Current Attitudes Toward Voice Studio Teaching Technology: A Bicoastal Survey of Classical Singing Pedagogues

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Summary. In recent years, the availability of studio teaching technology tools for the classical singing studio has developed exponentially. Nevertheless, the integration of voice analysis technology and other computer-based technology into a traditional classical singing studio can be a daunting task for many teachers, despite fine instructional texts such as those of Garryth Nair (1999) and Scott McCoy (2004). For this reason, The Texas Tech Voice Alliance developed and assessed a bicoastal online survey of classical singing pedagogues in the United States about their perceptions of, and attitudes toward, the use of studio teaching technology. The purpose of this study was to investigate the current use of technology and to assess the readiness of these teachers to explore further its possible benefits. Subjects were asked to rank relevant factors associated with voice studio teaching technology in the classical singing studio and respond to questions using calibrated judgment scales. Discussion focuses on descriptive survey results and analyses, including agreement and disagreement between classical singing pedagogues regarding real or perceived uses and future benefits of voice studio teaching technology in their studio programs. Results of this survey provide data on which to base future studies. Building on the record of existing software and related literature, and through ongoing research, this team ultimately intends to expand the survey group and use the results to guide us in further development of user-friendly computer-based technology.


INTRODUCTION

The challenge

In virtually every human endeavor of the 21st century, computer technology plays an integral part. The automobile, the power plant, the traffic light, the home sprinkler system, the library catalog, and our most immediate source of information (the Internet), all thrive on the power of computer technology. We can thank Captain Kirk and the visionaries of science fiction for the dream of data organization and access beyond the abilities of a single human brain; and we can thank companies such as Dell, Apple, IBM, and Microsoft for their hardware and software developments toward the realization of that dream. Nevertheless, there is still a prevalence of discomfort for many of us over 40 to trust a machine with information and analysis that traditionally intends to expand the survey group and use the results to guide us in further development of user-friendly computer-based technology.

Since the writings of Jerome of Moravia, Corri, Hiller, Mancini, Lamperti, Garcia, Vennard, Appleman, and others, singing knowledge has been passed down in a genetic code of sorts from teacher to student—and teacher to student—for centuries. Many pedagogues and performers proudly relate the genealogy of their training, as far back as five or six generations of voice tradition. This is as it should be, as our culture derives from people singing and people listening, and other people assessing what is “good” and what is considered to be “not good.” Even with the advent of computer technology available for assistance in the study of singing, the ultimate job of evaluation still belongs to the human ear and sensibilities. As Robert Thayer Sataloff puts it in his third edition of Professional Voice: The Science and Art of Clinical Care, “Such technology is no substitute for traditional, excellent voice training. Rather, it provides an extra set of tools for the voice teacher to help identify specific problem areas and to assure steady progress.”

It is generally agreed that as teachers of singing, we have a responsibility to relate to the learning styles of our students. Many of them begin and end each day with computer interface and feel most comfortable using computer-based technology in their learning and research efforts. As Carl Swanson points out in his recent article, “It is a fact that most students nowadays are not only computer literate, but also computer dependent.” How is it, then, that singing teachers of our time can adequately take advantage of the most trusted technology for our students under the age of 30? Oren Brown answers this question beautifully for us in saying: “... every student is different. To get the results I want, I often have to find new ways of instructing.”
 Argument for investigation
In recent years, the availability of studio teaching technology tools for the classical singing studio has developed exponentially. Since the advent of the Kay Computerized Speech Lab, immediate and real-time analysis programs such as Voce Vista, Kay Multispeech PC Lab, PRAAT, Cool Edit Pro, and many others have made the personal computer a viable teaching device in the 21st century voice studio. Interestingly, however, many singing teachers may not view computer-based technology as just another addition to the technology they already use.

According to The American Heritage Dictionary of the English Language, “technology” is defined as: “the body of knowledge and tools available to a society that is of use in fashioning implements, practicing manual arts and skills, and extracting or collecting materials.”

