

Empowering Music Education: Leveraging Digital Audio Technology in the Pursuit of Vocal Mastery – A Case Study of the Modern Popular Singing Course

Jiandong Ban, Ahmad Rithaudin Bin Md Noor

Faculty of Music, Universiti Teknologi MARA ,Shah Alam, Malaysia

Corresponding Author Email: yafeng17@gmail.com

To Link this Article: <http://dx.doi.org/10.6007/IJARPED/v13-i4/23050> DOI:10.6007/IJARPED/v13-i4/23050

Published Online: 30 October 2024

Abstract

This scholarly article delineates the conceptual framework and evolutionary trajectory of contemporary digital audio technology (DAT). It conducts a thorough examination of DAT's application within the realm of music education, focusing on the utilization of digital audio workstations (DAW) and related digital audio tools. The study aims to investigate the efficacy of blending DAT with conventional pedagogical approaches to enhance music instructional methodologies. The research is grounded in a case study conducted at the esteemed Sichuan Conservatory of Music in China, with a specific focus on the institution's popular singing courses. This case study serves to reflect on the intersection of technological advancement and the state of music education. A comprehensive analysis is undertaken to underscore the benefits of DAT in music pedagogy. The study involves a quantitative survey of 60 students enrolled in two distinct teaching environments: one employing DAT and the other adhering to traditional non-DAT methods. The findings suggest that the incorporation of digital audio technology significantly enhances classroom efficiency for educators and boosts student motivation in music education settings.

Keywords: Digital Audio Technology, Music Education, Popular Singing, DAW

Introduction

The researcher have worked as a music production lecturer at a Conservatory China. During this time, I have paid attention to the impact of digital audio technology on the conservatory curriculum. Thanks to the advancement of science and technology and the popularisation of computers, digital technology has already penetrated the field of music education. It provides more possibilities for developing music education and points out a new reform direction. Giddings (2020), stated that in order to maintain students' efficient learning in music classes, use digital technology to allow them to collaborate and practice better and ensure that every student can use music software to experience the fun of learning music perfectly. Effectiveness requires the support of teachers and giving students the correct guidance, experience, and collaboration. So, as music educators, our purpose is to inspire students to become lifelong learners and participants in music. However, do we fully

understand the current teaching technology and have the corresponding skills? This is a thought-provoking question: how to improve teachers' teaching effectiveness with the application of DAT, how to stimulate students' interest in learning music, and how to deal with the many challenges faced by DAT in music education, thereby improving the quality of teaching. In this article, I use the popular singing class of Sichuan Conservatory of Music as a case to analyse and explore, aiming to show the correlation between digital audio technology and music education and the current situation of using digital audio technology in college courses. Raposo et al (2019), contend that becoming a teacher involves prioritizing learning over teaching. The concept of the "self-made man" may lose significance if access to vast amounts of information becomes more convenient, making it simpler to acquire knowledge beyond the confines of traditional education. School should be viewed as a place that fosters learning and drive, which are frequently lacking. Thus, the precise direction of teachers in the classroom is crucial for fostering students' willingness to learn music.

As the theory has confirmed the use of technology-based music instruction such as DAT to support music learning, it is essential to find empirical proves for the real practice (Dorfman, 2022). With this problem in mind, this study is undertaken with the objective of elucidating the function of technology within the domain of music education. Adopting the pedagogical viewpoint of the instructor and situated within the formal setting of the conservatoire, the research endeavors to discern the mechanisms by which technological integration can facilitate a more efficient enhancement of students' professional competencies.

Literature Review

Current Situation and Problems

In China, using digital audio technology in classrooms has become very common. This way of applying digital audio technology to music teaching is mainly formed through teachers' guidance and students' participation. As a role that integrates teaching and technology, teachers are very important in guiding students to learn and use technology correctly. Teachers must display and operate this series of digital audio technologies in the course to let students feel digital. The power and fascination of audio technology. Raposo (2019), pointed out that the application of technology in the classroom requires the correct guidance of teachers to ensure that technology can maximize the teaching service. This will be a restriction on the application of technology if teachers do not have the ability and attitude to control technology. The current problem is that teachers have varying degrees of acceptance of digital audio technology. Many teachers say that applying it to their courses is challenging due to their lack of understanding of digital audio technology. This is also a challenge when realizing the value of technology.

