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Application of Digital Tools in Pitch and Rhythm Training of School Wind Bands

Jia Zhang

Graduate University of Mongolia, Ulaanbaatar 999097, Mongolia

Abstract

Pitch and rhythm are fundamental components of wind band teaching in primary and secondary schools and represent the most prominent difficulties in students' practice. Based on survey data from 506 wind band students in five primary and secondary schools in Tianjin (pitch control at 69.57% and rhythm mastery at 65.02% ranking as the top two practice difficulties), this study, combined with teaching practice, systematically examines the application of digital tools in pitch and rhythm training of school wind bands. Common digital tools are classified into four categories: metronome/rhythm tools, tuning/pitch tools, recording/feedback tools, and sight-singing/practice-companion tools. Specific application methods, such as tempo-varied metronome practice, tuner-based pitch detection and recording-playback comparison, are elaborated in both classroom rehearsal and after-class self-practice scenarios. The analysis identifies problems in current applications, including blind tool selection, insufficient equipment and venue supply, over-reliance on devices, and inadequate digital literacy of teachers. Accordingly, this study proposes establishing tool selection guidelines, improving equipment configuration, adhering to the principle of auditory training first and tools as support, and strengthening teacher training, so as to provide a reference for the digital application of pitch and rhythm training in school wind bands.

Keywords

Wind band; digital tools; pitch training; rhythm training; primary and secondary schools.

1. Introduction

1.1. Research Background

Pitch and rhythm are two fundamental abilities of wind instrument performance and basic guarantees of ensemble quality (Qu Xin, 2019; Hu et al., 2019). However, a survey of 506 wind band students in five primary and secondary schools in Tianjin shows that pitch control (69.57%) and rhythm mastery (65.02%) are the most prominent difficulties in students' practice, both exceeding 60%, with no significant differences across grades; among students' ability-improvement needs, sense of rhythm ranks third at 61.46%. This indicates that pitch and rhythm training has long been a weak link in wind band teaching in primary and secondary schools (Zhang Cheng, 2020; Cui Hua, 2019). Meanwhile, the development of digital technology has provided new means for music training; digital tools such as metronomes, tuners and audio recorders are gradually entering music classrooms and rehearsal halls, offering possibilities for breaking through the bottlenecks of traditional training.

1.2. Research Purpose and Significance

This study aims to explore the specific application of digital tools in pitch and rhythm training of school wind bands, analyze the problems in their application, and propose improvement suggestions. Its significance lies in two aspects: on the one hand, it provides front-line teachers with operable application paths for tools, alleviating the difficulties of slow progress and untimely feedback in pitch and rhythm training; on the other hand, it offers empirical

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references based on real surveys and teaching practice for the digital application of wind band training.

1.3. Research Methods

This study comprehensively employs the literature research method and the teaching practice method. First, relevant literature on wind band training and music digital tools at home and abroad is reviewed (Chen Luhui, 2022; Fang Xiaolin, 2019; Cui Rongrong, 2012; Abril & Gault, 2008); second, based on wind band teaching practice in Tianjin primary and secondary schools, combined with survey data from 506 students, the application types and operating methods of digital tools are summarized; finally, the problems in application are analyzed and targeted suggestions are proposed.

2. Application Types of Digital Tools in Pitch and Rhythm Training

Digital tools applicable to pitch and rhythm training of school wind bands can be divided into four categories according to training functions (Table 1). Metronome/rhythm tools, represented by metronome Apps, provide adjustable tempo, time signatures and accent displays, serving as basic tools for rhythm training; tuning/pitch tools, represented by electronic tuners and tuning Apps, display pitch deviation in real time to assist pitch correction; recording/feedback tools utilize the recording and playback functions of mobile phones to help students listen back to their own performance and make comparisons; sight-singing/practice-companion tools train students' inner hearing and music-reading ability through singing-along, sight-singing and intelligent practice features.

The four categories of tools are complementary in function and are often used in combination in training, jointly serving the two training goals of pitch and rhythm.

Table 1. Classification and training functions of digital tools

Tool Category	Representative Tools	Core Functions	Main Training Objectives
Metronome/Rhythm tools	Metronome App, rhythm App	Tempo adjustment, accent display, rhythm-pattern demonstration	Rhythmic stability and unity
Tuning/Pitch tools	Electronic tuner, tuning App	Real-time pitch detection, pitch deviation display	Pitch accuracy and consistency
Recording/Feedback tools	Mobile recorder, audio editing App	Performance recording, playback comparison, slow-speed playback	Self-listening and correction
Sight-singing/Practice tools	Sight-singing App, intelligent practice App	Singing-along training, sight-singing practice, intelligent correction	Inner hearing and music reading

3. Application of Digital Tools in Pitch and Rhythm Training

The application of digital tools should follow the framework of "tool types—training content—application scenarios—training objectives" (Figure 1). In practical teaching, metronome/rhythm tools are mainly used for rhythm training, tuning/pitch and recording/feedback tools mainly for pitch training, while sight-singing/practice-companion tools support both; tools can be applied not only in classroom rehearsals, but also extended to after-class self-practice and section cohesion training (Qu Xin, 2019; Hu et al., 2019).