Therefore, when singing teachers use any information other than their own innate knowledge, they are, in fact, using technology in their teaching. This includes:

- any knowledge and/or exercises that their teachers passed on to them,
- the piano, keyboard, or other instrument that may supply pitches for their teaching,
- mirrors used by the student to check visual aspects indicated by the teacher,
- audio or video recorders used by the student to monitor lessons,
- posters, charts, and models used by the teacher to illustrate concepts while teaching, and
- any textbooks, journal articles, and other printed materials used by the teacher for discussing the aspects of singing.

There is no mention of computer-based technology in this list. Yet, by virtue of the definition of technology we have cited and the evolution of its use in the singing studio, it would seem logical to regard assistive technology based on computers as simply “one more set of tools” available for the classical voice teacher.

The dream and reality of one such tool was reported by Carl Seashore in 1916. He writes of an invention developed by him while teaching deaf children at the Iowa School for the Deaf. The instrument and train him to speak with pleasing inflection of the voice by practising [sic] with the aid of the eye.5(p593)

In the statements above, we may recognize the vision toward “real-time” analyses, remote conferencing, and the ultimate possibility of Internet 2.

Certainly, in the 21st century, we have realized the reality of these dreams; yet many of us still are reluctant to embrace these tools and their as-yet-undiscovered ultimate benefits. Despite fine instructional texts such as those of Garyth Nair6 and Scott McCoy,7 the integration of computer-based technology into the traditional classical singing studio can be a daunting task for many teachers. Many of us have just become versed in the possibilities, and necessity, of e-mail correspondence. Consequently, with this line of inquiry, our research team has embarked upon the path of discovering why this is—and how we can help. The purpose of this pilot study, therefore, is to pursue a preliminary investigation of the current use of studio technology by a specified group of classical singing pedagogues, and to begin to assess the readiness of these teachers to explore further its possible benefits for the voice student.

METHODS
Participants
The Texas Tech Voice Alliance: A Multidisciplinary Research Initiative functions with a revolving membership of interdiscipli

5(p593)
Eastern Pennsylvania, and California were compiled to yield an initial pool of 555 subjects.

Survey design
The final survey design was a result of patterning other published surveys and acquired recommendations from professionals with survey experience. Ultimately, the online survey was primarily based on that published by Chris Watts et al., in a 2003 article in *Journal of Voice*. In designing the instrument, we also tried to be mindful of the limited time an active singing teacher generally has to spend online. Therefore, we limited the survey to one page of demographic information, and two pages of actual survey questions. By using the *Dragon Web Surveys* 6.5 template for our online design, we were also able to offer “point and click” survey completion options for many of the questions and short answer text boxes for others, as shown in Figure 1.

The entire instrument was divided into three main sections that would require approximately 4 minutes of the participants’ time for completion:

1. Demographic Information (14 items),
2. Attitudes Toward Current-Use Technology (36 items), and
3. Attitudes Toward Future-Use Technology (8 items).

Our research team anticipated the *Demographic Information* page to reveal information such as age, education, and teaching environments. Nevertheless, the attributes of the *Dragon Web* 6.5 program ensured that the identities of individuals within the subject pool remained anonymous. E-mail addresses were not paired with or recorded with responses submitted to the database.

The first set of actual survey questions (*Attitudes Toward Current Use*) asked participants to rate various pieces of hardware and software that they currently use in the categories of

- Pitch-matching software,
- Voice recognition software,
- Vocal methods and technique software,
- Sound recording software,
- Music teaching software,
- Visual aids,
- Kinesthetic aids, and
- Auditory aids.

The level of usefulness for each item was rated on a calibrated 6-point scale, with the instructions contained in Figure 2.

The second section of survey questions (*Attitudes Toward Future Use*) asked participants to rate their likelihood of using the various types of technology in the future, by following the instructions shown in Figure 3.

Upon completion of each page of the survey, participants were instructed to submit their answers by clicking the SEND button, as seen in Figure 4.

After completing the last page of the survey, participants interested in reviewing the compiled data of our study could also enter their e-mail addresses for inclusion in a separate data bank, unrelated to the submissions. Complete contents of the survey before online conversion can be viewed in Appendix A.