Teaching Design of Digital Audio Technology in Popular Singing Courses

The purpose of popular singing classes is to cultivate students' ability to sing popular songs. It requires the guidance of teachers to complete students' training in timbre control, emotional expression, and stage performance. Teachers must pay special attention to factors such as students' pitch, timbre, and rhythm during singing to achieve targeted guidance in these aspects. If there is no traditional classroom with digital audio technology, teachers can only use their ears to check the performance of students' singing. However, in classrooms where digital audio technology is applied, teachers can use digital audio technology to observe

students' singing more efficiently and easily and give feedback to students quickly and accurately, greatly improving teaching efficiency.

The Structure of the DAT in a Classroom Devoted to Pop Singing

The structure of the DAT in a classroom devoted to pop singing is divided into two main parts. These include the hardware part and software part (refer table 1). Refer figure 1 on Digital audio equipment connection instructions diagram and figure 2 on sound source plug-ins and effect plug-ins running on DAW software.

Table 1

The structure of the DAT in a classroom devoted to pop singing

Part	Components	Functions
Hardware Part	Computer:	Hardware and software used to interface with digital audio and process and edit audio signals.
	Audio interface:	Used for converting digital and analog signals and assisting the computer in completing the input and output of audio signals.
	Microphone:	Used to record singing.
	Monitoring equipment:	Used for monitoring audio recording, editing, and processing.
	MIDI input device:	Used to transmit MIDI standard signals to complete the interaction between MIDI instruments and controllers.
Software Part	Digital Audio Workstation (DAW):	As the most intuitive way to present digital audio technology, the Digital Audio Workstation (DAW) is an important carrier and platform for this technology. On this basis, we can use various music software to record, detect, and adjust sounds and use MIDI technology to compose, arrange, and do other music creation-related work.
	Sound source plug-in:	Plug-in software provides virtual instrument sounds for DAW.
	Audio effect plug-in:	Plug-in software used to monitor and process the sound of audio tracks.



Figure 1: Digital audio equipment connection instructions diagram



Figure 2: Sound source plug-ins and effect plug-ins running on DAW software

The Application of DAT in Popular Singing Classes

Teachers in a music classroom equipped with digital audio technology can use DAW to teach students. Generally speaking, the teaching process for music lessons with the help of DAT technology is as follows:

- a) Teacher explanation: The teacher first explains the knowledge points and performance skills of the songs that the students want to sing.
- b) Demonstration recording: The teacher demonstrates singing once and uses DAW to record it for students to imitate.
- c) Student singing: Perform singing exercises based on the teacher's explanations and demonstrations. The teacher can also make a preliminary assessment of the students' singing ability during this link.
- d) Student recording: After several singing exercises, students will record their singing

for analysis and comparison in subsequent sessions.

e) Analysis: Use digital audio software to analyze the recorded audio track's pitch, timbre, and rhythm to assist teachers in identifying problems and deficiencies in students' singing.

