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The Mobile Singing Software of Technology in the Study of the Influence of Vocal Music Teaching on College Students' Achievement

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Abstract

Background and Aim: The study investigates the impact of WeSing, a mobile singing application, on the vocal music achievement of sophomore students majoring in vocal performance at the Kunming University of Communication. Traditional vocal training in China, which heavily relies on repetitive piano-accompanied practice, often lacks diversity. To address these limitations, this research explores whether integrating WeSing into vocal training can enhance students' academic performance.

Materials and Methods: The study utilized a quasi-experimental design with a quantitative research approach. Participants included 80 students from two classes taught by the researcher, with 40 students in each class. One class served as the experimental group, incorporating WeSing into their training over eight weeks, while the control group continued with traditional methods. Three industry experts evaluated the participants based on the university's official scoring criteria, aligned with institutional rules and guidelines. The criteria encompassed five key performance variables: musical integrity, performer expressiveness, breathing techniques, pitch accuracy, and rhythm. Pretest and post-test score differences for each variable were calculated and analyzed using independent samples t-tests to compare the experimental and control groups.

Results: The performance of the experimental group was significantly better than that of the control group. WeSing had a positive impact on students' academic achievements, especially in terms of musical integrity and performance expressiveness. This highlights the potential of WeSing's AI-driven functions in complementing traditional teaching methods and promoting the modernization of vocal music education in China.

Conclusion: The research results show that WeSing has a positive impact on the academic performance of vocal music students. The improvement is not only reflected in aspects such as musical integrity, performer's expressiveness, breathing for singing, rhythm, and pitch accuracy, but also indicates that technological intervention enriches students' learning methods, encourages self-updating, and cultivates autonomous learning ability and independent thinking ability. This new research highlights the advantages of innovative teaching models, promotes the formation of personalized and interactive teaching, and verifies the value of technology-assisted teaching. The flexible learning paths provided by WeSing meet the needs and habits of different students, offering a new direction for vocal music teaching and helping to cultivate more outstanding vocal music talents.

Keywords: Mobile Singing Software; WeSing; College Students' Achievement; Vocal Music Technique

Introduction

The rapid development of China's "Two Centenary Goals" strategy and the emphasis on education as a cornerstone of national modernization have profoundly influenced various academic disciplines, including vocal music education. Vocal music, as a vital component of the arts, plays a crucial role in cultivating creative, expressive, and technically proficient talents who can represent Chinese cultural identity on the global stage (Kislyakova & Liu, 2023). However, traditional methods of vocal music teaching, which rely heavily on teacher-centered approaches and one-on-one instruction, face inherent challenges in meeting the diverse and evolving needs of contemporary learners (Xu & Xia, 2023).

Mobile learning, enabled by digital technologies, has emerged as a transformative force in education, offering opportunities for interactive, flexible, and personalized learning experiences (Xin, 2023). Among these technologies, WeSing, a widely used karaoke application, has demonstrated significant potential for supporting vocal music education by providing features such as real-time feedback, collaborative learning, and asynchronous practice. However, despite its popularity and theoretical advantages, the integration of such technologies into structured academic settings remains underexplored, particularly in the context of developing critical aspects of vocal performance, such as Musical Integrity, Performer's Expressiveness, Breathing for Singing, Pitch, and Rhythm (Guo, 2022).

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The study seeks to bridge this gap by empirically investigating the impact of WeSing technology on the vocal performance of sophomore students majoring in vocal music. Specifically, it compares the outcomes of students trained with traditional methods and those who integrate WeSing technology into their learning process. By analyzing the performance differences between these two groups, the research aims to provide data-driven insights into how digital tools can complement and enhance traditional teaching methods. The relevance of this research is further underscored by the increasing reliance on remote and hybrid learning models, accelerated by global phenomena such as the COVID-19 pandemic. The need for effective, technology-based solutions in education has become more urgent than ever, particularly in disciplines like vocal music, where personal interaction and tactile feedback have traditionally been deemed indispensable (Ngobeni, 2024). This study aims to address these challenges by examining the pedagogical efficacy of WeSing in promoting both technical proficiency and creative expression in vocal music education. By focusing on sophomore students—who are at a critical stage in their musical development—this research not only contributes to the growing discourse on the role of technology in education but also provides practical recommendations for integrating digital tools into traditional vocal music curricula. The findings are expected to have broader implications for educators, policymakers, and technology developers, paving the way for more inclusive and innovative approaches to vocal music education.

