen the tongue between the two points of contact to create a hinge;

- make and break contact between the tip of the tongue and the alveolar ridge several times (in a motion that would create a light /t/ /d/ or /n/ sound), until this movement starts to become somewhat familiar.

2   Then, for initial combinations of sounds, we use: /ts/ /st/ /ft/ /ʃt/ /tʃ/ /kt/

3   We now add vowels before and after these sequences, to start creating English words. Voiced consonants can now be introduced into the exercises, too.

4   After students have done some experimentation along these lines, we show them two YouTube videos of MRI scans, one of a Chinese speaker and one of a speaker of American English.

https://www.youtube.com/watch?v=ezOwCf835YA (*"What happens in our mouth in the process of speaking"*) and https://www.youtube.com/watch?v=Nvvn-ZVdeqQ (*"The flexible tongue"*)

Students always like to see both videos several times. The videos show how the tongue is held and moved very differently in the two languages. Honikman's "rapping" of the tongue tip against the alveolar ridge in English is very obvious. We

point out that the teeth are not visible, so any impression that the tongue is floating freely is misleading. There is contact with the upper teeth along the sides.

After showing the videos, we return to the initial exercises described above, for which the reasons are now clearer to the students.

5   With speakers of any L1 that has an /r/ sound that differs from the English one, we will make use of this sound at some point. The correct articulation of /r/ is usually highly determined by the BoA of the language being spoken.[12] It therefore serves as a litmus test for the development of the students' English BoA and an encouragement that they can, indeed, transcend their L1 pronunciation.

In English, we use the phrase,

> *Robert Road in Ryde*

If possible, we or our students create a phrase that is comparable to this in the students' L1. For French, we have used,

> *Rue Robert à Rennes*

We then encourage the students to compare saying each sentence with both their native L1 and the English BoA (four permutations in total). We, and our students, have always found the results to be a striking endorsement of the need to adopt the BoA of any L2 when trying to pronounce it. It is impossible to produce an English /r/ with the French BoA, for example, and vice versa.

6   Once the BoA for English has been introduced, it is useful to have some way of reminding the students to take it up again if they let it slip. This might be a drawing of a mid-sagittal section of the mouth on the classroom wall, or your own Cuisenaire rod model of the mouth on a table, or a picture of our model on the wall. Simply by touching a picture or the model, you can ask your students to focus their attention on the underlying posture of their mouth and tongue, until their use of the English BoA

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[12] Note that Roach (1991:60) says the only articulation of (simple) /r/ he can recommend to learners of RP is as a post-alveolar approximant:
"The important thing about the articulation of /r/ is that the tip of the tongue approaches the alveolar area in approximately the way it would for a /t/ or /d/, but never actually makes contact with any part of the roof of the mouth … (This is, of course, very different from the 'r-sounds' of many other languages where some kind of tongue-palate contact is made.) The tongue is in fact usually slightly curled backwards with the tip raised; consonants with this tongue shape are usually called retroflex … The 'curling-back' process usually carries the tip of the tongue to a position slightly further back in the mouth than that for alveolar consonants such as /t/ and /d/, which is why this approximant is called 'post-alveolar'."
This articulation is, of course, made possible by the English BoA.

feels natural. Another possibility would be to tap your cheek with your finger at the level of your pre-molars, having set this up during your explanation of how the sides of the tongue are tethered here in English.

Summary

Adopting a new BoA in any language may initially feel awkward. Describing the English BoA as primarily a lateral spreading gesture rather than the retraction of the tip of the tongue has the advantage of making the unaccustomed feel of this posture explicit and understandable to students. As we pointed out earlier, it is a gesture that students can consciously maintain throughout any utterance. It also puts them squarely in contact with the fact that they are learning a <u>foreign</u> language and that they will need to move into a new physical use of themselves if they are to learn to pronounce English well.

Part 3 – Autonomous practice

How pronunciation should be practised

With the advent of communicative language teaching, there has been a general movement to try to make pronunciation work 'communicative', too. We support integrating pronunciation into work on expression—that part of communication that we think it is appropriate to work on in the classroom—and we do this ourselves.