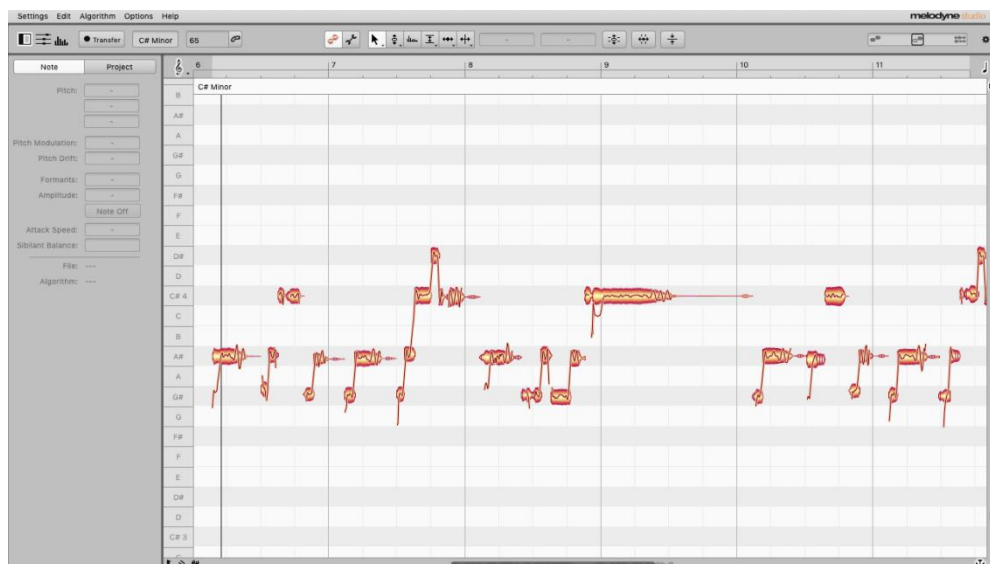


Figure 3: Monitoring of vocal pitch and rhythm in DAW software.

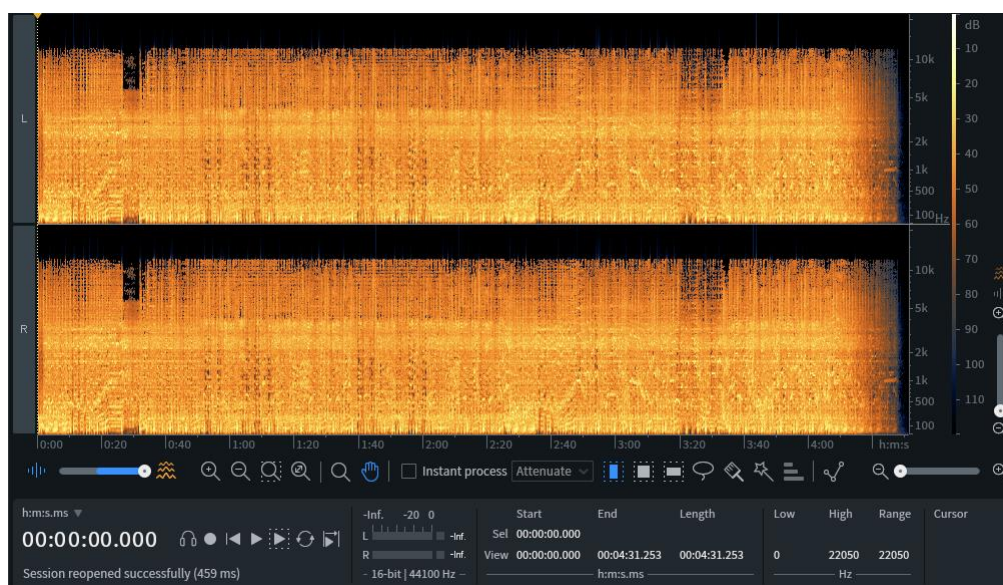


Figure 4: software RX9 detects the spectrogram of human voice timbre

f) Teacher guidance: provide targeted guidance to students based on the analysis results.

g) Student singing: After recording analysis and teacher guidance, summarize the problems, correct and improve the singing method, and practice singing again.

h) Recording comparison: Record students' singing after guidance and compare it with before to help teachers and students summarize problems and improve solutions.

i) Assign homework: The teacher completes the guidance of students' singing skills through this lesson and assigns targeted homework based on the problems that arise during students' singing.



Figure 5: A pop singing teacher is using a DAW in her classroom

Methodology

The survey report that Jiao (2020), completed offers a research method to comprehend the teaching effects of digital and traditional audio technology classrooms. In the study, the researchers used group comparisons, semi-structured interviews, and a short questionnaire to inquire about the teaching effects of classrooms using digital audio technology and traditional classrooms. Sixty students participated in these data collections. This is a very preliminary study, not intended to be a mere statistical exercise but to validate opinions and feelings derived from our experiences in the music classroom.

