Becoming a Speech Sound Detective

Part 1

Lissa Power-deFur, Ph.D., CCC-SLP

NOTE: You will need to download PEPPER font to your computer to read the IPA symbols in this transcript. It is available at <http://www.waisman.wisc.edu/phonology/pepper.html>.

Greetings I am so glad that you are going to participate in these three modules on becoming a speech sound detective. I'm working with the Virginia Department of Education to create a series of modules to help you, speech-language pathologists, become a little bit more comfortable with your ability to analyze students’ speech sound errors. I am Lissa Power-deFur. I teach at Longwood University and teach the graduate class in Advanced Studies in Articulation and Phonology and I'm delighted to have this opportunity to collaborate with Marie Ireland at the Virginia Department of Education. There will be three modules, each approximately 30 minutes long. In the middle of the modules, I will ask you to stop the module and do some of the activities on your own and then continue them. It will take you a little bit longer than 30 minutes to complete the module even though the recording time is about 30 minutes.

Before we get started however, I do want to thank my two amazing graduate assistants who have been so helpful with this project, Kayla Stover and Hailey Voorhees. Let's get started.

Our learning objectives for the three modules are to refresh your knowledge about phonetic principles and the influence on phonetic production. I found that many speech-language pathologists have lost their “edge” in phonetic transcription. In the beginning, I will be assisting you in recalling that information. Our second module is going to look at phonological processes and how they influence phoneme production, especially the process of assimilation. Thirdly, we are going to look at assessment approaches and look at those that help us plan our intervention.

Some disclosures here, I am receiving an honorarium from the Virginia Department of Education grant given to Longwood to create this online training, as are the two graduate assistants. I'll be discussing a variety of websites and programs and I have no financial interest in any of those.

I'm going to start out by reviewing some common myths folks have about speech sound disorders but before I start, let's talk about speech sound disorders. You probably think of this as just our artic, these are our artic kids aren't they? Well the field moved from articulation as the terminology in the early days of our field and then we began to understand we had phonological processes we needed to consider. So, speech sound disorder is becoming the preferred term because it captures both articulation or phonetic disorders and phonological process disorders.

The first myth is “there is no need to use IPA.” With IPA, you have a great deal of power in analyzing your student’s production. Second, “phonological processes are just areas of substitution and omission.” For folks trained in the traditional articulation approach, we think about substitution, omission, and distortion. However we've come to understand that there are rule systems children have which are very different from substitution patterns that we thought of in the phonetic context.

Third -- “standardized assessments provide all the necessary information to begin therapy.” We are increasingly being required to use standardized assessments in eligibility in schools and sometimes that's our fallback. There's a lot more we want to do to investigate the student’s speech sound disorder. Similarly, there are some speech language-pathologists who don't use standardized assessments at all. Rather they tend to use their own probes, their own conversations with the child. We're going to talk about why that might not be as complete as needed to plan your intervention. Lastly, in our third module we will touch on the fact that the old Van Riper approach, which many of us have relied on for years, may not be the best approach.

All right, we're going to start out with “demythtifying” these, beginning with the myth about the IPA. So, “there is no need to use IPA or phonetics” and “heavens, we don't need to use diacritics.” For many of us, that’s something that was in the very distant past in our graduate education and we’ve forgotten a little bit of that so we're going to review some of those today. The IPA is an international phonetic alphabet. It reflects the phonemes of all countries, as we are increasingly seeing young people that have the influence of an L1 from another language. IPA can assist us in translating that. For example, recently at Longwood’s clinic, we had a young woman working with us from one of the former Soviet Republics and we pulled up the Russian phonology and refreshed our memory on the IPA symbols from that country. That really assisted us in analyzing her current speech sound errors. IPA assists us in identifying manner, place, and voicing and we really need to be facile with this to be able to analyze our students’ productions in real time.

As I said, diacritics carry some key information. The transcription in IPA is really the code of our profession. It's the code of how we as speech -language pathologists code speech. Don't let it slip away from you. I had an unfortunate conversation with a speech language pathologist who was referring to the “h” sound in the word “ship.” Clearly, that person had let phonetics slip away, losing the fact that it is not /s/ and /h/ together. It is actually the different phoneme of /c/. Here at Longwood, we encourage our students to write their reports using both IPA and then a translation that's understood by non-speech-language pathologists. That helps our public, our consumers, and our colleagues understand that we do have a code that is unique to us that we use in analyzing speech.