![FIGURE 1. Dragon Web Survey 6.5 online survey design.](image-url)
Content validity and reliability

Before sending invitations to our subject pool, it was necessary to test both the content validity and the reliability of our instrument. For the purpose of assessing content validity, we questioned 10 university-appointed voice teachers from two generations. The first group consisted of five master teachers over the age of 49 and the second group consisted of five teaching fellows under the age of 33. The 10 experts were then asked to review the survey and answer the following questions:

1. In your opinion, is every item in this survey related to the topic and overall goal of the survey?
2. In your opinion, is every aspect related to our survey covered in the survey questions?

All 10 experts responded in the affirmative for both queries, indicating that the instrument content could be deemed “valid” for our purposes.

To determine the reliability of our survey, we used test/retest measures. A pair of identical surveys labeled “#1” and “#1r” was mailed to 60 NATS members randomly chosen from the midcontinental region of the United States. Test/retest of the reliability group was not possible to conduct online, as our survey was not designed to record any identifying information with submissions. Therefore, each reliability subject contacted was invited to:

1. complete the initial survey (#1) and return it immediately in the prepaid envelope and
2. complete an identical retest survey (#1r) 1 week later and return it in its own prepaid envelope.

Of the 60 NATS members contacted for the reliability study, 52 returned the survey in the first round; and 23 of those returned the retest survey 1 week later. Correlation coefficients of these 23 participants’ two responses to each of the 33 questions were almost perfect. In the case of some software that was not used by any of the participants, correlation coefficients could not be calculated. Nevertheless, in all other responses, the obtained correlation coefficients ranged from 0.94 to 1.00, with an average coefficient of 0.99—indicating to us that the test/retest group of participants’ perceptions of usefulness for technology in studio voice teaching was reliable.

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FIGURE 2. Rating scale for Current-Use Technologies.

FIGURE 3. Rating scale for Future-Use Technologies.
We found that software classified into the same category serves similar functions for a voice studio; it was unlikely that an instructor would use more than one software program within the same category. Therefore, internal reliability of participants’ responses of software use within the categories was not examined because no response consistency was expected.

Having received our validity and reliability measures, we then proceeded to issue e-mail invitations to the 555 members of our bicoastal subject pool—as reproduced in Figure 5.

Of the 555 e-mail invitations sent, 91 failed delivery, and 14 were delayed in service, then fire-walled out of the subjects’ systems. Ultimately, 450 of the original e-mails were successfully delivered. The data collection from the preliminary administration of our bicoastal online survey was accomplished with tools provided by Dragon Web Surveys 6.5 over a period of 20 days. Our short sampling period was based on the general e-mail experience of our research team, such that it was agreed that the majority of items remaining in an “in-box” for over 2 weeks would most often be forgotten.

RESULTS

Demographic data
Of the 450 e-mail invitations delivered, a total of 52 were returned reflective of a correspondence rate of 11.556%. Of the 52 respondents, all (100%) indicated that they were teachers of singing. Their ages ranged from 26 to 78 years, with a mean of 51.94 (SD = 10.47) years. Among them were 19 males and 33 females. Thirty-seven of them were formally educated as singing teachers, and 15 did not have formal training that qualified them to teach singing. Forty-two had earned a degree in vocal music, and 10 did not possess a music degree. The most common degrees earned by the participants were Masters degrees (n = 27 or 51.9%), Bachelors degrees (n = 7 or 13.5%), and Doctoral degrees (n = 7 or 13.5%). Within the group of 52 respondents, 35 (67.3%) possessed multiple degrees in higher education. Their teaching experiences varied from 3 to 49 years, with an average of 22.56 years of experience in teaching singing. Thirty-nine of them described teaching singing as their primary profession, estimating spending an average of 18.96 (SD = 10.21) hours per week teaching singing. Twenty-four participants taught in a university setting, five in secondary schools, and three in elementary schools. However, 42 (80.8%) of them sustained a private studio solely or in addition to other environments. Most of the participants had not received training in music technology, and 35 of them (67.3%) had not taken any courses in music technology. Among those who had some training, more than half had only one course.

