

A Necessary Evil: An Overview of the Pitch Correction Course Offered at Northern Vermont University-Lyndon

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Abstract

An overview of the pitch correction course currently offered at Northern Vermont University-Lyndon, which was designed to teach students the foundational skills of pitch correction software while developing critical musical listening skills and encouraging in-depth discussions surrounding the ethics and philosophy of pitch correction.

The presentation at the 2020 MEIEA Summit included the inspiration to create a pitch correction course, introduction to common pitch correction practices, and an overview of the course's topics, assignments, and materials, which build the necessary skills to professionally pitch correct a voice performance with respect and reverence.

Keywords: pitch correction, pitch correction software, audio engineering, audio production, Melodyne, Auto-Tune, Waves Tune, vocal performance, vocal recording

Introduction

The late GRAMMY® nominated recording engineer Tal Herzberg once said, "If you learn how to tune a vocal, you will never stop working." Transparent pitch correction has been utilized by recording artists and performed by audio professionals for decades. While this skill is necessary for professional success, many audio instructors shun the practice or relegate the topic to a single lecture or demonstration. This is a disservice to the audio student. By training a student to use pitch correction software, we change the way a student listens to a performance. They learn to listen critically and hear pitch more accurately. The combination of critical listening and pitch correction editing skills give the students a competitive edge in a difficult job market.

Course Overview

Most music listeners are aware of the "Auto-Tune" effect used on much of T-Pain's musical catalog or Cher's 1998 release, *Believe*. However, the general, music-listening public may not know that nearly every note sung by modern popular music singers has been manually pitch-corrected by an audio engineer. The modern music listener has unknowingly become so accustomed to this effect, that un-tuned vocals sound unprofessional. It is vital that modern audio engineers learn effective and subtle use of pitch correction software in order to be a well-rounded audio professional.

As a young audio engineer, I resisted using pitch correction software believing it would make a performance feel disingenuous. Another engineer friend questioned, "What right do I have to modify someone's performance?!" In my case, I have a degree in music; music is my life. I treat a vocal performance with great care. Since this type of technology is now a permanent part of the popular music landscape and a vital resource for artists, producers, and recording engineers, I wondered, how can I teach students to use pitch correction software with care and respect for the original performance?

Within the Audio Production concentration, which is a part of the Music Business and Industry major at Northern Vermont University-Lyndon, I have developed and taught pitch correction software as part of a course called Issues in Audio Production. This course allows the professor to quickly respond to current trends in the audio production and engineering field. I decided to focus the course on vocal pitch correction with Melodyne software. I chose Melodyne because of its popularity in the music industry and the transparent method it uses to make pitch changes. It also has a user-friendly interface. This inspired me to research pedagogical approaches and design a course focusing on the ethics and use of pitch correction software, and specifically as it applies to voice performances.

Over the duration of the semester, the course includes the following topics:

- A brief history of pitch correction software and its use in the popular music from 1997 to 2020
- Discussions on great voice performances and what characteristics make a great performance
- Discussions on the ethics and controversies of pitch correction software
- An introduction to pitch correction software such as Melodyne, Auto-Tune, and Waves Tune
- Critical listening to performances and tuning musical content
- Editing skills applied to editing pitch in the Melodyne software
- Distinct problems to address principles, concepts, or techniques that remain challenging for each student

I teach the Issues in Audio Production course in a hybrid format which consists of weekly, in-person class meetings in a digital audio workstation computer lab as well as online materials such as training videos and discussion forums. Many online materials were generated by Celemony, the creators of the Melodyne software. I feel that this format works well for both conceptual knowledge and physical practice of the material, and the students' work can then be examined by their instructor as well as their peers.

Description of Facilities

The course is primarily taught in Northern Vermont University-Lyndon's Digital Audio Workstation (DAW) Lab, which consists of sixteen student stations that have an iMac computer with a Focusrite Scarlett 2i4 interface, 64 key MIDI keyboard, and additional computer monitor. Each computer has Pro Tools Ultimate, Logic Pro X, and Melodyne Studio installed for student use. Students have 24-hour, seven day a week access to the facility.

Students also have 24-hour, seven day a week access to

a recording studio with a Toft ATB24, Pro Tools HDX, and a collection of studio-standard outboard equipment and microphones.

Course Design

This course was designed to go beyond the technical skills needed to pitch correct a vocal performance. The "why" or "should" an audio engineer use pitch correction software is equally important. The student needs to be aware of the ramifications of obvious pitch correction and the effect on the performer when it is used to modify a performance. At all times, the engineer should try to honor and enhance the performance. So, the course is split into two parts: online discussions on what makes a great vocal performance and demonstrating skills needed to subtly pitch correct a vocal performance with a student reflection.