This study divided 60 students into 6 groups, 3 of which were music classes that used digital audio technology (DAT Group), and the other 3 groups were traditional music classes that did not use digital audio technology (TMC Group). According to the students' scores, they are divided into three levels: excellent, sound, and poor, corresponding to the numbers 1, 2, and 3, respectively. Let these 60 students take a one-month, four-hour popular singing course to learn and test their skills. Researchers evaluate teaching results through objective analysis of the assessment results in three directions: on-site assessment, ability growth, and error rate.

Results

As shown in table 2, DAT students performed better than TMC students. There were more excellent DAT students (43.3%) as compared to TMC students (33.3%) (refer table 2 and figure 6).

Table 2

Overall Performance of DAT vs TMC groups

Singing Performance							
	excellent	%	sound	%	poor	%	total
DAT (digital audio technology) group	13	43.3	12	40.0	5	16.7	30
TMC (non DAT using) group	10	33.3	11	36.7	9	30.0	30

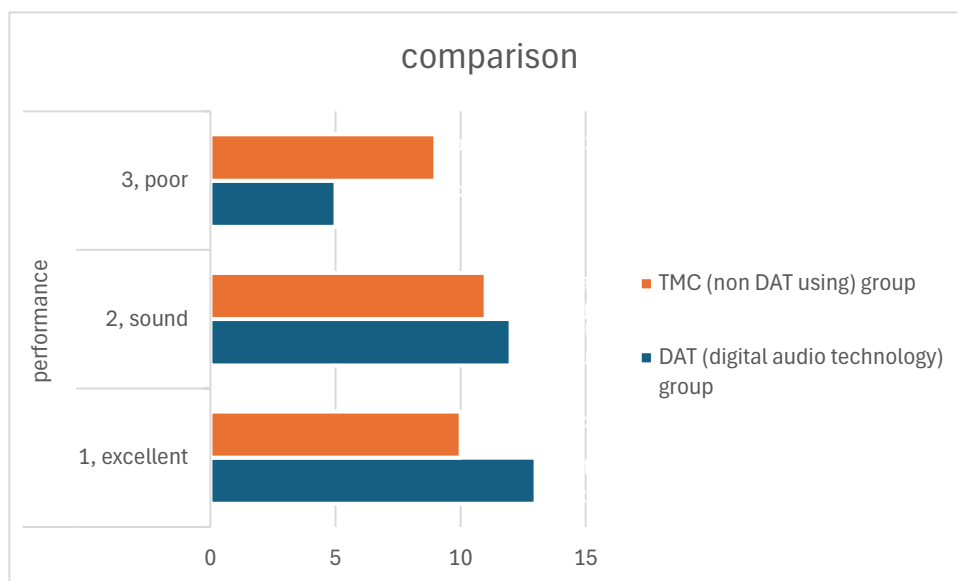


Figure 6: overall Performance of DAT vs TMC groups

As shown in table 3, DAT excellent students (95%) out performed non DAT excellent students (90%). On ability growth, sound DAT students (84%) out performed non DAT sound students (70%) as well. While on the error rates, it was observed that the error rates of non DAT poor students (44%) were higher than the DAT poor students (34%).

Table 3

Performances on on-site assessment, ability growth and error rate of DAT vs TMC students

	<i>On Site Assessment</i>	<i>Ability Growth</i>	<i>Error Rate</i>
<i>DAT (digital audio technology) group</i>			
<i>1, excellent</i>	95	82	8
<i>2, sound</i>	88	91	15
<i>3, poor</i>	75	84	34
<i>TMC (non DAT using) group</i>			
<i>1, excellent</i>	90	73	12
<i>2, sound</i>	82	70	20
<i>3, poor</i>	68	65	44

Although this research work is in its infancy and needs to continue, judging from the current small-scale surveys and studies, digital audio technology has a very significant role in promoting the teaching effect of music classrooms. Figure 7 below shows the comparative results of the popular singing skills of the two groups of students after passing the test.