However, while pronunciation has cognitive, perceptual and other dimensions, pronunciation is also—and always—a highly complex motor skill, comparable to playing a sport at a high level. Speaking an L2 will require a new use of oneself and this has to be learnt. If communication is 'playing the language game', then acquiring the motor skills to play the game can best be done, as in any sport, in dedicated practice sessions where the game itself is <u>not</u> being played.[13]

During practice sessions in which there is no requirement to communicate, students are free to concentrate on improving the many motor routines that are needed to support the wide range of pronunciation challenges they face: from producing individual L2 sounds all the way to producing whole phrases that are segmentally and suprasegmentally correct. All of this has to be practised to the point of mastery, where the speech component of L2 has become completely automatic. Much of the

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[13] Eduardo Briceño has given an excellent TED talk on this topic, distinguishing the activities that are appropriate for what he calls the 'Learning Zone' and the 'Performance Zone': https://tinyurl.com/yafkk8qs
Within the 'Learning Zone', the most important activity is what Ericsson (e.g. Ericsson and Pool 2016) has called 'deliberate practice'. (Anders Ericsson is a leading researcher on expertise. He was the source of the '10,000-hours rule', which Malcolm Gladwell described incorrectly but made famous.)

practice needed is best done without reference to meaning or grammar and without an interlocutor. These are needed when students are 'playing the language game', but are unhelpful distractions during motor skill development.

For this type of practice, teachers have created phrases and sentences that exemplify particular features of pronunciation. For practising the English BoA, examples can be found in Jenner and Bradford (1982).

However, students will not be able to secure new motor routines for pronunciation within the time that is usually available for practice in the classroom. These have to be practised outside, autonomously. Above all, autonomous practice requires that students have criteria with which to assess their own performance and this is a major part of what the work in the classroom should provide them with.

For autonomous practice, we ask intermediate and advanced students to work on a short text that they themselves choose, that they will be happy to say many times over. Students have chosen verse and excerpts from plays, the Bible or famous speeches. We call this text a pronunciation 'performance piece'. The students use it as a way of practising the movements of pronunciation without the distraction of having to formulate and deliver normal speech. Because students get to know their piece so well, they can come to observe every movement of their tongue and other articulators while they are performing it. This includes maintaining the BoA throughout the piece.

The teacher's way of working should have already shown students how to actively practise a piece[14] rather than simply repeating it. When practising, a student makes himself present to different aspects of his pronunciation and then at some point brings them all together in a performance which will tell him what he now needs to revisit. Practice becomes mere repetition—and therefore a waste of time—when a student stops bothering: stops being present to what he is doing and just speaks automatically.

Using the 'times tables' for autonomous practice

Fortunately, there is some speech material that can be used as a performance piece even with beginners, although we find that students at all levels appreciate the work and benefit from it.

We introduce students to the 'times tables' in English.

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[14] I.e. Ericsson's (2016) 'deliberate practice'.

2 x 1 = 2	2 x 7 = 14
2 x 2 = 4	2 x 8 = 16
2 x 3 = 6	2 x 9 = 18
2 x 4 = 8	2 x 10 = 20
2 x 5 = 10	2 x 11 = 22
2 x 6 = 12	2 x 12 = 24

Times tables make excellent pronunciation exercises because:

- There is never a problem with understanding the content. Everybody over the age of seven or eight knows them in their own language.

- There is no need to memorise the content; it can be recreated at will.

- The content is very easy (requiring no new vocabulary or grammar), so students can place all their attention on the pronunciation challenge.

- If they say the words slowly, students can watch their tongue and lips in operation. They can speed up, or slow down, very easily.

- Several tables give students the chance to work very specifically on the BoA. They can explore the feel of tethering and lateral spreading and the consequences on the position of the tip of the tongue. Does it now hover under the alveolar ridge? Does it rap against it for alveolar sounds? The 2, 3, 6, 7, 9 and 10 times tables all offer this opportunity.

- They contain a number of the problematic sounds of English, and there are some interesting liaisons, for example when 8 appears.

- The tables are excellent for practising Stress & Reduction. (As we will explain in our second article, we teach stress as a respiratory system activity and introduce reduction as 'stuttering' for the schwa sound.)

- Students can easily take these exercises out of the classroom and use them to practise their pronunciation elsewhere.

Let's begin

The 2 x (two times) table is a natural place to begin, and is immediately relevant for the students' development of the English BoA. /t/ is a consonant that is articulated differently in English from how it is articulated in most other languages: with the tip of the tongue (i.e. apically) rather than with the blade (laminally). Whether cause or effect of the BoA, this articulation is certainly closely bound up with it.

We start by writing "2 x 2 = 4" on the board. This line of the table contains two very clear /t/ sounds. One of the students might spontaneously say something like, *Two times two equals four*. We work on this phrase until the pronunciation is correct.

But then we write a few more lines from the table in a column below the first line:

2 x 3 = 6
2 x 4 = 8
…

We indicate that in the context of a table like this, the sentence they're saying is rather cumbersome.

