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Cognition in the Age of Corona: Teaching Students How to Learn

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This past spring, the COVID-19 pandemic sparked a rapid exodus from a shared to a virtual teaching and learning space. Just as quickly, products for free and products for sale proliferated—webinars and social media tips, digital platforms and products—all with one target consumer in mind: the teacher.

Whenever teachers are confronted with change, whether by internal motivation (e.g., seeking professional development at a NATS conference) or external crisis (e.g., COVID-19), this emphasis on *pedagogy* (simply defined as the "the tools and practice of teaching") makes sense at first glance. When change is not an option, teachers should fire up their teaching tools!

At the beginning of my own teaching career, I eagerly heeded Richard Miller's exhortation that as teachers, "we owe it to our students to be able to take advantage not only of everything that was known 200 years ago, but also of everything that is known today,"[1] and ramped up my efforts in what I later came to call "the Doctrine of Accumulation."[2] That doctrine was simple: The more a teacher accumulates knowledge about the voice, the better one can sing and teach singing—or so I thought. At that time, it seemed to me that *what* a teacher knows matters most. Indeed, much pedagogy of practically everything

> emphasizes *what* the teacher knows and not *how* best the student may receive that knowledge. [Yet] Cognitive science is concerned with the latter question, and because so much more is now known about the way that humans process information, a shift in emphasis is called for in the pedagogy of just about every discipline imaginable. How much better could teaching and learning go if the focus were switched from the content of the teacher's brain to the landscape of the learner's mind?" [3]

In response to advances in cognitive science, I have proposed that a paradigm shift in voice pedagogy should occur, away from "how well teachers teach, to how well students learn."[4] Similarly, I have proposed that cognitive science take its place as the "third pillar" of voice science, the first two pillars being physiology and acoustics.[5] While the twin pillars of voice physiology and voice acoustics created a firm foundation for the field of science informed voice pedagogy, what was conspicuously absent from the field, until very recently, was both the delivery system and the receptacle for that knowledge: the human mind.

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Now, in the "Age of Corona," other shifts in pedagogy are in order, starting with the overarching one, from face to face to online learning. But this shift was not by choice; it was foisted on us by a spherical, spiky crowned virus. Indeed, the rapidity with which COVID-19 engulfed the world has demanded an equally rapid response from the pedagogy of just about everything, and therefore, the emphasis has been on teachers who were compelled by dire circumstances to radically shift from one mode of instruction to another. In the words of an education technology executive, in the spring of 2020, most teachers were "thrown into the deep end of the pool for digital learning and asked to swim . . . Some will sink, some will crawl to the edge of the pool and climb out and they'll never go back in the pool ever again."[6]

Perhaps. But given the dangers of aerosols (respiratory droplets that can remain suspended in the air) in an enclosed environment, and the specific risks to singers who contract and survive a COVID-19 infection, it is imperative to consider other online modes of instruction.[7] Besides, in the spring of 2020, many of those who teach for an institution had no choice but to switch to online instruction; perhaps those who teach privately felt they had no choice, either, if bills were to be paid. In either case, most of us are living out the rest of this commentator's prediction: "But many will figure out what to do and how to kick and how to stay afloat."[8]

Nevertheless, splashing about in the rapid turnaround from expectation to execution was frustrating for many people. There were multiple contributions to this frustration, among which were:

- unfamiliarity with online tools
- poor Internet bandwidth
- latency issues (also called "lag time") between teacher and student
- poor fidelity of sound
- damping of the higher harmonics that distinguish robust opera and music theater singing
- a genuine sense of sadness over the loss on in-person connection

I experienced all of these frustrations myself, and since most of them had to do with technology, I set about trying to find technological solutions. Fortunately, there were some tweaks that addressed technological problems, and now there are a variety of new products specifically tailored for individual music lessons available for on-boarding in time for fall instruction.

To combat the sense of sadness I felt creeping over me when my student singers' forlorn faces zoomed into view, I spent more time asking them how they were feeling, and much more time listening to their replies, than in the "before time," when such an exchange was a mere preamble to learning.

Yet unease still gnawed at me. Over time, I came to realize that an overarching source of these combined frustrations was the attempt to graft an old teaching method (one on one studio, face to face instruction) onto the new "video conferencing" teaching platform; I was trying to cram a square peg into a round hole. And with equal clarity, I heard the voice of one of my students who once remarked about her inefficient breath use, "Well, let's just not do that." Indeed.