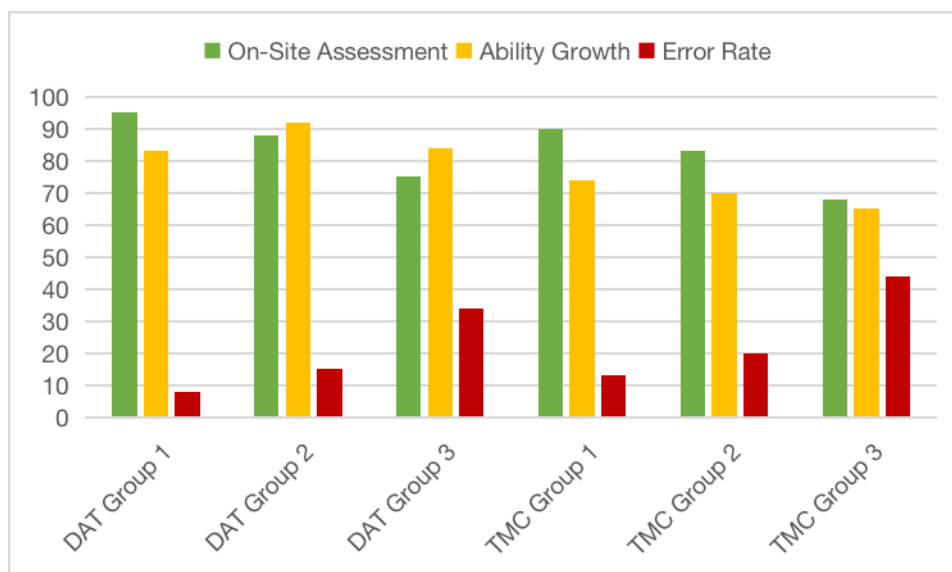


Figure 7: Comparison chart of assessment results

An analysis and comparison of Figure 7 shows that in classrooms where digital audio technology is used in music teaching, students can achieve more obvious skill improvements in the short term. At the same time, the control of error rates during performances will be improved. Traditional music classroom teaching also has specific effects, and students' abilities have improved, but it is inferior to classrooms with digital audio technology. This shows that the application of digital audio technology in music classrooms has a very positive impact on the quality of teaching.

Discussion & Conclusions

The results of this study have confirmed that DAT students as a whole outperformed non DAT students. It was also found that DAT students performed better than the non DAT students in the aspects of on site assessment and ability growth. On the aspect of error rates, it was observed that the non DAT students were having higher rates than those DAT students.

This study has confirmed that the use of DAT is beneficial to the students in developing their performance skills as shown in other studies, such as Aufegger et al (2017), and Havice (1998). Comparative study method is often used in confirming the integrated utilization of DAT as in comparison to traditional non DAT teaching (Havice, 1998). The students are able to use DAT in improving their performance as the visualization of the device is very helpful in informing areas that they can improve in which the improving of learning is with the support of DAT tool with image-related guidance (Geronazzo, et al, 2017). The computer graphics of DAT enhances attention and visual memory and eases students understanding that lead to betterment of the performances (Healey, & Enns, 2012).

The challenges of the integration of DAT lie on the technological skills that the music teachers have (Bannerman, & O'Leary, 2021; Bell, 2015). Therefore it implies that for music teachers education, DAT should be included in the music teachers education curriculum in which DAT utilization is facilitating and promoting music learning (Bell, 2018, 2019, 2020; Bell, & Satarasinghe, 2022). Formative research can do for music education in which it calls for the active use of DAT as a viable tool for informed change in music education (Bresler, 2021).

Evaluation of teachers' technological skills in using DAT in music education through the lens of constructivism is hence imperative (Burrows, & Brown, 2019).

This study has also ascertained that DAT is a helpful tool that students can use anytime and anywhere in supporting their learning. It is also in line with the mindset of constructivist learning in which media of learning can be supportive in making learning occur and without being dependent on the instructors (Blackburn et al, 2014).