You might need a refresher. So, if you take a look here at this web link, it will take you to the International Phonetic Alphabet website and as you go through this website, you can see the chart with sounds. As we get to that particular chart, you'll see it begins with a vowel quadrilateral. It goes on and presents large numbers of consonants. You'll see a lot of symbols on there you perhaps didn't review when you were in grad school. Remember this is the *International* Phonetic Alphabet. Our colleagues in linguistics perhaps know these better than we do, but this assists us while we are looking at the phonemes of other languages.

Since everything is computerized nowadays, you probably want to make sure that you have IPA on your computer. You can download PEPPER Font, which is the font, which has all the IPA symbols we use in Standard American English from this particular website. Here at Longwood, we have it loaded on all of the computers we have in our clinic so it's very easy to produce. In addition, if you're going to be printing this particular PowerPoint you will need to have PEPPER font loaded onto the computer because if not it will change the symbols to something else.

This is your first activity. Make sure you've downloaded the activity handout to go along with this. I want you to go through this and refresh your memories. This is where you're going to be coding manner, place, and voicing. Just as a refresher, if you look down the first column you will see that these are the various manner categories - stop, fricative, affricate, nasal, liquid, and glide.

Quick comment about stops, we often use the words “stop” and “plosive” interchangeably. I want to mention a slight difference between the two. A stop is when we stop the airstream. That’s, for example the /t/ in the word hat; we just stopped the airstream and produce that with our tongue up at the alveolar ridge. A plosive would be more like the /t/ in the word tall. We have stopped the airstream and then we release it to move into the vowel. If we release it when it's in the final position in hat, we end up with /hqt1/ and we added /1/ or schwa, which is not necessarily something we want to have. So that's why you see that differentiation sometimes between the words stop and plosive.

Remember also that an affricate is a combination of a stop and a fricative. When we're saying /./, for example, that is stopping the airstream with a/t/followed by the frication of the /c/and putting that together.

Then across the top, we have the varying place categories. What I'd like you to do is also underline the voiced phonemes. As you recall we have voiced and voiceless cognates. Stop the recording here and we'll come back and go over the answers

Here are the answers. I'm sure you did a wonderful job on it! As we go through that the top row I think probably, all got these stops. I think those we know well. Don't forget that glottal stop. The fricatives, as you know, have four pairs of cognates, voiceless and voiced, and then we have the glottal fricative. We have two affricates in Standard American English but some are beginning to sneak in. You can have an affricate if you are stopping the airstream and continue with frication. In the word “tsunami,” that /ts/ in it is really an affricate that we are borrowing from another language.

I know you're familiar with those three nasals. Remember the difference between

the /n/ and /a/. When we say “ring,” we don't have the /n/ followed by a /g/. Due to assimilation, we create a new phoneme. The nasal /n/is pulled back for that placement of the /g/.

There are two liquids and two glides. Remember our glides are very much like vowels that are put together pretty quickly. There's some similarities between our glides and our diphthongs

This is another site that I think you may want to download. There is an app you can purchase for a small amount of money so you can have it on your iPad or your iPhone to share in therapy. It comes to us from the University of Iowa. It’s a great site where it goes over the consonants by manner, place, and voice. Here, I've opened up the manner page. You see the varying manner categories. I've selected fricative and you can see it sorts them by the cognates, the voiced, and the voiceless. On this particular slide, I’ve I selected the /s/. It tells us that it is a voiceless fricative; it's a lingua-alveolar. If I were to click on play here, it would move the velum and it would move the mandible. You see the vocal folds vibrating and you'd see the particular portions of the tongue that are moving.

Remember the tongue is not a single muscle, it’s multiple muscles and so it actually works in three different sections. You get the tongue tip, you've got the dorsum, and then you've got the back of it. Sometimes those plastic tongues we use in therapy to help children figure out where to put their tongue doesn't really help us because it only moves as a single unit. It only moves to one location. You'll see also that this web site gives you a step-by-step description. I find this really helpful for graduate students refreshing their memory and for some of the older clients because they really like use of technology. They think it's kind of fun to see what their articulators are doing and then it is particularly helpful in showing the actions of the tongue and the velum.