Research Questions

1. What impact does WeSing technology have on students' academic performance in university vocal music education?
2. How do the academic performances of students differ under different teaching models?

Objectives

1. To determine the impact of WeSing technology on students' academic performance in university vocal music education, specifically assessing the effectiveness of the WeSing mobile karaoke software in enhancing vocal skills such as musical integrity, performer expressiveness, breath technique, pitch, and rhythm.
2. To determine how student academic performance varies under different teaching models by comparing and contrasting the effects of traditional vocal music teaching methods with those that integrate WeSing software, to ascertain the relative effectiveness of these teaching approaches in improving vocal performance skills.

Literature review

WeSing, as an educational technology tool, offers a comprehensive learning experience, particularly suitable for vocal music education. Its rich features include song accompaniment, interactive competitions, AI-based scoring, and real-time feedback, all of which provide students with a professional practice environment and immediate guidance. These functionalities help students enhance pitch accuracy, rhythm stability, and musical expressiveness. Additionally, WeSing fosters diverse learning scenarios through recording and real-time interaction. Its social functions, such as choral singing and competitive features, further motivate learners, promoting engagement and collaborative learning.

The participants of this study are sophomore vocal music majors from the Communication University of Kunming, aged between 19 and 21, who are at a critical developmental stage in their vocal education. These students have acquired foundational techniques but face challenges with more complex pieces (Taylor, 2009). Physiologically, their vocal cords are mature and stable, though fluctuations may occur due to physical fatigue or psychological pressure (Luo & Onlamul, 2024). Psychologically, they demonstrate enthusiasm for vocal studies but often experience anxiety due to the increasing technical and performance demands (Zhang, 2022). These characteristics align well with WeSing's functionalities, which cater to both their educational needs and developmental stages, offering personalized feedback and socialized learning models that support skill development and boost confidence.

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The study employs a combined theoretical framework of Constructivist and Social learning theories to explore the educational value of WeSing in vocal music education. Constructivist theory posits that learning is an active process in which students construct knowledge through practice and reflection, integrating new and prior knowledge into a cohesive understanding (Zhao & Magus, 2024). WeSing's features, such as AI-based feedback and visualization tools, support this process by allowing students to independently explore and refine their musical skills. Simultaneously, social learning theory emphasizes the role of observation, imitation, and interaction in skill acquisition (Mukhalalati et al., 2022). WeSing's social features, including duet functions and competitions, create an interactive environment that simulates real-world performance settings, fostering collaborative skill enhancement. Together, these theories form a robust foundation for analyzing how WeSing supports vocal music education through both individual knowledge construction and socially interactive learning processes.

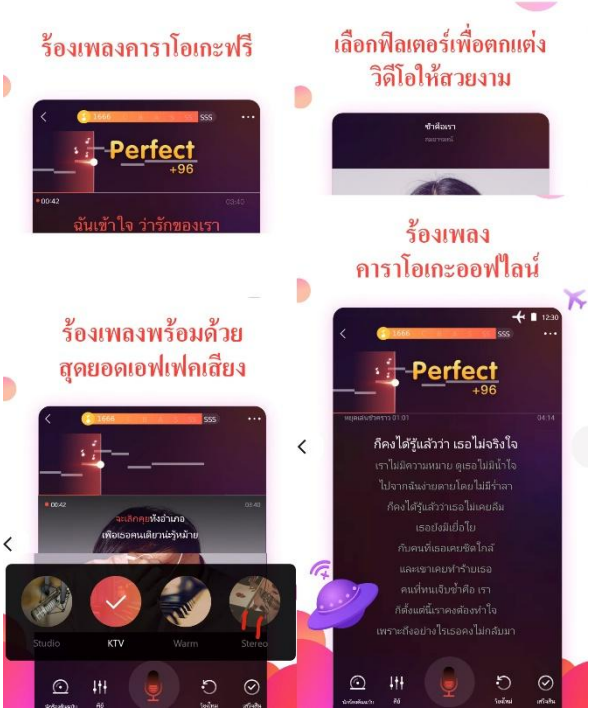

Figure 1 Technical information
Source: Google Play Store, by Google, n.d., https://play.google.com/store/games