Many British English speakers recite their tables as, *two twos are four, two threes are six*, etc. This is the most useful way to get your students to say the tables as a pronunciation exercise. The word *are*, appearing in all the tables except the 1 x table, is pronounced as a schwa, a reduced sound, but the syllable it creates has to exist. In the 1 x table, the verb is used in the singular: 1 x 2 = 2 is said as *one two's two*.

Rather than writing the words "Two twos are four" on the board, we now point out the sounds on a phonemic chart like the ones below, /tuː tuːzə fɔː/ for British English (or /tuː tuːzɚ fɔr/ for American English).
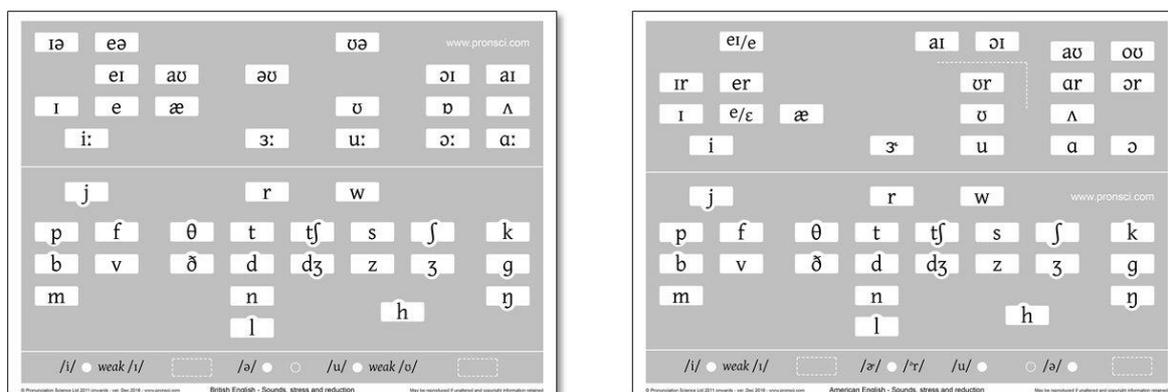
Figure 6. Phonemic charts for British English (left) and American English (right).

This way, the students have the pronunciation of the line, but probably without knowing exactly what they are saying. We don't yet address their puzzlement at /tuːzə/, but instead work on getting the string of sounds to sound natural. This means getting the stress and reduction right, with three respiratory system 'pushes', one for

each number, and the schwa or schwr joined on to the end of the second word, *twos*.[15]

One way to get words grouped naturally is to 'place' them on your fingers, one word per finger. Fingers can then be closed together to show when words are grouped. So, in this case, the second and third fingers are closed together to show that they are said as if they are one.

Figure 7. Arrangement of fingers for /tuː tuːzə fɔː/ or /tuː tuːzɚ fɔr/. The word two *has been placed on the little finger so the fingers can be 'read' from left to right by the class.*

When the pronunciation pattern is well established for this line and a few more lines of the table, it's time for the students to discover that one of the words they've been saying is *are*. How we do this depends on the particular class we have in front of us.

For non-beginners learning a British type of English, the /r/ liaison in 2 x 4 = 8 or 2 x 9 = 18 may be enough of a clue for them to solve the puzzle. Alternatively, or as a second clue, we might put up 1 x 2 = 2 (*one two's two*) and then 1 x 1 = 1 and 1 x 3 = 3 and make sure that everyone has noticed how the schwa has disappeared and a /z/ has appeared in its place. These can then be turned around: 3 x 1 = 3 (*three ones are three),* etc, which creates a clear contrast.

Why do we do this? The notion of reduction is alien to speakers of many languages. The fact that native speakers really do say /ə/ for *are*, and say it as a clitic (as if it were a suffix rather than a separate word), is one of the features of English that requires a significant conceptual change in these students if they are to say *are* this way themselves and expect to hear it said this way by others. Being told about the

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[15] In the second article, we will talk more about the work we would do before and at this point: on speech breathing for stress, on our approach to getting /t/ aspiration right, and on how to produce reduced syllables authentically. We deal with these topics in videos developed for the 'Teaching Pronunciation Differently' session that we have led for the last few years in the Electronic Village Online project (http://evosessions.pbworks.com). The videos can be seen at https://www.youtube.com/channel/UCOw2e_irdPfo5Q30mSppZLA.

reduced form is rarely enough to induce change in an intermediate or advanced student who uses a full form for this word. So this is a precious moment: the phrase is so short, the rest of it is so banal, that the point is inescapable. Students can't dismiss the fact of reduction.

Whatever the level of the students, we want them to discover that /ə/ is *are* rather than us telling them this. The realisation and their own subsequent practice will have more impact this way.