I've got another little bit of practice for you. If you're going to be really good at figuring out what kids are doing in the middle of therapy you need to be figuring out what manner, place, and voicing are they doing and which one of those was changed. So let's take this first one we've got. The phoneme /m/ and we're only going to change manner. That means we're going to keep voicing the same, we're going to keep place the same. So that means we will be changing the manner from a nasal. What else is available there? Well let's change it to a bilabial stop. We have the /b/. Stop the recording, fill out the rest of these rows, and when you've completed it, turn on the recording again.

I'm sure you did well on this. For the phoneme/z/, we have an alveolar. We have a fricative that's voiced. So we were keeping voicing, we were keeping placement. We only changed the manner to nasal. So that gave us the /n/. For the phoneme /g/, we have a velar, that is a stop, and that is voiced. So we only change manner from stop to something else. That gives us the /a/nasal. For the phoneme /s/, we have a fricative that is an alveolar and it's voiceless. All we're doing now is making the placement change to linguadental. That gives us the voiceless “th,” /'/. The /a/ to /g/ is just the flip of the two rows above. Let's do the last one, the voiced th, /;/. This time we're only changing place or keeping a fricative. We’re keeping voicing but moving it back to palatal and that gives us /x/phoneme.

Let's move on to talk a little bit about vowels. We can talk about vowels in a variety of ways. We can talk about them in terms of high and low tongue placement or front and back tongue placement. The /i/ for example is a high, front vowel because we have a high, front tongue placement. The /e/ is a low, back tongue placement. We also have lip rounding. Lip rounding obviously as present for the /u/ and it is not rounded for the /i/ where you've got spread. Centralization is when we tend to move all of our vowels to the middle of the mouth; that's our neutralization. The /4/, - that “carrot” that we often talk about that is an upside down v. If it is destressed, we often end up with the schwa. Then we have tense and relaxed vowels. Tense /i/is one of our most tense, /u/ is a very tense vowel. Then the relaxed are those that are centralized like the schwa again.

Moving over to complexity, we have creating diphthongs and reducing diphthongs. Diphthongization (creating diphthongs) is taking a monophthong and turning it into a diphthong. So cat (/kqt/ would become /kq1t/. You often see this in very southern speech or in people who are not co-articulating. They're saying every phoneme individually.

Diphthong reduction would be something like taking oil (/9]l/) to /4L/). Certainly, that is a dialect here in the US; but, if it were not dialectical, you would want to address the fact that both components of the diphthong are not being included.

How do we use this information about vowels? Let's take a look at the vowel quadrilateral. You probably remember this from a phonetics book. I borrowed it from Shriberg and Kent's *Clinical Phonetics* book. It goes over the front and back placement of the tongue, where you have the greatest constriction of the airway or where you have the greatest reduction of the airway (the vocal tract), and then whether the placement is high to low. I recommend that you print this and use this as you are selecting the vowels to go with the consonant you're working on, because you want to facilitate production by choosing a vowel that is in the same place as a consonant you're working on and then move progressively to those that are in a different place.

There are some other ways that phoneticians describe phonemes. So let's talk about a couple of these terms to refresh your memories. Obstruents - we are obstructing the airway. This is a phoneme produced with a complete or narrow constriction of the vocal tract. We have stops, fricatives, and affricates. To refresh your memory from speech science, we have resonant phonemes where we have vocal fold vibration and the vocal tract resonates. Those are our vowels, liquids, glides, and nasals. Obstruents are different. We aren’t producing this resonance. We are producing the sound by creating noise. We are having a sudden stop and release of the airstream, with a stop. We have a constriction of the airstream for fricative, and then we have a combination for affricates.

Stridents are the phonemes that are produced with the greater noise intensity. You probably remember hearing that word a lot and just think about these as the ones that have the noise that have the greatest intensity, /s,z,c,x,., j/.Sibilants are the most intense and the high frequency noise, the /s/ and the /c/. That is certainly the reason why we use the /c/ to tell people to shush down.

Sonorants – this term gets back to that resonance, that we have an open vocal tract that is resonating. Remember when you made a wine glass resonate by making it vibrate by running your finger along the top. That is kind of what's happening with our open vocal track. We are resonating that cavity. As I said, those are the vowels, nasals, liquids, and semi vowels.