Therefore, the aims of this article are to change the focus in two ways: from technical solutions to cognitive solutions, and from those who have been called upon to *teach* to those who have been called upon to *learn.* We will frame this refocusing effort by recalling one tenet about learning that is irrefutable: Learning is a dynamic dance between two partners, the teacher and the student. If this is so, the dance this spring was, for many teacher-learner teams, like a bad date—stilted and halting. The question before us is, how might this duo proceed with teaching and learning online in the Age of Corona?

As already stated, the emphasis on what teachers should know in this moment (as evidenced by proffered wisdom and saleable digital products) is in full swing. By extension, this emphasis includes and accentuates what teachers should actually do. But these emphases—on teachers' knowing and doing—tend to ignore the other partner in the dance, the student. Even though the benefactor of teachers' knowing and doing are students, these emphases do beg the question: What might the other partner in the dance—the student—do to aid the learning partnership in the Age of Corona?

We will start by examining two central questions: what is learning, and what aids learning? Next, we will consider the kind of learning that comprises the typical voice lesson, as well as the kind of individual practice that should comprise the time span between weekly lessons. Finally, we will examine how to leverage what is known from cognitive science about the connection

between volition and learning so that music students might maximize their own agency and responsibility for learning, and teachers might create the best cognitive conditions for online learning in the Age of Corona.

CAVEATS

Before we begin, a few caveats are in order. The first has to do with teaching venue and context. While the NATS membership represents those who teach in varied contexts, there are several broad dividing lines between private instruction and group instruction. We might also call this the difference between solo voice instruction versus choral instruction. In this article I am referring to those who teach solo voice in a one on one instruction setting.

The other broad dividing line is between those of us who teach within an academic institution versus those who run a private studio and engage with their students as clients rather than students who are earning a grade and course credit. Because I teach within both of these contexts, and also because I find that these contexts are mutually beneficial and reinforcing, in this article I will use the terms "student," "client," and "learner" interchangeably.

The second caveat has to do with the client's profile. Because we are going to be considering attributes such as volition, agency, and responsibility, it is important to establish at the outset that the type of student I am considering is someone who is well on the way to becoming what is known in Self-Determination Theory (STD) as a "fully functioning person" (also known as someone who is or "developing their potential").[9] Self-Determination Theory holds that people can develop their full potential when circumstances allow them to satisfy their basic psychological needs.[10]

> SDT distinguishes three psychological needs that are inherent in human nature: *autonomy,* or the desire to feel volitional rather than controlled and to establish inner coherence; *competence*, or the need to engage optimal challenges and feel effective; and *relatedness,* or the need to feel valued and connected with others. As long as people's basic psychological needs are being met, people's natural tendencies toward growth will emerge, leading to enduring intrinsic engagement, vitality, and wellness.[11]

Sadly, most of us can think of examples of students who, in the Age of Corona, do not inhabit circumstances that allow them to satisfy these three basic psychological needs, therefore they are stalled in their quest to become a "fully functioning person."

Stories from the educational front are already filled with tales of students for whom the place they call "home" is, at best, a noisy environment where learning online is extremely challenging. At worst, home is so toxic that students have resorted to their basements, their cars, or their buildings' laundromats to seek refuge from the chaos and a quiet place to have their lessons.

I earnestly hope that someone will be able to invent a protocol for this population to continue their music study in the Age of Corona, and thwart what many in this cohort have decided: that rather than fight for the right practice and make music in their home, they have withdrawn from study. But this article is not about these unfortunate students, nor is it about protocols for them. This winnowing is because this population has special needs that are not simply cognitive ones, therefore their difficulties will require an approach that is outside the scope of this particular paper to explore. Instead, the focus of this article is on those learners who are:

- well on their way to becoming a "fully functioning person"
- have chosen to stay in the voice studio
- have access to a private practice space
- are psychologically free to make a variety of vocal sounds

I am well aware that this learner profile is directly tied to student maturity—and may well describe a college student or other adult client. And thus this caveat highlights some well known tenants from cognitive science regarding how humans learn, namely, the importance of *volition* and *effort* in learning. These parameters are, shall we say, "non-negotiable." Humans literally cannot learn without healthy doses of both wanting and trying. And these truths, in turn, highlight another fact: As most of us mature, we do become not only better at the topic or activity that we are attempting; we become better at learning itself.

WHAT IS LEARNING AND WHAT AIDS IT?