This course utilizes experiential learning. I connect coursework to current audio industry standards. In doing so, class work and assignment outcomes have direct relevance in the professional workplace. I relate class presentations and coursework to my eighteen years of professional industry experience so that students will understand the importance of the work for their own future success. My utilization of this pedagogy allows for direct student experience by creating challenges and drawing connections to the modern entertainment industry. The principles of experiential education allow my students to become independent thinkers. They develop a strong desire to learn because the information is directly related to their future careers in the music industry.

Many audio programs encourage mimicry to lead their students to success. Mimicry leads to limited knowledge of the subject matter and does not allow the students to become creative problem solvers, which is a mandatory skill in the entertainment industry. Instead of constant demonstration during class time, I create a need for the information by starting class with a challenge and asking the students to solve the problem with me as their guide. This experiential education technique requires the students to engage in class, which helps with concept retention.

Several music and audio prerequisite courses are required before enrolling in the pitch correction course. Students in the course have completed Music Theory I and Ear Training, Digital Recording Techniques, Introduction to Audio Engineering, and Hybrid Mixing Techniques. Music Theory I and Ear Training focuses on a study of diatonic harmony, voice leading, sight singing, and contextual listening. Digital Recording introduces the student to digital audio workstations. Introduction to Audio Engineering and Hybrid Mixing Techniques combine the digital audio workstation with an analog recording studio.

Course Content

As opposed to other audio production courses that cover a wide range of topics, this course focuses on specific skills needed to accurately and ethically pitch correct a vocal. Classes typically include discussions and presentations on what makes a great vocal performance, the history of pitch correction software, the ethics and controversies of pitch correction, introductions to pitch correction software, and editing skills using Melodyne pitch correction software. Students complete assignments intended to provide perspective for class discussions. I designed a series of assignments that prepare a student to tastefully use pitch correction software to support artists and the music they are creating. A sample course schedule is included in the table below:

Sample Course Schedule

Week 1	<i>Rolling Stone: 100 Greatest Singers of All Time</i> <i>Cochrane: Is Pitch Correction Cheating?</i> <i>Daley: Vocal Fixes</i>
Introductions: class schedule and syllabus. Studio tour and rules review. Discussion Post A assigned.	
Week 2	<i>Menasché: Autotuning: Making the Most of Pitch Correction Software</i> <i>Colletti: Plugin Roundup: The Best Tuning Plugins</i>
Qualities of great vocal performance: dynamics. Emotions of dynamics. Class discussion of adjectives and connection to dynamics. Discussion Post A due. Discussion Replies A assigned.	
Week 3	<i>ConcertHotels.com: The Vocal Ranges of The World's Greatest Singers</i>
Qualities of great vocal performance: Timing. Discussion of feelings associated with timing. Discussion Replies A due.	
Week 4	<i>Melodyne: Transferring Audio</i>
Introduction to tuning a bass guitar with Melodyne. Transferring audio into the software. Introduction to the pitch grid, pitch tool, note separator tool, display options as well as scale and chromatic snap. Assignment A assigned.	
Week 5	<i>Melodyne: Playback, Navigation, Zooming</i> <i>Reynolds: Reading 1</i>
Qualities of great vocal performance: Pitch. Accuracy, Vibrato, Sliding between notes. Assignment A due. Discussion Post B assigned.	
Week 6	<i>Melodyne: Pitch Grid and Scales</i>
Introduction to Autotune Artist. Signal Flow of Autotune sessions. Setting Key. Creating Autotune Effect. Retune speed. Tracking. Advanced settings to remove notes. Discussion Post B Due. Discussion Replies B assigned.	
Week 7	<i>Melodyne: Pitch Tool, Note Separation Tools</i>
Review of Melodyne basics: Introduction to Melodyne pitch grid, pitch tool, note separator tool, display options, Scale and chromatic snap. Discussion Replies B due. Assignment B Assigned.	
Week 8	<i>Melodyne: Pitch Modulation and Drift</i>
Introduction to vocal pitch correction. Pitch modulation tool and pitch drift tool introduced. Assignment B due. Discussion Post C assigned.	

Week 9	<i>Reynolds: Reading 2</i>
Review of pitch modulation tool and pitch drift tool. Vocal pitch correction examples. Discussion Post C due. Discussion Replies C assigned.	
Week 10	<i>Melodyne: Display and Other Options</i>
In-class tuning exercise. Each student tunes section of vocal. Discussion Replies C due. Assignment C assigned.	
Week 11	<i>Reynolds: Reading 3</i>
Pitch correcting background vocals. Issues with leakage and pitch correction. Assignment C due. Discussion Post D assigned.	
Week 12	<i>Melodyne: Audio Characteristics and Algorithms</i>
Review of recording and editing vocals using Pro Tools playlists. Introduction to Melodyne Polyphonic (Sustain/Decay) Algorithm. Discussion Post D due. Final Project assigned. Discussion Replies D assigned.	
Week 13	
Review of professionally tuned vocal. Comparison to examples found in class. Discussion Replies D due.	
Week 14	
In-class listen to Final Project. Final Project due.	