Statistical analyses
Descriptive analyses, percentages, and frequency counts were calculated for the survey items. Investigation and observation of response trends and data patterns were tracked through graphical analyses. Informal interpretation was used for question items #1, #26, and #36, by virtue of their narrative nature within the survey instrument.
Technology ratings and rankings

The most revealing presentation of the data gathered in the *Attitudes Toward Current Use* section of the survey proved to be a ranking of experience (or lack thereof) with the various types of technology cited. Table 1 contains information compiled from “no experience” responses reported by the participants.

Due to the small sample size, if more than 80% of the participants reported “no experience” with a specific type of technology, the group’s perception on the usefulness of that technology was not meaningful. Therefore, the group’s perception of the usefulness of specific types of technology was only calculated for those items that more than 50% of participants reported using in their teaching—basically, the 14 types of technology shaded in Table 1.

Table 2 summarizes the perception of usefulness of the 14 most useful types of technology. It is apparent from this organization of the results that traditional technology—such as mirrors, physical modeling, tape/digital recorders, and pianos—seem to be the favorite tools of choice in the singing studio. This interpretation is borne out as the mean perceptions of each type of technology cited here were above 5 in the 6-point scale of usefulness (5 = always useful, 4 = often useful, 3 = sometimes useful, 2 = rarely useful, 1 = never useful, 0 = no experience).

The final part of the survey (*Attitudes Toward Future Use*) asked participants how likely they would be to use new technology in the areas of pitch matching, voice analysis, vocal methods and techniques, sound editing, music teaching, auditory aids, visual aids, and kinesthetic aids. Participants’ perceptions of future use of these types of technology are summarized in Table 3. It is worth noting that with the 6-point scale used for this section of the survey, the midpoint of 3.5 indicates “no opinion” on whether the technology would be likely used in future studio instruction by the subject, that is, 5 = most likely, 4 = more likely, 3 = no opinion, 2 = less likely, 1 = least likely, and 0 = not likely.

Generally, the results of the *Attitudes Toward Current Use* section of the survey seem to indicate that the voice teachers who responded depended on three traditional types of technology: pianos, tape/digital recorders, and mirrors (all with mean ratings above 5.43). Additionally, it seems that they were not inclined to use most new technology in their teaching practice. However, they did seem to show a positive attitude for future use toward three types of technology: sound recording software, visual aids, and kinesthetic aids (all with mean ratings above 4.54) in the *Attitudes Toward Future Use* section of the survey.

**DISCUSSION**

The results of this pilot study were both expected and surprising to us. Traditional technology of the voice teaching studio has been proven over generations of trial and error; and perhaps that is what will be necessary for new trends in computer-generated technology to be fully embraced by vocal pedagogues. Nevertheless, it is interesting that the computer monitor did rate as number 12 within the 14 most-used types of technology in the *Attitudes Toward Current Use* section of the survey. Perhaps this is because e-mail communication has become such an important part of the way we relate to each other.

Our challenge remains in identifying applications of new teaching technology that make sense for the way we teach, and the way our students learn. As Professor Nair writes in his *Voice Tradition and Technology*:

> Pure research does not need to have application as a goal.... At the same time, voice professionals – sensing no immediate practical application of research results – do not see the need to spend time and effort learning enough to understand the available scientific knowledge.⁶

The time factor involved in learning new technology seems to be the most daunting among busy singing teachers, for that is time spent away from the student in a pursuit that may or may not prove useful.

Carl Swanson’s recent article touts digital keyboards with miraculous software built in:
Some of the upscale models now come with full-color LCD digital displays built in or near the piano’s music stand. The device will actually transcribe the music as it is played. It can also show your musical score on the LCD screen and keep track of where you are in the score, thus eliminating those pesky page turns.  