Let us begin by examining two central questions: what is learning, and what aids it? The first question is the vital one of cognitive science. Certainly, learning is a fundamental—some say *the* fundamental—human

enterprise. Our construct of human learning traditionally rests on two pillars: knowledge that is gained by exercising the human attribute of reason, or *rationalism,* and knowledge gained through sensory experience, known as *empiricism.* This dichotomy is reflected in all of the standard learning theories, despite the many terms used to describe them. Two of the most common terms are *declarative* and *procedural,* the simplest definitions of which are:

- Declarative Learning: a process that results in a permanent change in behavior as a result of *experience*.
- Procedural Learning: a process that results in a permanent change in behavior as a result of *practice*.

As can be seen, the definitions are practically equal, except for the parameters that sustain them, which are "experience" and "practice," respectively. While it is outside the scope of this article to completely explore a topic as rich and complex as human learning, let us at least note a few features about each type.[12]

Declarative learning (also called "know-that") is information that one can speak about, or "declare." The construction "know-that" refers to knowledge of facts, as in "I know that the frequency of the second harmonic is twice that of the fundamental."

This kind of knowledge is not innate; it has to be "declared" to the learner, and is best elucidated by an expert teacher as a guide. Declarative learning typically takes place over a time period of days, weeks, or months.

As we all have learned as students, studying facts to the extent that they can be successfully recalled for an exam requires motivation and diligence. Thus another key attribute of declarative learning that distinguishes it from procedural learning is *volition*—learners themselves must want to learn, captured in the folk wisdom, "you can lead a horse to water, but you cannot make it drink."

Procedural learning (also called "know-how") refers to learning physical skills (procedures) by doing, and is inclusive of both those innate movements with which we are born knowing how to do, like crawling, to advanced skills, like learning to play a musical instrument. It is crucial to note here, that "higher order" or complex procedural learning (learning to play the piano, for example) must partake of both declarative and procedural learning. The field of study dedicated to research in complex procedural learning is called *motor learning,* wherein "motor" refers both to motion and to the *motor neurons* (brain cells) that create movement. Complex procedural learning requires dedicated practice over time to master, and thus like declarative learning, requires volition.

An attribute related to volition that both procedural and declarative learning require is *effort;* we have to want to learn, and we have to apply ourselves with some determination in order to progress. The majority of the time spent in that determined effort is in *practice.*

STUDENT PRACTICE TIME

It must be acknowledged that there is very limited data on how much student musicians actually practice.[13] One source suggests that there is an "unwritten norm for the amount of individual practice [that] seems to average around 20–25 hours per week," while acknowledging that there are "pronounced variations" on this average, "primarily depending on the nature of the instrument."[14]

My observation from over thirty years of teaching experience at the college level is that this number is typically lower for singers. Therefore I made a calculation for college level singers enrolled as collegiate vocal performance majors, based on my studio expectation of two hours practice per day, over six days a week.[15] This comes to twelve hours of individual practice per week. Please refer to the chart "Total Individual Practice Time per Week" (Figure 1), and note that the figures were based on the standard convention of a one hour lesson once per week, and the individual practice formula referenced above (this practice did not include any ensemble rehearsal of any kind). The point of this graphic is to compare the percentage of time that students spend in a lesson versus the percentage of time they spend practicing on their own; note that the contrast between individual practice time (92%) is in stark contrast with the 8% figure that represents time spent in a lesson receiving *augmented feedback,* the scientific word for teachers' directives.

Now let us contrast this calculation with another cohort of students who regularly practice. College level athletes practice, on average, thirty to forty hours per week. This is three times more than collegiate vocal athletes. What is perhaps more interesting—and more germane to the topic of this article—is that the vast