The course has four online discussion forums for a deeper exploration into the ethics and mindset regarding pitch correction, and three assignments to improve the student's pitch correction editing skills. The discussions and assignments prepare the student to perform the tasks needed for the final project which consists of the student singing all the voice parts of a popular song and pitch correcting their performance.

A table of all assignments and targeted skill sets is provided below:

Assignment	Targeted skills
Discussion Post A: Ethics of Performance Manipulation	Critical thinking about concept of perfection in musical performances.
Discussion Replies A: Ethics of Performance Manipulation	Critical thinking about concept of perfection in musical performances.
Assignment A: Tune the Bass	Critical listening. Transferring audio, scale identification and selection, basic editing skills in Melodyne.
Discussion Post B: Pitch Correction as an Effect	Critical thinking about the "Auto-Tune" effect.
Discussion Replies B: Pitch Correction as an Effect	Critical thinking about the "Auto-Tune" effect.
Assignment B: Tune the Lead Vocal and Bass	Critical listening. Intermediate editing skills using note separator, pitch modulation, and drift tools in Melodyne.
Discussion Post C: Death of Auto-Tune	Critical thinking and reflection about pitch correcting vocals.
Discussion Replies C: Death of Auto-Tune	Critical thinking and reflection about pitch correcting vocals.

Assignment	Targeted skills
Assignment C: Tune the Bass, Lead and Background Vocal	Critical listening. Intermediate editing skill of matching background vocals to lead vocal.
Discussion Post D: Pushing the Boundaries of Music	Critical thinking about musical innovations.
Discussion Replies D: Pushing the Boundaries of Music	Critical thinking about musical innovations.
Final Project	Critical listening. Advanced vocal editing skills in Pro Tools and Melodyne.

Classes include listening to great vocal performances that have not been tuned and others that have been tuned. Students study the vocal technique of modern singers such as Ariana Grande, as well as great singers of the past such as Freddie Mercury, to determine the qualities of a great vocal performance. The way a singer uses the key elements of vocal production such as dynamics, timing, and pitch determines the quality of the performance. The course breaks down these elements as well as the techniques to delicately pitch-correct a vocal.

The discussion posts are used to open a student dialogue; they allow students to share their opinions on the ethics and controversies surrounding pitch correction. The discussions are forums housed in the Canvas learning management software, used by Northern Vermont University-Lyndon. First, each student writes an initial post of approximately six hundred words. The following week, each student will choose two initial posts written by fellow students and reply with approximately three hundred words each to expand upon the conversation.

Discussion A has the students read several articles about the ethics and uses of pitch correction software. It then asks the following questions: How much editing is too much editing? Does everything need to be perfect in a song? Can you find an example of a great song with flaws? Can you find an example of a song that appears edited and still retains a human feel? The student also provides examples of the songs and provides links for their classmates.

Discussion B, C, and D all reference different portions of *How Auto-Tune Revolutionized the Sound of Popular Music* by Simon Reynolds from [Pitchfork.com](https://pitchfork.com). Discussion B has the student explore the hard-tuning, Auto-Tune effect which removes the natural vibrato of a singer's voice making the voice sound synthesized and robotic. In addition to the removal of vibrato, the software transitions from note to note very quickly making the voice sound unnatural. Auto-Tune is just one of the many software programs that can perform this pitch correction effect. Discussion B explores questions such as: Why does the hard-tuning effect currently connect with a wide audience? Will the hard-tuning effect become dated?

Discussion C has the student reflect on their first voice tuning experience. They are asked questions such as: Is your new experience part of the solution or creating more problems? Did you improve the vocal performance? Did other elements stand out after you pitch corrected the vocal? Some critics of pitch correction have said that pitch correcting vocals, “depersonalizes, eradicating the individuality and character of voices” (Reynolds 2018). The students are asked if they feel this happening as they manipulate the vocal performance.

Discussion D lets the student think more creatively and identify artists who are pushing the boundaries of music. Reynolds compares Young Thug's use of pitch correction to Miles Davis' use of a wah-wah effect on his trumpet in the 1970s (2018). The students are asked to find a musical example from the Reynolds article that they would consider innovative. They are also asked to share the work of an artist that they feel is innovating and changing the sound of popular music.