Once students understand the words they are saying, they may well revert to pronouncing the schwa with too much prominence, perhaps even as a full vowel: /ɑ:/ or /ɑr/. But they are now in a position to compare this to how they were saying it—correctly—before they knew which word was involved.

These sentences are therefore an excellent opportunity for students to discover to what extent reduced sounds really are reduced in English, and to explore what it feels like to make a clitic schwa and what the language then sounds like.

One appearing in the plural

2 x 1 = 2 is said *two ones are two*. Once the students have discovered the meaning of this sentence, be aware that they are often surprised by the use of *one* in the plural (*ones*) and the consequent plural form of the verb. You can contrast this <s> with the <'s> in 1 x 2 = 2, said *one two's two*. These lines from the tables juxtapose the singular and plural forms of numbers as nouns and the contracted and reduced forms of the verb *to be*.

The rest of the 2 x table

> *Two threes are six*
> *Two fours are eight*
> *Two sixes are twelve*
>
> *Two eights are sixteen*
> *etc...*

These lines of the table require very precise work with the tongue on and around the alveolar ridge. Note the liaison /r/ between *are* and *eight*.

Note the plural of *sixes.* Some students have a problem with the pronunciation of plurals, and this line will highlight it. Note, too, that /s/ rather than /z/ is used for the plural of *eight.*

Don't work through the tables as a multiplication exercise! That would lead to repetition rather than deliberate practice. We suggest instead that you spend a few minutes getting your students to understand the principles involved, then get them to work on a few lines that are appropriate for the problems they have. Help your students to perfect these lines. Then they can gradually gain in speed without ever sacrificing quality. There is no need to hurry.

The 3 x table

The 3 x table makes extensive use of the unvoiced <th> sound, /θ/, and selected lines from it provide an excellent exercise for intensive practice of this.

Three ones are three
Three threes are nine
Three sixes are eighteen   *(*note the /z/ and /r/ liaisons*)*
Three tens are thirty
Three elevens are thirty-three

A student's pronunciation of *three* is a good test of his BoA. Spoken with a French or Japanese BoA, for example, the /θ/, the /r/ and the slide between them cannot be made correctly.

The 9 x table

The many /n/s in the 9 x table give students a good opportunity to check that their tongue is spread and tethered, and that the tip rather than the blade is making contact with the alveolar ridge. The 2 x and 10 x tables offer a similar opportunity, but the tip does not rest on the ridge for a /t/ in the way that it does for an /n/. So once students are confident with the BoA in the 9 x table, you can return to the 2 x and 10 x tables.

Nine tens are ninety

Notice that the tip of the tongue moves to the alveolar ridge five times in this sentence! Recall Honikman's description of how the English BoA functions:

*[The upper pre-molars] on either side of the roof of the mouth serve, as it were, as forward mooring-posts for the tongue, allowing the transverse part of the dorsum between them to **operate as a hinge** which enables the tip and blade to swing comfortably up and down, towards, to, and away from the alveolar ridge …*

Once students can feel both the hinge and the contact, two similar sentences introduce the additional challenge of adding a non-alveolar consonant into the string:

    Nine nines are eighty one   *(*with the /r/ liaison*)*
    Nine elevens are ninety nine

Other activities

Most of the tables have something interesting to work on. The 4 x table has the /ɔː/ sound, the 5 x table has /f/ and /v/, etc. If your learners struggle with any area of pronunciation, see if there is a table which uses it, and then work on some lines from that times table in particular.

And throughout ...

Make sure the work remains light. It's not a maths exercise, the students are doing this for their pronunciation. And the phrases are so simple that it is reasonable for you to insist on your students getting the pronunciation right.

Conclusion

From our experience of teaching the English BoA we can make the following points.

Firstly, that for good pronunciation, it is essential that students acquire the BoA as part of developing the articulatory setting (AS) of English. As others have pointed out, it is impossible to pronounce an L2 well with the AS of one's L1 if this is significantly different from the L2 setting.

Secondly, that few students develop an L2 BoA spontaneously.

Thirdly, therefore, that it is necessary to teach the English BoA and this involves both articulatory instruction and motor practice. For us, this is also true of other aspects of pronunciation, but it is particularly obvious for the BoA.

As a more general point, teaching pronunciation as a motor skill means giving students practice tasks that are specifically designed for motor skill development. As language teachers, we can learn from domains where it has always been obvious that motor skill development is needed. Nobody denies that there are cognitive aspects to learning a sport or a musical instrument, but no sports coach or music teacher neglects the motor skill development needed for these activities. In fact, a great deal of time is spent on developing them through well-designed, deliberate practice. We should not hesitate to do the same when teaching pronunciation.

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