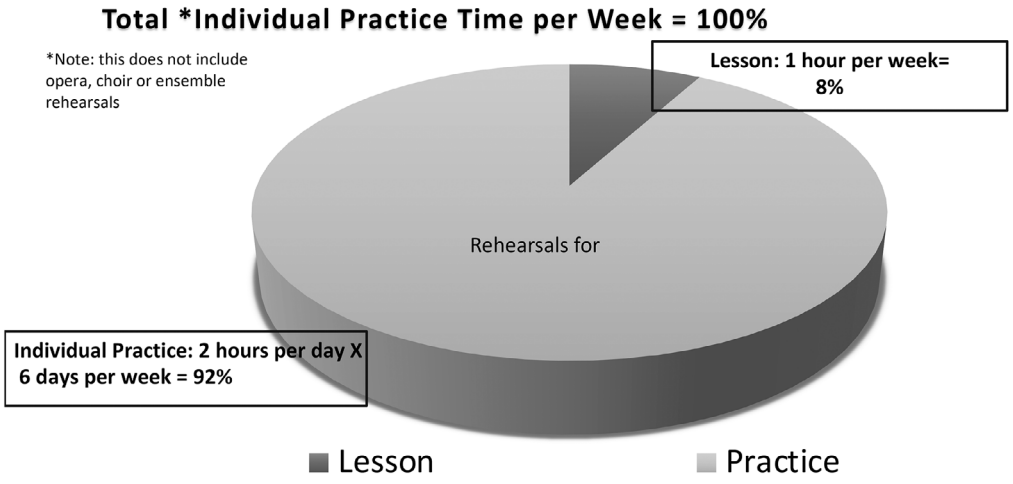

Figure 1.

majority of college level athletes' practice is with *coaching* (augmented feedback).[16]

Most of us understand that the amount of time that music students spend in instruction with teachers, versus the time spent in individual practice, is unbalanced; but when I have shown this graphic in various public forums, it always elicits a little gasp from the audience, revealing the power of a chart to make an abstract notion concrete.

These two elements—the percentage of time that students spend in a lesson versus the percentage of time they spend in individual practice—and the fact that individual practice receives practically zero augmented feedback—raises many questions; chief among them is this essential one: how are learners spending that 92% individual practice time?

It probably would be an understatement to say that many voice students do not always practice as much as they could, or as effectively as they should if they want to improve. Indeed, the difference between a novice and a professional often comes down to quality of practice. As already noted, we get better at a lot of things as we age, including learning itself, albeit not without some painful bumps along the way. This trajectory is clearly expressed by opera star Rod Gilfry.

> In reviewing the times in my career that performance anxiety has compromised my performances—even to the point of crashing and burning onstage—I finally concluded that every failure was caused, in one way or another, by lack of preparation, in a perfect storm of procrastination and perfectionism. When these two personality traits conspired, they kept me from even starting some projects, with the rationalization, "I want to prepare perfectly, but I don't have enough time today, so I will start when I have more time." With gathering success, I also believed more and more that I could rely on my "talent" instead of hard work. These experiences showed me that thorough preparation is my best protection against performance anxiety.[17]

But more important than time spent in practice is the *quality* and the *effectiveness* with which practice is pursued. This has been beautifully expressed by K. Anders Ericsson as "Deliberate Practice," defined as ""an effortful activity designed to optimize improvement."[18]

So if the percentage of time that students spend in individual practice far exceeds the time spent with a teacher, and deliberate practice has been shown to be the most effective type of practice, committed teachers may wonder, how might we nourish this 92% chunk of time? And now, in the Age of Corona, when opportunities to be together in real time are curtailed, this question becomes more acute, and therefore it demands a new answer. As a comparison, here is what I wrote in the "before time" (before the COVID-19 pandemic):

> This gulf between athletes' versus musicians' teacher-mediated practice is striking. Given the impressive gains seen when augmented feedback is provided often

> (especially in the early stages of motor learning), perhaps it is time to reconsider this paradigm. Singers need look no further back in time than the great tenor Luciano Pavarotti, whose legendary vocal technique was grounded in daily voice lessons with his first teacher, Arrigo Pola, with whom he worked for 90 minutes a day, seven days a week, over a span of two years (Tommasini, 1995). This intense schedule is probably not feasible for most singers, but availing oneself of *other, varied forms of augmented feedback* can be very beneficial. For example, augmented feedback [in the form of] *analysis of recordings accessed days or weeks after performance* (called "delayed feedback" in the motor learning literature) *can be very valuable*." [emphasis added]

Now, in the Age of Corona, I submit that this specific tool is not merely "beneficial" but "essential." Before considering this technique specifically, it is necessary to consider the two elements vital to learning, *volition* and *effort.*

LIKE A HORSE TO WATER

The old adage, "you can lead a horse to water but you cannot make it drink," illustrates that *volition* is foundational to learning. Volition, simply defined as "the power of using one's will" (synonyms include *determination, firmness of purpose,* and *resolve),* is not just a benefit to learning. Volition is the secret sauce in what is called the *pre-attentional phase* of learning, also known as *arousal.*[19] No person can force another to desire anything; teachers cannot make students want to learn. This simple truth has never wavered in its authenticity; yet when juxtaposed with how this article began—with an observation that most pedagogy emphasizes teachers' tools—many revelations come to the fore, including this stark contrast:

- Positive: the intersection between the teachers' desire to teach—if high—and the students' volition to learn—if high—can result in an explosion of learning and growth.
- Negative: the negotiation between the teachers' desire to teach—if high—and the students' volition to learn—if low—can result in an impasse.