Katherine Eberle of the University of Iowa and Brian Shepard of the University of Oklahoma describe the miracle of Internet 2’s potential for long-distance voice teaching:  

...use of Internet 2 is proving to be an excellent innovation with the appropriate purchase of equipment because it offers real-time, full-motion, bi-directional broadcast quality video on television monitors with stereo audio.  

Yet, Scott McCoy puts it all in perspective in his exploration of the benefits of Voice Analysis Software in the teaching studio:  

A computer can help its user understand what is happening in a voice; it cannot, however, tell if the sound is beautiful or musical…. Just as no one has ever learned to sing solely by listening to recordings of his voice, no one will learn to sing solely by looking at a computer monitor. 

Our task, then, as 21st century singing teachers is to find what is best in every instance, for each student—to match individual
learning styles with the tools available to us. Clearly, this pilot study of current attitudes toward voice studio teaching technology is a scrape on the surface of information that should be gathered and analyzed toward the goal of understanding ways to make new technology more user-friendly and accessible. It may take an intermediary group such as interested singing teachers to interpret the benefits and the most efficient application of this new knowledge. Ultimately, however, we must use the means that will directly serve our student populations and their potential contributions to our broad cultural palette. As Dr. Sataloff states in his recommendation of Professor Nair’s work:

He explains how techniques such as computer-assisted, real-time analysis can provide feedback to the teacher and student that expedites and enhances the training process in a natural way, serving as an important, additional tool in the armamentarium of a modern voice teacher.10

CONCLUSION
Encouraged by the findings of this brief pilot study, our research team intends to launch a nation-wide online survey campaign during the coming year. This will, of course, entail a much broader sampling period. In the later stages of the study, we look forward to further results of the demographic information that may be compared to the current attitudes of singing teachers. In this way, we may begin to determine trends in age categories, education levels, and teaching environments.

In addition, by regionalizing our subject groups within the national count, we also hope to discover the geographical locations of populations most in touch with developing technology and, eventually, to contact them regarding their methods of assimilation. It may be that, through this line of inquiry, we might discover the elements and attributes of easily digestible technological tools currently in use. Consequently, we hope to share that knowledge with developers of new technology, making exploration of these new tools an exciting prospect for the singing teacher—rather than a shuddering glimpse of “the final frontier.” Therefore, with all due respect to the captain and crew of The Enterprise, we remind you to “live long and prosper!” The joy is in the journey.

Acknowledgments
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REFERENCES
APPENDIX A

Survey items

Current Attitudes Toward Voice Studio Teaching Technology –
demographic information

1. Are you a singing teacher?    Yes   No

2. What is your age? ________

3. Are you Male or Female? ________

4. Were you formally educated as a singing teacher?    Yes   No

5. Do you have a degree in vocal music?    Yes   No

6. If you answered “yes” to question 3, what are the degrees you have earned?
   (Check all that apply)
   _____ BM
   _____ BA
   _____ BFA
   _____ MFA
   _____ MM
   _____ DA
   _____ DM
   _____ DMA
   _____ PhD
   Other: ________________

7. How many years have you been a singing teacher? _______________

8. Is teaching singing your primary profession?    Yes   No

9. How many hours per week do you teach singing? ________ hours.

10. Have you had any courses in music technology?    Yes   No
    If so, how many courses have you taken? __________

11. Where do you teach?
    (Check all that apply)
    _____ University
    _____ Secondary School
    _____ Elementary School
    _____ Private Studio

12. What age group do you teach?
    (Check all that apply)
    _____ 14 – 18
    _____ 18 – 25
    _____ 25 +
Current Attitudes Toward Voice Studio Teaching Technology – page 1

1. What place do you think technology has in the Classical-Voice Teaching Studio?
   Technology is defined as the body of knowledge and tools available to a society that is of use in fashioning implements, practicing manual arts and skills, and extracting or collecting materials.

