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Research on the Efficacy and Practical Paradigm of Artificial Intelligence Technology in Primary School Music Teaching

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Abstract

Taking the teaching of basic music knowledge in primary schools as the entry point, this paper explores the auxiliary teaching functions of artificial intelligence. It sorts out the characteristics and training objectives of primary school music education, explains the technical principles of AI-assisted teaching, and designs a complete teaching implementation scheme covering teaching objectives, teaching content, intelligent tool selection, implementation procedures and data collection. Teaching practice shows that AI-assisted teaching can significantly improve primary school students' mastery of basic music knowledge and provide brand-new technical support for classroom teaching. This paper analyzes the practical effects and existing deficiencies of artificial intelligence applied in primary school music classrooms, puts forward optimization suggestions, prospects its application in music education, and offers practical references for the informatization construction of music education.

Keywords

Primary School Music Education; Artificial Intelligence-Assisted Teaching; Basic Music Knowledge; Teaching Practice; Learning Outcomes

1. Introduction

With the rapid iteration of information technology, artificial intelligence has gradually penetrated into education and brought new opportunities for discipline teaching innovation. As a vital component of aesthetic education, primary school music education aims not only to impart basic music knowledge but also to foster students' aesthetic ability and artistic accomplishment. Restricted by large class sizes, prominent individual differences among students and insufficient teaching resources, traditional music classrooms can hardly deliver targeted personalized tutoring. Basic music knowledge such as pitch, rhythm and timbre is abstract. For primary school students whose cognition is still developing, it is difficult to fully arouse their learning interest merely through teachers' verbal instruction.

Endowed with technical features including intelligent recognition, adaptive learning

and virtual interaction, artificial intelligence opens new technical paths for music education. Intelligent pitch recognition systems give real-time feedback on students' intonation performance; adaptive rhythm-training software dynamically adjusts exercise difficulty according to learners' mastery level; virtual reality technology builds immersive music-learning scenarios. These enrich classroom forms and motivate students' autonomous learning.

Artificial intelligence also facilitates educational equity. As an auxiliary teaching means, it narrows regional gaps in music education resources and enables more students to access high-quality music education. For teachers, intelligent tools undertake plenty of repetitive teaching work, freeing teachers to focus on creative tasks such as optimizing teaching design and providing personalized guidance. Existing studies have proven that intelligent systems achieve remarkable results in professional skill training for piano and vocal music. Nevertheless, practical explorations targeting basic music-knowledge teaching in general primary-school classrooms remain inadequate. Therefore, exploring the integration path of artificial intelligence and basic music-knowledge teaching in primary schools conforms to the trend of educational informatization. It carries theoretical and practical significance for constructing an intelligent music-education model and promoting aesthetic-education innovation in basic education.

2. Practical Design of AI‑assisted Basic Music‑Knowledge Teaching in Primary Schools

2.1. Objectives and Content Design of Teaching Practice

The core objective of applying artificial intelligence to basic music-knowledge teaching in primary schools is to improve students' cognition and application of fundamental musical elements via intelligent means. With the support of AI tools, students can comprehend core concepts such as pitch and rhythm and develop abilities to conduct simple musical analysis and elementary creation based on music theory knowledge. Teaching content strictly complies with the Compulsory Education Music Curriculum Standards, covering note identification, time-value combination, scale cognition, basic beat perception and so on.

Artificial intelligence transforms static music-theory knowledge into interactive dynamic teaching content. Intelligent audio-analysis systems offer real-time evaluation and feedback on students' intonation practice; adaptive-learning systems push differentiated rhythm-training exercises according to students' learning status. Considering primary-school students' cognitive traits, abstract musical concepts are visualized through graphic interfaces and game-based tasks. AI-driven interactive staff games help students establish the correspondence between note positions and pitch. AI-accompaniment and intelligent chord-generation tools assist students in understanding tonal rules. The human-machine collaborative teaching model integrates real-time feedback and personalized guidance, makes up for

shortcomings of traditional classrooms and improves learning efficiency of basic music knowledge.

2.2. Selection and Application Strategies of Artificial Intelligence Tools

Selecting AI tools suitable for basic music-knowledge teaching in primary schools should take three dimensions into account: matching degree with teaching content, functional practicality and ease of operation.

For pitch-perception training, intelligent tuning tools equipped with pitch-detection algorithms are adopted. They collect audio via microphones on mobile terminals with detection accuracy reaching ±0.1 cents and output real-time intonation-deviation data. For rhythm training, Auralia 5.0 software is applied. It contains diverse beat materials and supports intelligent adjustment of exercise difficulty. For music-score reading teaching, SmartMusic is used. Based on convolutional neural networks, it recognizes paper staff within milliseconds and converts them into digital practice materials. In terms of hardware, tablets are recommended to deploy the Soundtrap EDU cloud-collaboration platform, which keeps audio latency within 20 ms. An AI-teaching monitoring system is installed on teachers' terminals to track whole-class learning progress in real time and adjust group teaching dynamically.