If this is so (and it is; just conjure trying to teach math to a balky elementary school kid or formant tuning theory to a class of bored undergraduates), then both the urgency of volition and the fact that it is solely within the province of the learner becomes bracingly clear. What, then, are teachers to do? The "before time" answer was: Sharpen teachers' pedagogic tools! But the answer in the Age of Corona is: Consider the cognition of the student.

THE IMPORTANCE OF EFFORT

There can be no learning without volition, attention, and effort; learners have to want to pay attention and they have to try—sometimes strenuously—to do so. Let us pause here to stress that in cognitive science terms, *learning* and *performance* are two different entities.

> *Learning* is the process by which one acquires skill or knowledge. Remember: learning is dynamic, unstable, and messy. *Performance* refers to the manner or quality with which someone functions. Performance is like the freeze-frame button on a video projector—it captures where the learner stands at that point in time along the learning continuum. Because of this frozen quality, most of us want our performances to be as polished as we can manage—the opposite of unstable and messy. In other words, the goals of learning and performance are—and should be—different. When they are conflated, both may suffer.[20]

So the higher the volition on the part of students, the more likely they are to learn, yet teachers cannot force-feed volition, nor coax volition from reluctant learners by tempting them with rewards. Praise, money, candy, and other goodies have shown poor results in the adherence of long term learning.[21]

COGNITIVE SOLUTIONS FOR TEACHERS

These suppositions demonstrate that pursuance of sharpening teachers' pedagogic saws can take the project of learning only so far. The other partner in the dance must not merely step forward and, as the saying goes, "meet the teacher halfway." This platitude could work when the teacher and learner are in the same room (whether virtually or in reality). But during that 92% individual practice time, there is no teacher present. Students must, in effect, self-teach, completely dependent upon their own feedback, of which there is a confusing tangle of not one or two, but four competing feedback systems.[22] And since the "alternative facts" of these competing feedback systems cause cognitive problems, some cognitive information may offer solutions. The following are some steps that teachers can take, followed by steps that their clients should take.

1. Teach Declarative Learning: Frankly educate learners, at the beginning of the relationship (or refresh before each learning term) about how learning works, stressing the necessity of volition and effort in the cycle of learning; remember: true learning cannot happen without a healthy dose of both.
2. Establish Goals: Work with the student to create goals as tools that will nourish their own volition and help them embrace effort.
3. Journaling: Establish journaling as a credible cognitive exercise that clarifies goals and strengthens cognitive structures outside of actual practice time.

Let us look at exactly how to accomplish these solutions, in order.

Educate Learners about Learning

People often ask if I "tell" my students about cognitive research. The simple answer is, yes. I do this in a variety of ways, but I recommend that the level of the learner, and the circumstances of one's relationship with that learner, are key starting points. For example, I have several short paragraphs in my studio syllabus about "How Learning Works," and an adaptation of these in my handout for private clients. Students enrolled in higher level pedagogy classes read books and articles on cognition. Similarly, I often share articles on cognitive topics with my private clients. Some of the most important topics for singing teachers are:

- The Difference between Learning and Performance
- Neurogenesis and Neural Plasticity
- The Ten-Year/10,000 Hours Practice Rule
- "Deliberate" Practice (Ericsson)
- "Mindsets": "Growth" mindsets versus "Fixed" Mindsets (Dweck)
- "Desirable Difficulties" (Bjork)
- Talent versus Training
- The Upside of The Bad Lesson
- Singers' "Alternative Facts" and Cognitive Dissonance
- Mirror Neurons and The No-Practice Practice Routine

Goal Setting

Goal setting has been shown in the short run to stimulate motivation, and in the long run, to actually increase achievement. Goal setting works in part by concretizing vague notions of achievement. It also promotes focus, cultivates self-regulation by aiding impulse control, and helps calibrate efficient use of time and financial resources. These various benefits accrue to promote positive feelings—which in turn, feeds more motivation. Four of the most important parameters to consider if using this technique are *specificity, format, difficulty,* and *process.* In order for goalsetting to be effective:

- Goals must be very specific rather than general.
- Goals must be written down.
- Goals must be challenging, not easy (this factor echoes both Ericsson's definition of *deliberate practice* and the notion of *effort).*
- Goals must answer the question how. One study reported that students who were required to answer this last question by listing exactly how they intended to achieve their goals were more likely to succeed.