Coronal talks about the position of the tongue. This is when you have the blade of the tongue raised from the neutral position and so these are examples when the tongue is above that neutral position, the /t,d,n,l,'/. The blade of the tongue is the area just behind the tip.

Anterior is when we're thinking about our area of obstruction as in front of the palate – the alveolar region. Basically, it's in front of where we say /c/. So when we think about the concept of fronting it's not moving everything up a little bit forward in the mouth. We tend to use the term when the tongue moves beyond that mid placement for the /c/.

High is another way of talking about coronal. You'll see coronal and high often used synonymously. You can see in this case, we're talking about the whole body of the tongue and coronal we're talking about the blade. We are moving it above the neutral position. Examples are the vowels /i, u, k, g/. We often don't think about that with / u, k, g/ do we? When you look at the tongue in the front, the tongue is down and that's where we need to remember that the back of the tongue is raised.

Low is the opposite. The body of the tongue is below the neutral position. /q, u/ are good examples there. Rounded -- this is when we have that narrowing of the lip with /u, o, w, 6).

Ok a little bit more practice. What I'd like you to do is to stop the recording, look, and see what this group of phonemes has in common.

How'd you do? If we look at the first row we see /c,x,y,r/. These are all palatal. Moving on to the next, we have /t, s,., k/. They are all voiceless and they are all obstruents. We have stops and affricates in there. /.,j,c,z/ are all stridents. Our next one, I'm sure you jumped on those right away, those are your stops, and then the last ones are sonorants. Those are ones where we have that resonance within the vocal tract.

Let's talk about some implications of this information. What are the implications of a child who favors obstruents? Think about that for a moment. You have a child who likes to stop or constrict the air stream. So what does the child not doing? The child is not enabling resonance within the vocal tract and so we need to teach that child a different way of producing phonemes. We need to introduce the glides the semivowels and the nasals where you are using more resonance (like a vowel) and that effort to try to constrict or stop the airstream.

What if a child favors a high tongue position? For some reason, this child isn't dropping the body or the tip of the tongue low in the mouth. Certainly, I want to do a very careful oral mechanism with his child but we probably would want to do some work helping the child recognize that we move our tongue around to different places in the mouth. Similarly a low tongue position, we have a child who doesn't recognize the need to move the tongue upward. Again, I would do a very careful oral mechanism examination with this child.

There are lots of diacritics and we're going to talk about a few of them that I think you'll find it really helpful as you are transcribing the speech of children with speech sound disorders. Stress, nasal, lip, tongue, sound source, stop release, timing, and juncture. Stress symbols -- there are a variety of ways to mark stress symbols. You can use the method that you often see in dictionaries with a heavy slash and the light slash. I think that here in our field that one of the best approaches is to use numerals that you place above your IPA symbol with primary stress be number one, secondary as number two, and tertiary as number three.

Take a moment and practice coding these words. You can do it without transcribing if you wish. That's what you'll see in the answer slide. You can just do it on this sheet and then think about which syllables include a schwa.

What are the answers? Elephant, mission, evidence. Notice there is a pattern there that typically in Standard American English we have the stress on the first syllable. If we have a three-syllable word, the second syllable usually has the least stress. When you're moving to that tertiary stress that's when you tend to change the vowel to a schwa. We have something different going on here in “department.” Why do you think the rule is different here? That's because we've added an affix in “de.” Whenever we are adding a prefix or suffix that changes the stress patterns. That becomes important to us as speech- language pathologists. We want to make sure our young people are not following this rule we've seen previously with the first syllable carrying the stress and saying department. Obviously, attention would be drawn to that young person. That would not be what we want. Which ones include the schwa? Here are the answers in terms of which ones have reverted in terms of stress to the schwa.

Nasal symbols, -- when we do a nasal diacritic we place that over the phonetic symbol. There is logic to that because the nose is above the lip. That might help you remember that particular placement. Nasalized are heard most commonly on vowels. So if you have a nasalized vowel, it's going to be that [nasalization of a vowel] “how are you.” It's a little squiggly line that you place right over the vowel. That's a little squiggle that I just tried to draw there. [Note – see the speaker’s curser movement on the PowerPoint slide.]