Teaching implementation proceeds in three phases: AI-supported perceptual learning in the initial stage, two-way error-correction training in the intermediate stage, and cultivation of students' musical creativity in the advanced stage. Meanwhile, intelligent tools cannot replace traditional classrooms completely. AI-generated rhythm exercises are combined with Orff instrument teaching to avoid monotonous teaching caused by over-reliance on technology.

2.3. Teaching Implementation Procedures and Data‑collection Methods

AI‑assisted teaching consists of three links: pre‑class preparation, in‑class interaction and after‑class consolidation. Before class, teachers produce preview micro‑courses on intelligent systems, and platforms push note‑reading and beat‑practice tasks according to students' historical learning status. Human‑machine collaboration is adopted in class: teachers dominate the overall teaching process, while AI systems detect pitch deviations and monitor practice status. Platforms push personalized consolidation exercises after class.

Multi‑modal methods are adopted for data collection: tablets record accuracy rates of rhythm exercises, and cloud‑based speech recognition calculates intonation deviations. Three measurement nodes are set: pre‑teaching test, formative unit assessment and final summative evaluation. All encrypted data are uploaded to an educational big‑data platform for statistical analysis.

3. Analysis and Discussion of Practical Effects

3.1. Analysis of Students' Learning Outcomes

In this experiment, 128 Grade-3 primary-school students were randomly divided into an experimental group and a control group for one-semester comparative teaching. The experimental group received AI-assisted teaching while the control group adopted traditional music-classroom teaching. Classroom observation, unit assessment and platform-collected data were comprehensively analyzed.

The results show that the accuracy rate of intonation discrimination in the experimental group rose from 62.3 % to 86.7 %, with an increase of 24.4 percentage points. The figure of the control group increased modestly from 63.1 % to 71.1 %. In rhythm imitation, the completion rate of complex-rhythm tasks in the experimental group climbed from 46.8 % to 78.4 %, up by 31.6 percentage points. The AI system outputs visualized intonation-correction feedback within 0.2 seconds and improves students' singing-adjustment efficiency by approximately 40 %. Driven by adaptive algorithms, the average test score for difficult knowledge such as chord and mode recognition increased by 22.8 points. The average weekly training duration on intelligent platforms for students in the experimental group reached 3.5 hours, 67 % higher than that under traditional training modes.

In the final test, the average score of the experimental group in basic-music-knowledge tests was 86.4 points, and individual gaps among students narrowed distinctly. Staff-reading efficiency improved by about 35 %, and the recognition time for accidentals was shortened from 4.2 seconds to 2.7 seconds. Practice proves that artificial intelligence can effectively enhance primary-school students' cognitive ability of basic music knowledge and accelerate knowledge internalization.

3.2. Teachers' Teaching Experience and Feedback

Intelligent tools help teachers quickly grasp the whole class's mastery of music-theory knowledge. Taking the simple-score teaching of Twinkle Twinkle Little Star as an example, the system automatically identifies intonation deviations in students' singing and generates learning-situation diagnostic reports. Time spent on collective error correction is reduced from 5-8 minutes to less than 2 minutes, which improves classroom efficiency. The rhythm-training module detects tapping mistakes in percussion practice and achieves an accuracy rate of 92 % for dotted and syncopated rhythms. Heat maps on teachers' terminals visualize class-wide learning status for locating underperforming students. The proportion of one-on-one tutoring in class rose from 15 % under traditional teaching to 28 %, optimizing the allocation of teaching resources.

In kalimba enlightenment teaching, computer-vision tools collect performance movements and overlay standard fingering demonstrations via augmented reality. Error-correction efficiency rises by 39 %, beginners' learning anxiety is relieved, and students' average in-class concentration duration increases by 3.7 minutes.

Meanwhile, front-line teachers report defects of existing tools: the system has insufficient capacity for evaluating harmonic balance in polyphonic works, with a recognition deviation of about 12 % for overtone features in children's chorus. The performance of haptic-feedback devices for hearing-impaired students needs further improvement, and algorithms should be better adapted to real-world primary-school music-teaching scenarios.

3.3. Advantages and Limitations of AI-assisted Teaching

Artificial intelligence delivers prominent advantages in standardized music-theory training. Systems accurately detect pitch and rhythm errors and dynamically adjust exercise difficulty. Benefiting from visual graphs and game-based learning, music-theory memorization efficiency is greatly improved, and class hours for staff-reading teaching are cut from 4 periods to 2.5 periods.