Teachers can make a required assignment out of goal setting, and strongly encourage them as a useful contract between themselves and their private clientele.

Journaling and Mirror Neurons

Journaling is a cognitive exercise that can help learners clarify both long term and short term goals. Because goals must be written down to stand a chance of being realized, journaling is not only the connective tissue between the ideation of goals and their actualization, but operates as a roadmap of the learner's progression. These attributes alone strongly recommend journaling for learning. But some exciting new research in neuroscience uncovered the possibility that humans have a mirror neuron system (MNS), described as brain cells that "fire during both the execution and the observation of a specific action."[23] Because observation does not just connote sight, but includes sound, it is highly likely that singers who listen to a recording of their own singing are activating their own mirror neurons.[24] I have dubbed this the "no-practice-practice routine" and believe in its efficacy by its proof over years of teaching that have included the journal requirement.[25] (For the actual assignment, please see the Appendix, Lynn Helding's Three-Part Voice Journal Assignment.)

COGNITIVE SOLUTIONS FOR LEARNERS: SWITCH THE DISH

The most important change that can be made to the standard voice lesson in the Age of Corona is what might

be called a change to the "main dish," for if a voice lesson is like a dinner party, there are many ways to host one. In a traditional voice lesson, the teacher is often both the host and *chef du jour*, responsible for welcoming her client into a warm and inviting atmosphere and providing a tasty repast of various tastes and dimensions. If the dinner party is a potluck, our teacher/host/chef may ask his guest to provide the side dishes, but is still expected to provide the venue and above all, the main dish. Regardless, in a standard voice lesson, the main dish is usually "the song" (or aria), that has been preceded by some prosecco (conversation) and appetizers (vocal warmups), attended by some awesome side dishes (piano accompaniment), and may or may not include dessert (praise).

But a lesson in the Age of Corona is an entirely different party. For venue, it takes place in a shared virtual space for which both parties are responsible; no lesson can be had without a reliable Internet connection by both partners. And the main dish that once amply filled the hour can feel strangely anemic in a Zoom room; at least, that was often my experience in the early days of teaching in the Age of Corona.

That is when I first realized I was attempting to graft an old teaching method onto a new teaching platform; I was trying to cram a square peg into a round hole. Or in the words of an education professor at the University of Illinois at Urbana-Champaign, many teachers are making the mistake of "using Zoom to reproduce everything that's wrong with traditional passive, teacher-centered modes of teaching."[26] So I began to think about how to change the dinner party. Potluck from now on, for sure.

The next component I considered was the main dish. I started by first considering the obvious: what are some tools that are available using video conferencing platforms like Zoom that either were not available during "before time," or that I just did not use on a regular basis? The answer, of course, was recording. Specifically, I set about switching the dish from an in-person rendition of the song or aria to a recorded version, taken and uploaded by my student to a shared site. This allowed my student and me to both look and listen to their recording (the main dish) together in real time. The pause button immediately became a compulsory accompaniment, as necessary as cranberry sauce with Thanksgiving turkey. Dinner party saved!

In cognitive terms, the pause button allowed the most effective type of feedback (according to motor learning research), which is *delayed terminal feedback*.[27] In human terms, switching the dish and using the pause button allowed my students to observe themselves in newly objective ways. This feature has always been available, of course. Yet the new twist is the addition of the teacher in the virtual room. Athletic coaches long have taken advantage of the replay button to coach their teams, and I daresay that there are more than a few enlightened voice teachers that have been doing the same. Perhaps I was just slow to this party, but that must be why this technique seemed to be a solution hiding in plain sight.

I have since attempted to codify my new dinner party, by keeping the main dish the same but switching out the appetizers, side dishes, and so on. For example, I now make a practice of pausing to offer feedback and then following up with what I have dubbed "mini-shots" (short bursts of technical or interpretive advice on a specific issue revealed in the video), and I linger longer over the ending of the dinner party—the long goodbye in the foyer—by giving a more detailed and extensive recipe for how my client should spend his 92% practice time until the next dinner party. All of this will be captured in the compulsory weekly journal assignment, which is submitted the day of the client's lesson—which I used to read on my morning train commute to the studio, and now read minutes before they zoom into view. Either way, my brain is nicely primed with the memory of the previous lesson and the student's account of the ninety-two percent practice time.