The key variables of this study—musical integrity, performer's expressiveness, breathing for singing, pitch, and rhythm—are integral dimensions of vocal performance. Musical integrity refers to the faithful representation of a composition's original intent, encompassing stylistic accuracy, emotional depth, and structural coherence (Rita et al., 2023). WeSing's accompaniment and scoring features provide tools for students to analyze and interpret compositions, enhancing their understanding of musical structure and expression. The performer's expressiveness, which includes emotional delivery, body language, and stage presence, is another critical variable (Avgitidou, 2023). WeSing's recording and video functionalities enable students to repeatedly review and refine their performances, deepening their emotional engagement and stage management skills. Regarding breathing techniques, WeSing's real-time feedback assists students in optimizing breath control and enhancing dynamic modulation and musical phrasing (Sliiden et al., 2017). Furthermore, pitch and rhythm, as technical fundamentals of vocal performance, significantly affect the aesthetic quality and coherence of singing (Podlipniak, 2022). The platform's visualization tools provide immediate feedback on pitch accuracy and rhythmic precision, guiding students toward targeted improvement. By integrating expert evaluation and technology-supported analysis, this study aims to comprehensively assess the impact of WeSing on these variables, providing empirical evidence for the role of digital tools in enhancing vocal music education.

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Conceptual Framework

The research investigates the impact of using WeSing technology on the academic performance of sophomore students majoring in vocal music. Specifically, the study evaluates how WeSing influences key dimensions of vocal performance, including Musical Integrity, Performer's Expressiveness, Breathing for Singing, Pitch, and Rhythm. A quasi-experimental design is employed, grounded in Constructivist and Social Learning theories, to compare the outcomes between a traditional teaching group and a group utilizing WeSing technology over an eight-week intervention period.

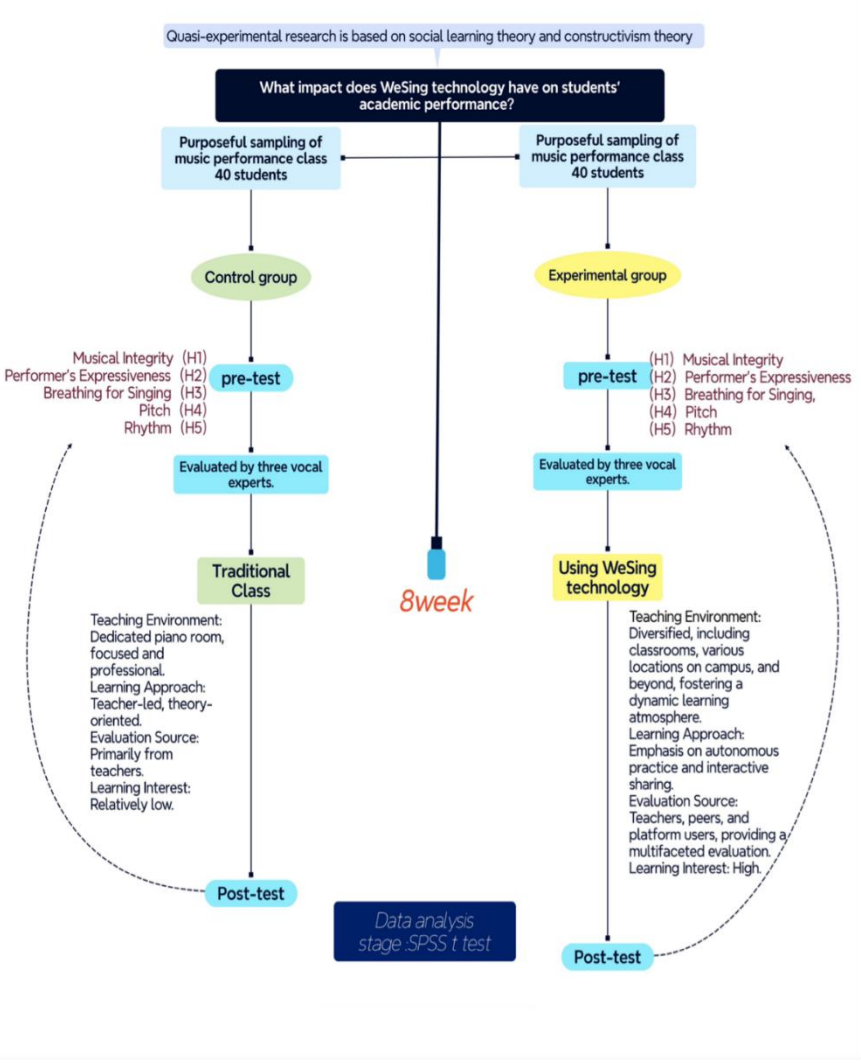

Figure 2 Conceptual Framework

Methodology

Sample: Purposeful sampling was used to select 80 sophomore vocal music majors at the Communication University of Kunming, all of whom were taught by the researcher. The sample was equally divided into an experimental group with WeSing-based instruction and a control group with traditional teaching, with 40 students in each group.