The course also covers the key elements of operating pitch correction software. These elements are taught in conjunction with the aforementioned material so connections are made between artistic decisions and technical decisions. Students are taught how to determine the key of a song to confirm that the software's detection algorithm has correctly determined the tonal center of the song. The students are also shown how to interpret the software's pitch display. This is important so students can make accurate, subtle, and creative decisions when it comes to tuning a source. We use Melodyne Studio software as a plugin within Pro Tools to reinforce concepts learned in previous courses.

To develop the essential skills needed to accurately pitch correct a vocal, I created four assignments utilizing Melodyne. Assignment A is to tune a bass guitar performance within a multitracked song. Pitch correcting a bass guitar is relatively simple since the bass is usually in tune and playing the root note of the chord. Students gain basic editing skills within Melodyne such as placing the plugin on a track, the order of plugins when using pitch correction software, transferring audio into the software, the pitch grid with scale snap as well as Blobs vs. lines, and the following tools: Magnifying Glass, Pitch Tool, and Separation Tool.

Assignments B and C involve pitch correcting multitracked vocals. Assignment B has the student transparently tune a lead vocal performance which is considerably more challenging than a bass guitar. The students draw from skills learned in Assignment A and learn new skills using Melodyne's Pitch Modulation and Drift tools. Assignment C goes a step further and has students aligning and pitch correcting background vocals to match the lead vocal. While completing these assignments, the student's ear is growing accustomed to the sound of a voice that has been tuned.

The Final Project has the student sing all the vocal parts of a popular song of their choosing and transparently pitch correct the performances. This utilizes skills learned in previous courses such as recording, playlist editing, and mixing in Pro Tools. By having the student perform, they draw connections between the challenges of a vocalist, editing techniques, and pitch correction. When should they re-sing the part? When should they edit? When should they pitch correct?

Intended Learning Outcomes

After completing this version of the Issues in Audio Production course, the student will have an awareness of outstanding vocal performances, an understanding of when pitch correction software should be used, skills using Melodyne software to subtly pitch correct a voice performance, and a grasp of the vocal recording and editing process.

It is unrealistic to think a student would master this process by the end of a single semester. However, students will have developed a better ear for vocal production, recording, and pitch correction after successful completion of the course.

Challenges

This course has run twice: once in the spring of 2018 and also in the spring of 2020. The spring 2020 offering was interrupted with the COVID-19 global pandemic. All of Northern Vermont University's courses went remote as of mid-March. During that semester, I was able to salvage the majority of the coursework other than the Final Project. Celemony and Avid, the makers of Melodyne and Pro Tools respectively, gave a free trial to all the students. Unfortunately, due to the economic make-up of the class, many of the students did not have their own microphones to record themselves singing the final project. Some could have used their computer microphones, but I felt it was an unnecessary challenge during an already extremely challenging time.

I would like to add additional historic content to the beginning of this course. Adding other types of pitch effects in the history portion of the course such as the Doppler effect, varispeed, and micro-pitch shift will place pitch correction in context with other popular audio effects. Adding this additional information would bring more validity to the pitch correction effect and a historical perspective of pitch manipulation.

Additionally, I would like to add a more creative project toward the end of this course to counteract the strictly technical nature of Assignments A through C and the Final Project. Students discuss pushing musical boundaries of music in Discussion D but do not have an opportunity to experiment in the course. I would like to create an assignment to have them think like musical pioneers and push the sound of music in a new direction.

Conclusions

Just like reverberation, equalization, and compression, pitch correction has become an essential part of the production of popular music. The hard-tuning effect may fade in popularity, but subtle, transparent pitch correction is here to stay. As long as these programs continue to support the production team, they will continue to be used.

After teaching this course twice and seeing students engage with the material, I wholeheartedly feel that audio production programs should require pitch correction software as part of their curriculum. These software platforms can be tedious for students to learn, but when paired with listening to musical examples and thought-provoking conversations surrounding the ethics of pitch correction, students prove to be engaged with and captivated by the material.

After successful completion of this course, my students have explored the ethics of and begun developing the technical skills needed to subtly pitch correct a voice performance. They have learned to listen with a discerning ear and appreciate truly outstanding vocal performances. As far as curriculum is concerned, I do not feel like additional pitch correction courses are needed beyond this offering. However, the concepts learned in this course will be used for the remainder of the student's time at the university, which includes a capstone project.

Due to limited study on the teaching of pitch correction software, continued pedagogical research is very much needed on the subject. However, as an audio professional, I have seen that comprehensive knowledge of these software platforms is vital for a successful career as an audio engineer. As universities seek to offer a comprehensive education in audio technology and prepare students for their future careers, the significance of pitch correction software should be considered and this material should be implemented into the curriculum.

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