COGNITIVE TRANSFORMATION IN THE AGE OF CORONA

As this article has attempted to demonstrate, teaching in the Age of Corona requires that both teachers and learners turn away from the limitations of digital platforms and instead embrace the tools it can offer. While this most certainly entails teachers searching for new teaching tools, it also entails looking for solutions within the components we already have—some of which may have been there all along. Included among those components are our clients' volition, agency, and effort.

Now, it must be acknowledged that many music students are questioning their immediate futures, and

whether pursuing private study in the time of corona is a worthy investment. It is a poignant question, but it is one that, truly, only the learner can answer. Teachers in the time of corona can proffer their expertise, but only students can commandeer their own volition to feed their own agency, which is not just their right to make their own decisions, but indeed, it is their responsibility if they are to be a true partner in the dance. It has already been conceded that the ability to embrace this responsibility is toggled to the maturity of the learner (this partially explains the adult wish to make learning fun for children). Perhaps struggling with this decision, and owning it, is itself a "desirable difficulty."

Who knows if we will ever (as Mother in the Broadway musical *Ragtime* sings) "go back to before"? Even if we do, it is sure to be transformed by our collective experiences living, teaching, and learning in the Age of Corona. The extent of that transformation will surely be tethered not only to the length of time we must tarry here, but also by the depth and severity of our experiences. Heaven help us all with a virus whose "ferocity" has been described by a medical expert as "breathtaking and humbling."[28]

But I do hope that at least one transformation in how we teach and learn will be positive and that it will stick. Just as the paradigm shift in pedagogy that I proposed in response to the cognitive revolution has begun to take root (a move away from what teachers know, to how students learn), I am hopeful that a shift in focus away from what teachers do, to how students can leverage their own cognitive tools of volition, effort and agency will adhere. If that focus holds fast, human learning stands to take a great leap forward.

NOTES

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9. See Carl R. Rogers, *On Becoming a Person: A Therapist's View of Psychotherapy* (London: Constable, 1967).
10. Richard M. Ryan and Edward L. Deci, "Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being," *American Psychologist* 55, no. 1 (2000): 68.
11. Sander L. Koole, Caroline Schlinkert, Tobias Maldei, and Nicola Baumann, "Becoming who you are: An integrative review of self-determination theory and personality systems interactions theory," *Journal of Personality* 87, no. 1 (February 2019): 15–36.
12. For more complete information on both types of learning, see Helding, *The Musician's Mind,* chapters 3 and 4.
13. See Harald Jørgensen, "Time for practising? Higher level music students' use of time for instrumental practicing," in H. Jørgensen and A. C. Lehmann eds., *Does Practice Make Perfect? Current Theory and Research on Instrumental Music Practice* (Oslo: Norwegian Academy of Music, 1997), 123–139.
14. Harold Jørgensen, "Strategies for Individual Practice," in Aaron Williamon, ed., *Musical Excellence: Strategies and Techniques to Enhance Performance* (Oxford, UK: Oxford University Press), 90.
15. This is my A) "Basic" studio requirement for vocal performance majors, a figure I arrived at by B) also considering how much the singers are phonating in choral, opera, or music theater rehearsals, as well as individual coachings and

time in rehearsals with collaborative pianists, for a total of three hours' vocal "dose" per day (with one day off per week). If there are zero to few hours spent in Group B activities, then I expect my students to be working up to 2 hours individual practice per day. Conversely, if the number of hours spent in Group B activities exceeds more than 2 hours per day, they should adjust individual practice accordingly. It is also important to note that, as in any fitness regimen, this is the number I wish my students to work up to, and then maintain.