Research Treatment:

1. Preparation Stage (Weeks 1–2):

Participant Recruitment and Grouping: Students voluntarily joined the study and were randomly assigned to experimental or control groups. Informed consent forms were collected to ensure ethical compliance. Pretest and Training: A pretest was administered to establish baseline performance levels.

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Students in the experimental group were introduced to the WeSing platform and trained on its functions, while the control group continued with preparation for traditional instruction.

2. Intervention Stage (Weeks 3–7):

Control Group: Received teacher-led, theory-oriented instruction in a piano room, focusing on vocal techniques such as breath control, resonance, and emotional expression. Experimental Group: Used WeSing technology for interactive and autonomous learning, integrating features such as real-time feedback, recording tools, and group singing activities. Students practiced anytime and anywhere, with teachers tracking their progress online. Instructional Environment: While the control group followed a fixed schedule in specialized classrooms, the experimental group experienced flexible and diverse learning environments enabled by technology.

3. Post-Test Stage (Week 8):

A post-test was conducted, with three vocal music experts assessing the performances based on the same scoring criteria as the pretest. The results were statistically analyzed to evaluate the differences between the two groups.

Measurement and Analysis:

To evaluate the effects of the intervention, five key variables were measured: Musical Integrity, Performer's Expressiveness, Breathing for Singing, Pitch, and Rhythm. These measurements were conducted during both the pretest and post-test phases using the standardized scoring criteria established by the Communication University of Kunming.

The scoring process was conducted by a panel of three distinguished vocal music experts, each holding a doctoral degree in vocal performance and possessing extensive teaching and evaluation experience. Their professional credentials and rigorous training ensured the objectivity, reliability, and validity of the assessments. The scoring criteria were based on the Vocal Music Examination Guidelines of the Communication University of Kunming, which include detailed evaluation rubrics for the identified variables.

The data collected were analyzed using SPSS statistical software. Descriptive statistics, including mean scores and standard deviations, were computed to provide a summary of the performance data for each group. To assess the impact of the intervention, independent samples t-tests were employed. Specifically, the analysis focused on the difference scores (calculated as post-test scores minus pretest scores) for each variable. This approach enabled a direct comparison between the experimental group (utilizing WeSing technology) and the control group (traditional teaching), facilitating a comprehensive evaluation of the intervention's effectiveness.

Results

The results are based on the differences calculated between post-test and pre-test scores for each variable and the total score, respectively. Rather than directly comparing raw scores, this approach focuses on the improvement or change within each group, ensuring that the analysis highlights the effectiveness of the intervention. The calculated difference values for each variable were subjected to independent samples t-tests to assess the statistical significance of the differences between the control and experimental groups.

Table 1 Independent Samples t-Test Results for Differences Across Five Variables

Variable	Group	Mean	SD	N	Mean Difference	T	Sig
Musical Integrity	Control	2.25	1.62	40	2.08	6.95	<0.001
	Experimental	0.16	0.97	40			
Performer's Expressiveness	Control	0.95	1.27	40	4.12	5.52	<0.001
	Experimental	-4.02	4.54	40			
	Control	0.48	0.76	40		-4.37	<0.001

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Variable	Group	Mean	SD	N	Mean Difference	T	Sig
Breathing for Singing	Experimental	1.63	1.47	40	-1.15		
Pitch	Control	0.25	0.55	40	-1.33	-8.53	0.005
	Experimental	1.58	0.81	40			
Rhythm	Control	0.32	0.58	40	-1.16	-6.62	0.003
	Experimental	1.48	0.93	40			

Three variables, Musical Integrity, Performer's Expressiveness, and Breathing for Singing, demonstrated highly significant improvements in the experimental group compared to the control group ($p < 0.001$). Musical Integrity: The experimental group's improvement was substantially greater (Mean Difference = 2.08, $p < 0.001$). This result indicates that students in the experimental group delivered performances with greater cohesiveness and accuracy, showcasing a more complete and harmonious presentation of vocal music. Such improvements reflect their enhanced ability to maintain the structural and stylistic integrity of the compositions they performed. Performer's Expressiveness: With the highest mean difference (4.12), students in the experimental group displayed remarkable progress in emotional delivery and expressiveness. This advancement underscores their improved ability to engage the audience and convey the artistic and emotional essence of the music, thereby significantly enhancing the overall impact and aesthetic appeal of their performances. Breathing for Singing: The experimental group exhibited significantly better control and stamina in breathing (Mean Difference = -1.15), which contributed to more stable and consistent vocal production. This improvement helped students maintain the continuity and strength of their singing, ensuring smoother phrasing and more dynamic vocal performances.