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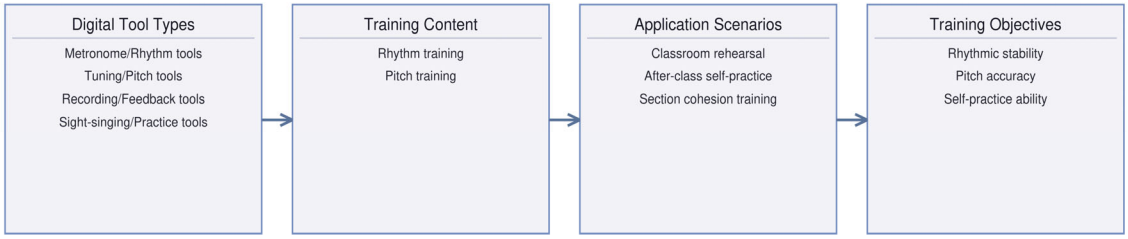


Figure 1. Application framework of digital tools in pitch and rhythm training of school wind bands

3.1. Application in Rhythm Training

Rhythm training focuses on the stability of tempo and the accuracy of rhythmic patterns. Metronome Apps can set adjustable tempos from 40 to 120 beats per minute; in training, students first practice long tones and scales at a slow tempo (e.g., 60 BPM) to establish a stable sense of speed, and then gradually increase the tempo to avoid speeding up while practicing (Qu Xin, 2019). In ensemble rehearsals, tempo can be set by section: the percussion section first follows the metronome to stabilize the basic rhythm, then the brass and woodwind sections join successively, and finally the whole band plays together, solving the problem of inconsistent rhythm. For complex rhythmic patterns such as dotted notes and syncopation, the rhythm-pattern demonstration function of rhythm Apps can be used for segmented listening: listen to the demonstration first, then imitate and play, and finally play independently without the tool.

In addition, the cultivation of a sense of rhythm also depends on the establishment of inner time. Students can be guided to use sight-singing practice Apps for rhythm imitation and body-movement exercises, combining visual, auditory and motor senses to internalize rhythmic patterns into a stable sense of time(Cui Rongrong, 2012). For after-class self-practice, teachers can designate metronome tempo ranges, and students complete tempo-varied practice at home with mobile Apps and record their progress, making up for the practical shortfall that fewer than two in ten students practice every day and practice regularity is lacking (Austin, 1990).

3.2. Application in Pitch Training

The core of pitch training is to establish accurate pitch concepts and correct deviations in time. Tuning Apps can display the frequency and deviation of the played pitch in real time; in training, students are required to play long tones and observe the pointer or value, actively adjusting breath and embouchure to stabilize the pitch within the allowable deviation range. This process transforms the vague feedback that previously relied on teachers' ear-by-ear discrimination into intuitive feedback that students can observe independently, helping to improve training efficiency (Qu Xin, 2019; Hu et al., 2019).

Recording/feedback tools are equally important in pitch training. Students' long tones, scales or phrases can be recorded and played back for comparison with the standard pitch, helping students discover pitch problems that are not easily perceived by themselves; the slow-speed playback function facilitates checking deviation positions in scales note by note. In section rehearsals, each section can be recorded separately and then merged for playback, enabling students to perceive the pitch fusion among sections and providing a basis for pitch unity in ensemble (Fang Xiaolin, 2019; Abril & Gault, 2008). The singing-along and imitation functions of sight-singing practice tools start from auditory training, helping students establish accurate pitch concepts, forming a training chain of "listen first, then play accurately" in combination with instrument performance training.

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3.3. Integration of Classroom Rehearsal and After-class Practice

The value of digital tools also lies in the extension of training scenarios. In classroom rehearsals, teachers uniformly use tools for pitch detection and rhythm demonstration to improve the efficiency of collective training; after class, students complete tempo-varied practice, pitch self-check and recording playback at home with mobile Apps, extending training beyond the classroom. The survey shows that students practice mainly at home (51.78%) and at school (45.85%), and after-class self-practice accounts for a large proportion of practice time; digital tools provide students with reliable feedback means for self-practice without teachers' guidance (Zhang Cheng, 2020; Cui Hua, 2019).