Technology can enrich the content and form of classroom teaching, but students must be guided correctly to make technology an effective means of music teaching. Tan (2021), believes that as a music teacher, you should change your concept and serve as a facilitator who can provide guidance and help to students rather than just a teacher who imparts knowledge. According to Pondaco's (2021), discussion, technology-based music classes can encourage students to use DAT to learn and practice, but this kind of class is not perfect, and at the same time, it will also have more requirements for teachers. Whether DAT will hinder communication between teachers and students, whether students can accept DAT in the classroom, and whether teachers can skillfully apply DAT all remain to be studied. Raposo et al (2019), believe that today, with the rapid development of technology, the roles of teachers and educators are still important in modern society. We must realize that even though technology can be conveniently used now, teachers are still real and virtual. , the bridge between technology and science, curriculum and skills, and cognitive and emotional worlds. According to Clauhs et al (2019), music technology is used in traditional music courses just as DAT is used in conservatory courses. Such an approach may also help to promote the transformation of the school's teaching atmosphere into a student-centred one and provide students with a better learning experience.

For future research, DAT can be used along with virtual reality devices (Bissonnette, et al, 2016). It is because DAT can provide learning environments which lessen students' music performance anxiety and hence enhance quality of performance using DAT for music training.

The limitations of this study lie on the limited number of participants in this study. Future research should expand the number of samples in validating the effectiveness of DAT use in supporting music performance training. Another limitation of this study is on the location of the study. As it is only one case of a location involved in the study, for future research, more locations should be included in confirming the results of the study. Besides, this study has only used descriptive analysis. For future research, Inferential analysis should be employed as to confirm the differences between the performances of DAT and non DAT groups statistically.

In conclusion, DAT utilization should be incorporated in all conservatory courses. This student-centered approach with the utilization of DAT is certainly assisting in heightening the outcome of learning and giving high level of learning supports that yield affirmative performances.

Theoretical & Contextual Contributions

This study provides important theoretical contributions to the integration of digital audio technology (DAT) in music education. The findings are consistent with constructivist learning theory, which emphasizes the importance of technology as a tool and method to promote self-directed learning in students. By integrating traditional music teaching with modern

technological tools, this study deepens the understanding and practice of how DAT can support teacher teaching and student learning. Specifically, this study provides empirical evidence to support the theory that technology enhances the classroom learning environment in conservatories, where tools such as digital audio workstations (DAWs) and audio analysis software can provide detailed and timely feedback to help students improve their performance in popular singing learning more efficiently, which is more obvious than traditional classroom teaching.

From a contextual perspective, this study expands the application of DAT in conservatory courses, especially in conservatories in China. This localized perspective provides some reference value for the distinctiveness of technology integration in different cultural and institutional contexts and also reveals the challenges and advantages of DAT in popular singing courses, which are less discussed in the existing literature. By focusing on the intersection of music education and digital technology, this study provides a foundation for future exploration of how to use technological advances to optimize teaching in conservatories. Research evidence shows that the appropriate application of DAT has a positive impact on teachers' teaching practices and students' learning performance and engagement in vocal mastery.

In summary, this contribution emphasizes the importance of integrating technology into the curriculum to ensure that music education remains advanced and effective in the digital age, reflecting the advancement of teaching methods and teaching technologies. By providing a roadmap for how to implement these technologies in practice, this study advances the discussion on the transformative potential of technology in the fields of art and education.