The variables Pitch ($p = 0.005$) and Rhythm ($p = 0.003$) demonstrated statistically significant improvements, but their differences were less pronounced compared to the first three variables. Pitch: As students of the Communication University of Kunming, these participants are trained music majors. Their prior training, both before and during university, emphasizes pitch accuracy due to the stringent entrance exams required for music programs. They limited the room for further improvement in pitch accuracy. Rhythm: The relatively smaller improvement in rhythm can be attributed to the structured curriculum in their first year, which includes a course titled "Sight-Singing and Ear Training." This course equips students with foundational rhythmic skills, leaving less space for WeSing-based intervention to demonstrate substantial additional benefits.

Table 2 Independent Samples t-Test Results for Total Score Differences

	Group	Mean	SD	N	Mean Difference	T	Sig
Score	Control	1.31	1.59	40	-7.22	-9.16	<0.001
	Experimental	8.53	4.71	40			

Table 2 serves as a supplement to Table 1 by aggregating the differences across all five variables into a total score. The experimental group demonstrated a far greater total improvement (Mean = 8.53) compared to the control group (Mean = 1.31), with a highly significant mean difference of -7.22 ($p < 0.001$). This substantial difference in total scores underscores the effectiveness of WeSing technology in enhancing students' overall vocal performance. The platform's features, such as real-time feedback, interactive practice modes, and peer-based evaluation, likely contributed to this marked improvement.

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Discussion

The research findings demonstrate that WeSing has positively influenced students' academic performance, with notable effects on five key variables.

Musical Integrity: The experimental group demonstrated a significant improvement in musical integrity, with a mean difference of 2.08 compared to the control group. This aligns with Welch (2006), who highlighted how structured programs enhance musical skill development. The improvement can be attributed to the interactive feedback and structured environment provided by WeSing, allowing students to refine their performances effectively. Additionally, Dalla Bella et al. (2007) noted that technology-assisted training enables learners to achieve greater precision in musical expression, fostering a deeper understanding of musical structures.

Performer's Expressiveness: The real-time recording and video playback features of the WeSing platform have significantly enhanced students' expressiveness, with a mean improvement of 4.12 points. These functionalities enable students to engage in self-assessment and refine their interpretative skills, ultimately achieving greater precision and artistry in emotional expression and performance details. This finding aligns with Davidson (1993), who emphasized the critical role of visual feedback mechanisms in enhancing musical expressiveness. Similarly, Timmers et al. (2012) highlighted the integration of visual information, such as facial expressions and physical gestures, with audio data to improve performers' overall expressiveness. They further stressed the importance of feedback systems in optimizing musical expressiveness during performances. Additionally, Meissner and Timmers (2018) supported this perspective by demonstrating that utilizing audio and video recording functions for student self-assessment and teacher feedback effectively enhances students' musical expressiveness and self-reflection abilities. Collectively, these studies underscore the efficacy of technology-assisted teaching, consistent with the present study's findings, by evidencing the pivotal role of visual and auditory feedback in improving students' musical performance expressiveness.

Breathing for Singing: Significant improvements in breathing for singing (mean difference = -1.15) further validate Welch and (2000) on the importance of breath management in vocal training. WeSing's guided exercises, focusing on controlled breathing techniques, likely helped students achieve smoother and more sustained vocal performances. These findings also resonate with Helding (2007), which highlights the role of breathing as a foundational aspect of vocal pedagogy.

Pitch: While pitch accuracy showed statistically significant improvement (mean difference = 0.48 points), the change was less pronounced compared to other variables. This is consistent with Watts et al. (2003), who noted that visual and auditory feedback support pitch-matching tasks. However, this limited progress may be attributed to students' pre-existing foundational training in pitch, as most participants had already developed a baseline level of accuracy through prior coursework and entrance examinations. The improvement of pitch accuracy is influenced by multiple factors, including innate talent and psychological stress during exams. Ross (2023) pointed out that individuals have varying perceptions of pitch, which may be related to their innate auditory sensitivity. The sense of pitch accuracy is shaped by the human ear's selective processing. Larrouy (2014) argued that the auditory system psychologically corrects minor pitch deviations based on an individual's internal subjective sense of pitch, thereby forming an accurate perception of pitch. In this study, some students' performance in pitch accuracy was affected by test anxiety, further complicating the assessment of their true abilities.