16. Tom Paskus and Lydia Bell, "Results from the 2015 GOALS (growth, opportunities, aspirations and learning): Study Of The Student-Athlete Experience" (presentation at the NCAA Convention, January 2016). Slides available at www.ncaa.org/research.
17. Helding, *The Musician's Mind,* 248.
18. K. Anders Ericsson, Ralf Th. Krampe, and Clemens Tesch-Römer, "The Role of Deliberate Practice in the Acquisition of Expert Performance," *Psychological Review* 100, no. 3 (1993): 363–406.
19. Helding, *The Musician's Mind,* 84.
20. Lynn Helding, "Brain," in Scott McCoy, ed., *Your Voice: An Inside View*, 3rd edition (Gahanna, OH: Inside View Press 2019), 293.
21. See Alfie Kohn, *Punished by Rewards: The Trouble with Gold Stars, Incentive Plans, A's, Praise, and Other Bribes* (Boston: Houghton Mifflin, 1993); Alfie Kohn, "Rewards Are Still Bad News (25 Years Later)"; www.alfiekohn.org/article/rewards-25-years-later/.
22. Lynn Helding, Cognitive Dissonance: Facts versus Alternative Facts," *Journal of Singing* 74, no. 1 (September/October 2017): 83–87.
23. Christian Keysers and Valeria Gazzola. "Social neuroscience: mirror neurons recorded in humans." *Current Biology* 20, no. 8 (April 2010): R353-R354; Roy Mukamel, Arne D. Ekstrom, Jonas Kaplan, Marco Iacoboni, and Itzhak Fried, "Single-Neuron Responses in Humans during Execution and Observation of Actions," *Current Biology* 20, no. 8 (April 2010): 750–756.
24. Christian Keysers. "Mirror neurons," *Current Biology* 19, no. 21 (2009): R971-R973.
25. Lynn Helding, "The Mind's Mirrors," *Journal of Singing* 66, no. 5 (May/June 2010): 585–589.
26. Marcus.
27. See Lynn Maxfield, "Improve Your Students' Learning by Improving Your Feedback," *Journal of Singing* 69, no. 4 (March/April 2013): 471–478.
28. Cardiologist Harlan Krumholz of Yale University and Yale-New Haven Hospital, as quoted in M. Wadman, J. Couzin-Frankel, J. Kaiser, and C. Matacic, "How does coronavirus kill: Clinicians trace a ferocious rampage through the body, from brain to toes," *Science Magazine* (April 2020): 1502–1503.

APPENDIX

Lynn Helding's Three-Part Voice Journal Assignment

Note: This *Voice Journal Assignment* is a weekly three-part "Written Assignment," given to students at all levels who are enrolled in private lessons as voice majors for grade and credit. This assignment is due to the teacher by 9 am on the day of the student's lesson. This three-part assignment is comprised of three components:

I. Lesson Summary

- **Goal & Content:** The *Lesson Summary* should be an accurate record of what was attempted and learned in the *previous* lesson (i.e. last week's lesson). Document exactly what happened in the lesson. You will need to listen to your lesson recording in order to do this. The lesson should serve as a template for how to practice the rest of the week.
- **Length:** There is no prescribed length for the *Lesson Summary*; about 3–5 sentences will usually suffice; more is ok but not necessarily better. This is not busy work; there is strong evidence that "journaling" boosts retention in motor learning via the *mirror neuron system.*

II. Weekly *Practice Reflection*

- **Goal:** "Reflect back" upon the practice week you had, and write a **very short* summary (*app. 5 sentences, total.)
- **Due date:** email your ***Voice Journal*** by 9 am the day of your lesson.
- **Content**
  - — **Number** of practice sessions this week?
  - — **Place** you practiced?
  - — Average **Length** of practice?
  - — **An overview** of your practice week in 2- 3 sentences: Here are some Prompts; be sure to answer the questions "how?" and "why"?
    - * *Overall, how was your practice week?*
    - * *What repertoire did you practice?*
    - * *What technical aspects did you practice?*

* *What was challenging this week? What was easy this week? How/Why? Explain.*
* *Add any important issues/questions/observations for discussion at lesson, if they are relevant to your voice study.*

III. Lesson Plan

- **Ethos**: "As active learners, it is *your* job to tell me what *we* are doing today, not the other way around."
- Prompt: What is ***your*** plan for ***our*** lesson?
- Components:
  — What of your assigned repertoire would you like to sing today?
  — What technical aspects would you like to address today, and *why*? Explain.
  — Are there any other topics would you like to address today? i.e. language/diction, interpretation/expression, appropriate style?

Lynn Helding is Professor of Practice in Vocal Arts and Opera and Coordinator of Vocology/Voice Pedagogy at the University of Southern California. A prolific writer on the nexus of cognitive science and music, she is the author of *The Mindful Musician: Teaching, Learning and Performance in the Age of Brain Science* (Rowman and Littlefield 2020), the chapter "Brain" in Scott McCoy's *Your Voice: An Inside View*, and the founder of the "Mindful Voice" column in the *Journal of Singing.* Helding sang leading roles with Harrisburg Opera, Nashville Opera, Tennessee Opera Theatre, and Ohio Light Opera, and solo recitals throughout the US, Italy, France, England, Germany, Spain, Australia, and Iceland. Honors include the 2005 Van Lawrence Voice Fellowship and election as the first Chief Operating Officer of the Pan-American Vocology Association (PAVA).