Nasal emission is when we have air coming out of the nose. This shows up on a consonant that requires some sort of pressurized airflow. Those are our obstruents. Our obstruents require us to manage the airflow. We have to build it up and stop it to make stops and affricates. We have to control it for fricatives. If you do not have sufficient velopharyngeal competence if you don't have a good, tight seal between the velum and the pharyngeal wall, air will escape into the nasal cavity and you're going to hear that nasal emission. The appearance of that is right here. If you look at this you can see you've got that little squiggle, just like you have for nasalization, and you have these two little dots here. Two little dots represent the air coming out of the nose; it's one of the nicest symbols that really gives you a good icon or good visual for what's going on. So, why would we want to code this? If you're working with a child post cleft palate surgery there's going to be a period of time where you're going to be tracking the results of surgery and you may want to do a probe with a typical series of obstruent consonants and code the nasal emission. You should see over time as the child is adjusting to the surgery that there is a reduction. As we know, we do are unable to change nasal emission unless it is a habit. Nasal emission is typically a result of physiological anatomical incompetence and is taken care of by the surgeon on the cleft palate team.

Denasalized -- we hear denasalized on a consonant of the same place. So if you're supposed to be hearing “mom” and it's denasalized, you can hear it a little bit like “bob,” that you've lost a little bit of your nasalization. So, let's move ahead. There we have that “universal not” symbol, where you've got the line going through and telling you that is denasalized. When we want to code that? Well certainly if you've got a child that's got a consistent upper respiratory issue keeping track of denasalization will be good information to share that on, “X number of days we saw this happening”. It may be the information that would be really valuable to share with the family and with the child's medical personnel

Tongue symbols -- tongue symbols are placed below the phoneme. If you think about that the tongue is in the bottom of the mouth that might give you a way to remember that diacritic. So for dentalized, you have the tip of the tongue behind the back of the upper teeth. Say the word “width” and notice what you're doing with your tongue. “Width.” Your /'/ is really not interdental there. Because of the influence of the /d/, you're really not getting your tongue all the way out to say “width.” That really sounds kind of odd when I said it “width.” [Note, the speaker said with alveolar /d/ and interdental /'/.] So for “width,” you really have your tongue right behind your upper teeth.

When we have a child that has a lisping error, we need to differentiate between producing a substitution of the voiced and voiceless “th” (/'/ and /;/ versus a dentalization of the /s/ or the /z/. If we have a complete interdental that would be something like Lissa [Note, the speaker pronounced as /L8'1/ which I said when I was probably about six years old. I completely replaced the /s/ with the voiceless “th” (/'/). As I progressed in speech therapy, which I did have for a couple of years, I moved it to a more dentalized production and then I moved it to a nice clean /s/. So your dentalization symbol can really assist you as you are marking the movement of the tongue further back in the mouth to get to the right placement.

Lateralization is this kind of curve here [Note – see the speaker’s movement of the curser on the PowerPoint slide] and it really does look like the edges of the tongue. If you think about what's going on when a child is lateralizing that they're letting down the sides of the tongue and so the air is coming out the side as opposed to out the middle the way it should be for your /s/. So we need to get a little bit more tongue tightness there. So it's pretty easy to code this for any of your sibilants they are using lateralization on. Just put that little kind of half circle below it.

Derhotisized is the opposite of that symbol; this is a child that's lacking the “r-ness.” It's /h~/instead of /h6/ (“her”) or /h~t/instead of /h6t/ (“hurt”). It can be dialectical. We certainly have that different parts of the country, but how do you transcribe that? It wasn't really an /2/ sound, it wasn't really an /6/ sound, and this diacritic assists you in coding that as the /6/ sound and then putting that kind of half circle below it and that notice that derhotization on that phoneme.

I think I gave you some examples about how those will assist you in analyzing. These diacritics often are very helpful in terms of noting progress. They also help your ear. Instead of just saying it was wrong you're recognizing, “oh we had this one that was five out of ten that were lateralized or we had five out of ten that were Derhotisized”. It assists us in knowing how the child is making progress. There's another picture of that lateralized /s/ or that Derhotisized /r/. [Note. The speaker was referring to the diacritic on the slide.]