In questions 2 through 9, please rate the following hardware and software on its usefulness in the Classical-Voice Studio based on your experience.
5 = always useful, 4 = often useful, 3 = sometimes useful, 2 = rarely useful, 1 = never useful
0 = no experience

2. In your experience, do you find the following Pitch Matching Software useful?
   a) Sing & See
      0 1 2 3 4 5
   b) Singing Coach by Carry-A-Tune Technologies
      0 1 2 3 4 5
   c) Singing Tutor by ViMas Technologies
      0 1 2 3 4 5
   d) Sabine Metrotune MT9000
      0 1 2 3 4 5
   e) PhonTuner by Phonature Software
      0 1 2 3 4 5

3. In your experience, do you find the following Voice Analysis Software useful?
   a) Voce Vista
      0 1 2 3 4 5
   b) Kay Multi-Speech PC Lab
      0 1 2 3 4 5
   c) PRAAT
      0 1 2 3 4 5
   d) Wave Surfer
      0 1 2 3 4 5
   e) WinSing AD
      0 1 2 3 4 5
4. In your experience, do you find the following Vocal Methods and Techniques Software useful?
   a) *Singing is Easy! Basic Foundation Series*  
      0 1 2 3 4 5
   b) *Singing Coach* by Carry-A-Tune Technologies  
      0 1 2 3 4 5
   c) *Vocal Imitation 1.0*  
      0 1 2 3 4 5

5. In your experience, do you find the following Sound Editing Software useful?
   a) *Cool Edit Pro*  
      0 1 2 3 4 5
   b) *Audacity Sound Editor*  
      0 1 2 3 4 5

6. In your experience, do you find the following Music Teaching Software useful?
   a) *Smart Music*  
      0 1 2 3 4 5
   b) *Music MasterWorks* by Aspire Software  
      0 1 2 3 4 5
   c) *Speech Analyzer* by SIC Acoustic Software  
      0 1 2 3 4 5

7. In your experience, do you find the following Visual Aids useful?
   a) Mirrors  
      0 1 2 3 4 5
   b) Posters  
      0 1 2 3 4 5
   c) Blackboard/Whiteboard  
      0 1 2 3 4 5
   d) Computer Monitor  
      0 1 2 3 4 5
   e) Anatomical Models  
      0 1 2 3 4 5
   f) Texts  
      0 1 2 3 4 5

   If found useful, please specify which texts: ____________________________
8. In your experience, do you find the following Kinesthetic Aids useful?
   a) Elastic Belting
      0 1 2 3 4 5
   b) Rubber Bands
      0 1 2 3 4 5
   c) Physical Modeling
      0 1 2 3 4 5
   d) Anatomical Models
      0 1 2 3 4 5

9. In your experience, do you find the following Auditory Aids useful?
   a) Tape/Digital Recorders
      0 1 2 3 4 5
   b) Microphone
      0 1 2 3 4 5
   c) Digital Piano/Synthesizer
      0 1 2 3 4 5
   d) Piano
      0 1 2 3 4 5
   e) Other instruments
      0 1 2 3 4 5

If found useful, please specify which instruments: _________________________
In questions 10 and 11, please rate the following technologies on the likelihood of you using them in the future.

5 = most likely, 4 = more likely, 3 = no opinion, 2 = less likely, 1 = least likely
0 = not likely

<table>
<thead>
<tr>
<th>Technology Type</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitch Matching Software</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Voice Recognition Software</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Vocal Methods and Technique Software</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Sound Recording Software</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Music Teaching Software</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Visual Aids</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Kinesthetic Aids</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Auditory Aids</td>
<td>0 1 2 3 4 5</td>
</tr>
</tbody>
</table>

10. Would you be more or less likely to use new technology involving the following types of software?

a) Pitch Matching Software
   0 1 2 3 4 5
b) Voice Recognition Software
   0 1 2 3 4 5
c) Vocal Methods and Technique Software
   0 1 2 3 4 5
d) Sound Recording Software
   0 1 2 3 4 5
e) Music Teaching Software
   0 1 2 3 4 5

11. Would you be more or less likely to use new technology involving the following types of hardware?

a) Visual Aids
   0 1 2 3 4 5
b) Kinesthetic Aids
   0 1 2 3 4 5
c) Auditory Aids
   0 1 2 3 4 5