Nevertheless, the technology has obvious limitations. Its accuracy in identifying children's singing emotions is merely 53 %, far lower than evaluation by professional teachers. Some rural schools lack hardware supporting a 44.1 kHz sampling rate, forming high hardware thresholds. Most existing algorithms are built on Western musical systems, yielding a 41 % error rate in recognizing traditional Chinese rhythms. Collecting minors' voiceprint biometric information brings potential data-security risks. Constraints exist in cultivating musical creativity, and the system hardly supports exercises for modern innovative musical techniques. In addition, databases for ethnic-minority musical elements in current systems are insufficient to satisfy diversified ethnic-music-teaching demands.

It can be concluded that artificial intelligence fits standardized knowledge training but cannot fully replace face-to-face instruction from teachers, especially for posture correction in performance and aesthetic-emotional cultivation. A human-machine collaborative teaching mindset must be adhered to.

4. Conclusions and Suggestions

4.1. Research Conclusions

By means of real-time feedback, visualization and game-based teaching, artificial intelligence effectively lowers primary-school students' barriers to learning pitch, rhythm and mode knowledge, and improves learning outcomes as well as classroom engagement. This study constructs a complete pre-class-in-class-after-class human-machine collaborative teaching model, establishing a three-dimensional classroom interaction relationship where teachers play the leading role, artificial intelligence offers assistance and students act as subjects. This model features good transferability and promotion value.

The personalized, low-pressure feedback mechanism of AI effectively supports academically-challenged students, narrows learning gaps and facilitates educational equity. Human-machine collaboration requires reasonable role division: artificial

intelligence undertakes mechanical tasks including data statistics and repetitive training, while teachers focus on core educational work such as curriculum design, aesthetic-education cultivation, emotional communication and classroom management.

4.2. Practical Enlightenments and Suggestions

When implementing AI-assisted music teaching, teachers should prioritize student-centered development, select suitable AI tools around curriculum objectives, and avoid weakening the aesthetic-educational essence of music education. Teachers shall enhance their capabilities in AI-platform operation and data analysis, and transform platform outputs such as accuracy statistics and weakness diagnoses into foundations for teaching-design adjustment and personalized tutoring. Balance technology application and traditional teaching. Links including demonstration singing, music appreciation and cooperative experience must not be substituted by technology. Over-reliance on visualization should be prevented so as not to impair students' auditory perception ability, and achieve organic integration of technology and music classrooms.

Schools shall improve hardware facilities for smart music classrooms and build digital-teaching-resource platforms. Hierarchical teacher training should be carried out to enhance teachers' skills in tool operation, innovative teaching design and data-ethics awareness. Data-management specifications shall be formulated to strictly control access authority for students' biometric information and guarantee information security.

It is recommended to set up interdisciplinary R&D teams to develop user-friendly intelligent-teaching systems matching primary-school music-curriculum standards and existing textbooks. Long-term teaching experiments shall be conducted and multi-dimensional evaluation systems perfected to promote in-depth integration between artificial intelligence and primary-school music education.

4.3. Research Deficiencies and Future Prospects

The subjects of this research are limited to Grade-3 students from one primary school, and the experiment lasts only one semester, so long-term intervention effects cannot be verified. The matching degree between existing AI tools and domestic textbooks needs improvement, and evaluation mechanisms for creativity and aesthetic literacy remain imperfect. Follow-up research should expand sample size and conduct multi-school, cross-grade longitudinal tracking studies. Localized AI music-teaching systems fully conforming to Compulsory Education Curriculum Standards shall be developed, multi-dimensional evaluation systems improved, and attention paid to data security and teaching ethics, so as to give better play to artificial intelligence in aesthetic education.

References

[1] Zhang J. Research on the Integration of Teaching-Learning-Evaluation Empowered by Artificial Intelligence in Primary School Music Education[J]. Gansu Education, 2026.

[2] Ding Y L. Research on Paths for Artificial Intelligence Empowering Core-competency Cultivation in Primary School Music Education[J]. Xueyuan Education, 2025.

[3] Chen N N. Innovate Teaching Modes and Implement Deep Learning — Research on the Application of AI in Primary School Music Education[J]. Test Questions and Research, 2025.

[4] Tang J Q, Dai L L. Boundaries of Artificial-intelligence-assisted Teaching: Professional Judgment and Value Persistence of University Teachers[J]. Heilongjiang Researches on Higher Education, 2026.

[5] Meng X Y, Chen C. Research on Inheritance Paths of "Huaibei Drum" in Primary School Music Education[J]. Anhui Educational Research, 2026(10):31-33.

[6] Ye W Y, Chen J. Research on the Current Situation of Educational Artificial-intelligence-assisted Teaching in the AI Era[J]. Technology Wind, 2025.