Stop release symbols – These reflect how we are releasing those stops. If you look here [Note speaker’s curser movement on the PowerPoint slide] we have a little “h” there next to the /t/ and time instead of saying /te]m/ (“time”) a child is saying /t(e]m/. You get that audible air release afterwards. We also have an unreleased stop in “hat.” Did the child really even say the /t/? It's not really an omission. If you look at the child's mouth, you recognize he's definitely moving the tongue up to the placement for the /t/ but nothing is produced. He isn’t stopping and releasing that airstream at all. So how will this assist you if you're looking at aspiration? Well this is letting you know that you had a child that's got some difficulties with respiratory control for the obstruents and then in terms of the unreleased, you've got an issue with the child not realizing they have to stop the airstream and release it. So, both of these symbols are going to assist you in kind of teaching the manner of a stop plosive.

Timing and juncture symbols. Lengthened -- this is when the duration is longer than expected. Like /s:qm/ or /q:p1l/. How are you going to make note of that without this little symbol? You know you're going to make a note to yourself of “longer,” but it's a pretty easy simple to use you just use that colon symbol right after the phoneme. That is an easy way for you to make note that that child is using lengthening. You want to notice which phonemes it's on. It could be that it's a byproduct of you trying to teach the phoneme as you've been emphasizing certain phonemes. Perhaps that child has identified he needs to say it a little bit longer so it's a good clue to you that you need to shorten the duration. You also will find it with folks who are relying heavily on feedback, either auditory our tactile. They’re waiting to get more feedback. Sometimes it shows up with people who are learning to speak by reading as opposed to listening. That can be your foreign language speakers. It could also be found in persons with significant hearing loss.

What about close juncture? This is a child that might say /te]miaqndj4nktc5s8mb1l/. There was no break between those words at all. So when you transcribe it you just transcribe every phoneme in sequence without that break between words. That lets you recognize that we've got a child is not making appropriate juncture at the end of words.

Then open juncture is where you have gaps between syllables. That might be the child who is saying /te]+mia qnd j4nk+c5 s8m+b1lz/. So, what you would do in this case is you take this plus symbol and you would put it between the syllables. Whereas I should have been saying “timing” (/te]mia/) I should put that plus (+) in between it to note that I added juncture where I shouldn't have. Again, this is helpful as you are recognizing a child is not working very well on coarticulation. This also can show up in folks that are learning English as a second language as they are often learning it by reading as opposed to hearing it.

The second to last activity here - to transcribe these phonemes. What I want you to do is to identify the phoneme and then add the diacritic symbol. So stop the recording here try it out and then turn it back on when you're ready to take a look at the answers.

All right. How'd you do I'm sure you did a great job. So here, we have a high front tense vowel. So here's your /i/, your high front tense vowel and we've nasalized it so we've added that diacritic. We have a voiceless bilabial stop. /p/ is voiceless, its bilabial, it's a stop and we didn't aspirate it. So there you've got that little mark that looks like half of a square. A low back vowel that is more tenses is lengthened and there are /9/ with the lengthen symbol. We have a bilabial voiceless plosive with nasal emission. So there's our bilabial -- it's voiceless, it's a plosive, and there's our nasal emission. We know it's emission because we see those two dots. A voiced lingual alveolar fricative. Lingual alveolar, that's /z, s/, fricative, and it's voiced so we know it's a /z/and we have dentalized it so we have that little half box again. Lateralized voiceless strident, we've got the /s/. It's voiceless, so we're using the /s/ not the /z/, and there's our lateralization symbol. Then we've got a palatal liquid so that's our /r/ and we’ve Derhotisized it. We've got that nice little half circle below it.

Ok. Now I've got another one for you to add diacritic. Take these five and

add the diacritic symbols. Again, if you wouldn't mind stopping the recording write down your answers and then turn the recording back on.

Here we go. We've added nasalization and lengthening in this first one. There's our nasalization and the lengthening with the two dots. We have dentalized the /s/ and lengthened it. We've got nasal emission on that /t/. We've lateralized the /z/ and we’ve denasalized the /n/.

How’d you do? Hope your brain doesn't “hurt!” I hope you enjoyed this refresher of phonetics with some ideas about application for therapy and I appreciate your engagement in Module 1. I'll look forward to seeing you back when we start on module 2. Thanks.