4. Main Problems in Application

4.1. Blind Tool Selection and Shallow Use of Functions

Tool selection in teaching lacks standards; some teachers only use the single functions of metronomes and tuners, with insufficient use of recording playback, rhythm-pattern demonstration and intelligent practice functions, so tools fail to play their full role and training still relies mainly on traditional methods (Qu Xin, 2019; Fang Xiaolin, 2019).

4.2. Insufficient Equipment and Venue Supply

The survey shows that the utilization rate of music classrooms is only 2.37%, and students mainly rely on home environments for practice; some schools lack basic equipment such as tuners and metronomes, so the application of digital tools lacks hardware and venue support (Zhang Cheng, 2020; Cui Hua, 2019).

4.3. Over-reliance on Devices and Neglect of Auditory Training

Some students rely too much on the display results of tuners and metronomes; their pitch and rhythm obviously regress without the tools, reflecting that tools have replaced auditory judgment rather than assisted auditory training, which violates the intrinsic laws of music learning (Qu Xin, 2019; Hu et al., 2019).

4.4. Insufficient Digital Literacy and Integration Ability of Teachers

The integrated application of digital tools places new demands on teachers; some teachers are unfamiliar with tool functions, unable to select appropriate tools according to training objectives, and lack the ability to integrate tools into instructional design, restricting the depth and effectiveness of application (Abril & Gault, 2008; Austin, 1990).

5. Improvement Suggestions

5.1. Establishing Tool Selection Guidelines and Clarifying Function Lists

To address the problem of blind tool selection, schools and teaching-research groups should formulate guidelines for digital tool selection, sort out function lists of various tools according to training objectives, and clarify the principle of "prioritizing metronome-type tools for rhythm training and tuning/recording-type tools for pitch training," so as to reduce arbitrariness in application. The functions, applicable grade levels and operating points of common tools can be compiled into a handbook for teachers' reference (Qu Xin, 2019; Fang Xiaolin, 2019).

5.2. Improving Equipment Configuration and Opening Practice Venues

To address the problem of insufficient equipment and venues, schools should gradually equip basic devices such as metronomes and tuners, and increase the opening hours of music classrooms to provide conditions for students to practice at school; for after-class practice, students can be guided to use free mobile Apps for self-training, lowering the equipment

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threshold and making up for the lack of guidance in home practice(Zhang Cheng, 2020; Cui Hua, 2019).

5.3. Adhering to the Principle of "Auditory Training First, Tools as Support"

To address the problem of over-reliance on devices, training should adhere to the principle of tools assisting rather than replacing: first use tuners and recordings to help students discover problems, then guide students to make auditory judgments and self-corrections without tools, and finally achieve the goal of maintaining pitch and rhythm stability without relying on tools. The basic training flow of "listen—sing—play—check" can be adopted, with tools serving only as auxiliary means in the feedback link (Qu Xin, 2019; Hu et al., 2019; Cui Rongrong, 2012).

5.4. Strengthening Teacher Digital Literacy Training and Teaching-Research Support

To address the problem of insufficient teacher competence, the application of digital tools should be incorporated into music teacher training, with hands-on training on metronomes, tuners and recording playback, and application case discussions should be carried out by teaching-research groups, so as to help teachers master tool selection and instructional design methods and improve their integration ability (Abril & Gault, 2008; Austin, 1990; NCAS, 2014).

6. Conclusion and Prospect

Pitch and rhythm are the most prominent training difficulties in wind band teaching in primary and secondary schools, and digital tools provide a new way to solve this problem. Based on survey data from 506 students and teaching practice, this study classifies common digital tools into four categories: metronome/rhythm, tuning/pitch, recording/feedback and sight-singing/practice-companion tools, and sorts out their application methods in rhythm training, pitch training and the integration of classroom and after-class scenarios. It also proposes suggestions of establishing selection guidelines, improving equipment configuration, adhering to auditory-first training and strengthening teacher training, in response to problems such as blind tool selection, insufficient equipment and venues, over-reliance on devices and inadequate teacher literacy.

The limitations of this study lie in: the survey data are descriptive of the current situation, and the training effects of tool application have not yet been verified through controlled experiments; the tool types and operating methods are mainly based on common tools, with limited discussion of AI-based new tools. Future research can carry out intervention experiments on digital-tool-assisted pitch and rhythm training under controlled variables to test its actual impact on training effects, and track the development of digital tools to provide continuous evidence for the digital transformation of wind band training.

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