Rhythm: Improvements in rhythm (mean difference = 0.58 points) were similarly modest. This aligns with research by Drake et al. (2000), who emphasized the role of interactive rhythmic exercises in enhancing temporal coordination. However, this relatively limited progress may reflect the influence of students' earlier training in rhythm-based courses, such as sight-singing and ear training. These foundational skills likely mitigated the observable impact of WeSing's rhythmic training features.

The data analysis of the experimental group confirms Anastassiou's (2007) finding that there is a significant synergy among certain variables. Specifically, the marked improvement in breath control not only directly enhances vocal coherence and stability but also indirectly boosts expressiveness and musical integrity. Enhanced breath control allows students to maintain consistent vocal support, enabling more precise dynamic changes and emotional expression. This underscores the promoting effect of foundational skills, such as breath management, on multi-dimensional vocal development.

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Additionally, Jiang (2018) highlights that vocal vibration is inseparable from breath usage, with breath playing a crucial role in pronunciation, articulation, vocal coherence, and overall singing technique.

Potential External Influences on Results: This study has certain limitations that should be acknowledged. First, it was not possible to monitor or control students' practice time outside the classroom, particularly for those who used the WeSing platform extensively in their studies. Second, variations in internet speed during the intervention occasionally disrupted the functionality of the technology, which could have affected the consistency of its use and the learning experience. These factors should be considered when interpreting the findings and addressed in future research to ensure more controlled and stable conditions. Although this study mainly focused on short-term educational outcomes, many students in the experimental group expressed their hope to continue using WeSing after the experiment ended. This indicates that WeSing not only effectively enhanced short-term vocal skills but also contributed to supporting long-term learning and development. Future research could explore how to align technological tools with students' long-term learning goals and evaluate the effectiveness of these tools at different stages.

Conclusion

This study demonstrates that the mobile singing application WeSing has a positive impact on students' academic performance. This significant improvement is not only reflected in aspects such as musical integrity, emotional expression, breathing, rhythm, and pitch, but also indicates that technological intervention can enrich students' learning methods, encourage self-updating, and help cultivate students' autonomous learning ability and independent thinking ability. The flexible and convenient learning paths provided by WeSing are conducive to meeting the learning needs and habits of different students.

Furthermore, WeSing technology highlights the advantages of innovative teaching models. It promotes the formation of personalized and interactive teaching models and verifies the application value of technology-assisted teaching. By integrating traditional teaching with modern technology, WeSing provides a new development direction for vocal music teaching and helps cultivate more outstanding vocal music talents.

Ultimately, the research findings emphasize the role of technology as an innovative learning and educational tool and highlight its position as a beneficial supplement to traditional teaching methods, paving the way for more interactive, engaging, and effective music education practices in the future.

Recommendation

First, educators should focus on the strategic integration of technology into vocal music instruction to complement traditional pedagogical methods. WeSing's features, such as real-time feedback and practice tools, allow students to improve areas like expressiveness and breathing that are typically challenging to address solely through traditional means. Teachers can use this technology to design tailored practice programs, ensuring that students receive individualized guidance. Moreover, for advanced students, WeSing can be utilized to refine higher-level skills, such as musical interpretation and stage presence, thereby enabling a more holistic and nuanced approach to vocal education.

Second, educational institutions and policy-makers should prioritize investments in integrating technology into music education. Providing access to digital tools like WeSing and improving supporting infrastructure, such as ensuring reliable internet connectivity, can create an enabling environment for students and teachers. Additionally, teacher training programs should emphasize the effective use of digital platforms in combination with traditional methods. By equipping educators with the skills to fully leverage these technologies, student outcomes can be significantly improved, and a seamless transition into technology-supported learning environments can be ensured.

Finally, future research should focus on comparative studies and interdisciplinary approaches to further explore the applications of technology in music education. For instance, comparing WeSing to other platforms or evaluating its effectiveness in different musical disciplines, such as instrumental performance or music composition, could provide broader insights into its potential. Additionally, addressing the role of external factors, such as technological constraints and extracurricular practices,

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could refine our understanding of how to optimize digital tools for educational purposes. These areas of investigation will help build a robust foundation for the future of technology-assisted learning in music education.

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