References

- Aufegger, L., Perkins, R., Wasley, D., & Williamon, A. (2017). Musicians' perceptions and experiences of using simulation training to develop performance skills. *Psychology of Music, 45*(3), 417–431. <https://doi.org/10.1177/0305735616664918>
- Bannerman, J. K., & O'Leary, E. J. (2021). Digital natives unplugged: Challenging assumptions of preservice music educators' technological skills. *Journal of Music Teacher Education, 30*(2), 10–23. <https://doi.org/10.1177/1057083720946902>
- Bell, A. P. (2015). Can we afford these affordances? GarageBand and the double-edged sword of the digital audio workstation. *Action, Criticism & Theory for Music Education, 14*(1), 43–65. <https://doi.org/10.22176/act14.1.43>
- Bell, A. P. (2018). *Dawn of the DAW: The studio as musical instrument*. Oxford University Press.
- Bell, A. P. (2019). Of trackers and top-liners: Learning producing and producing learning. In Z. Moir, B. Powell, & G. D. Smith (Eds.), *The Bloomsbury handbook of popular music education* (pp. 171–185). Bloomsbury.
- Bell, A. P. (2020). FX roulette. In A. P. Bell (Ed.), *The music technology cookbook: Ready-made recipes for the classroom* (pp. 245–252). Oxford University Press.
- Bell, A., & Satarasinghe, O. (2022). From Tin Pan Alley to Trending: Remixing Ragtime and South Asian Popular Music with Digital Audio Workstations. In *Commercial and Popular Music in Higher Education* (pp. 23–35). Routledge. <https://doi.org/10.4324/9780429023571-3>
- Bresler, L. (2021). What formative research can do for music education: A tool for informed change. *Visions of Research in Music Education, 16*(5), 24.

- Burrows, J., & Brown, J. (2019). Creating a tool to evaluate teaching materials for older beginner piano students through the lens of constructivism. *Australian Journal of Music Education*, 52(2), 33–45.
- Bissonnette, J., Dube, F., Provencher, M. D., & Sala, M. T. M. (2016). Evolution of music performance anxiety and quality of performance during virtual reality exposure training. *Virtual Reality*, 20, 71–81. <https://doi.org/10.1007/s10055-015-0281-0>
- Blackburn, A., & McGrath, N. (2014). Anytime, anyplace, anywhere: New media and virtual tools offer constructivist learning in online music education. In *E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. 1114–1119). Association for the Advancement of Computing in Education (AACE).
- Clauchs, M., Tobias, E., Herring, M., & Bowman, W. (2019). Mixing it up: Sound recording and music production in school music programs. *Music Educators Journal*, 106(1), 55–63. <https://doi.org/10.1177/0027432119856085>
- Dorfman, J. (2022). *Theory and practice of technology-based music instruction*. Oxford University Press.
- Geronazzo, M., Peruch, E., Prandoni, F., & Avanzini, F. (2017). Improving elevation perception with a tool for image-guided head-related transfer function selection. In *Proc. of the 20th int. Conference on digital audio effects (DAFx-17)* (pp. 397–404). Edinburgh, UK.
- Giddings, S. (2020). The creative magic of digital audio workstations: Technology to unlock creativity in your learners. *Canadian Music Educator Journal*, 61(4), 41–44.
- Havice, W. L. (1998). A comparison of college students' achievement following traditional and integrated media presentations. *Journal of Industrial Teacher Education*, 35, 29–43.
- Healey, C., & Enns, J. (2012). Attention and visual memory in visualization and computer graphics. *IEEE Transactions on Visualization and Computer Graphics*, 18(7), 1170–1188. <https://doi.org/10.1109/TVCG.2012.84>
- Jiao, Q. (2020). Research on the Application of Digital Audio Technology in Music Performance Professional Teaching. 1 Aug. 2020.
- Pondaco, J. J. (2021). You have to work with what the computer has: Music software affordances and student compositions. *Journal of Music Composition Studies*, 35(2), 121–135. <https://doi.org/10.1234/jmcs.2021.02.003>
- Raposo, A., Dias, M., Martins, A., & Reis, C. (2020). Technology as a tool to enhance motivation and learning. *E3S Web of Conferences*, 171, 01011. <https://doi.org/10.1051/e3sconf/202017101011>
- Tan, S. E. (2021). Special issue: Decolonising music and music studies. *Ethnomusicology Forum*, 30(1), 4–8. <https://doi.org/10.1080/17411912.2021.1938445>