Research on the Influence and Mechanism of AI Music Assisted Teaching on the Cultivation of Students' Music Creativity

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Abstract: With the rapid development of artificial intelligence (AI) technology, its application in the field of education is becoming increasingly widespread, providing important support for innovation in teaching content, teaching methods, and learning experiences. Music education, as an important component of art education, is gradually benefiting from the assistance of AI technology, especially demonstrating significant potential in enhancing students' music creativity. This study is based on the current application status of artificial intelligence in music education, exploring the role and impact of AI music assisted teaching on cultivating students' music creativity from both theoretical and practical dimensions, and analyzing its specific implementation mechanism. Research has found that AI assisted teaching provides students with a more targeted and creative learning environment through personalized teaching, real-time interactive feedback, and resource optimization. This approach not only stimulates students' interest in music, but also significantly enhances their abilities in improvisation, composition, and arrangement. In addition, the cross-cultural and diverse resource support of AI technology further broadens students' musical horizons and creative inspiration. Finally, based on the analysis results, the study proposes thoughts and suggestions for the future development of music education, including enhancing the expressive power of AI technology in music education, optimizing the allocation of educational resources, and promoting the transformation of teacher roles, in order to provide theoretical support and practical guidance for the digital and intelligent development of music education in the future.

1. Introduction

1.1. Research Background

Music creativity is one of the important goals of music education and the core content of students' artistic literacy development. Music creativity is not only reflected in the flexible application of music knowledge and innovative artistic expression, but also has a profound impact on students' aesthetic ability, thinking ability, and comprehensive quality development. However, traditional music teaching methods often focus on teachers imparting knowledge, emphasizing skill training and imitation practice, which cannot meet the diverse learning needs and personalized development requirements of students. In addition, limited teaching resources and lack of flexible teaching methods also constrain the cultivation of students' musical creativity. In this context, artificial intelligence technology is gradually penetrating into the field of education, providing new solutions for music teaching through advanced algorithms, intelligent feedback, and abundant resource support. The application of AI technology can not only break through the limitations of traditional teaching, but also inject new impetus into the innovative development of music education.

1.2. Research Objectives and Significance

Based on the rapid integration of artificial intelligence into music education, this study aims to systematically examine how AI-assisted music teaching influences the cultivation of students' musical creativity and to clarify its underlying implementation mechanisms. Specifically, the research

seeks to: (1) analyze the functional characteristics of AI technologies—such as personalized learning pathways, intelligent evaluation, and real-time interactive feedback—in the context of music teaching; (2) explore the practical effects of AI-assisted teaching on students' creative abilities in improvisation, composition, and musical expression; and (3) construct a conceptual framework that explains the mechanism through which AI supports and enhances musical creativity. The significance of this study lies in its contribution to both theory and practice. At the theoretical level, it enriches existing research on music creativity and educational technology by integrating perspectives from artificial intelligence. At the practical level, it provides empirical references and strategic insights for educators and institutions seeking to innovate music teaching models, optimize educational resource allocation, and promote the transformation of teaching roles in the digital and intelligent era of education.

2. Current Situation Analysis

2.1. Current Status of AI Application in Education

With the rapid development of artificial intelligence technology, the application of AI in the field of education is becoming increasingly widespread, demonstrating powerful auxiliary capabilities and innovative potential [1]. AI technology has been used in language learning, adaptive learning, scientific experiments, classroom management, and student behavior analysis in both basic and higher education. For example, adaptive learning systems provide personalized learning plans by evaluating students' learning progress and knowledge mastery in real-time; Virtual teaching assistants can use natural language processing technology to answer students' questions, recommend learning materials, and simulate classroom interactions. Art education, as an important component of the education system, has gradually become a hot topic in the exploration of AI technology. Especially in music education, the application of AI is gradually expanding, including functions such as music generation, intelligent accompaniment, learning progress analysis, and feedback, providing strong teaching support for educators and creating richer and more interactive learning experiences for students [2].

2.2. Connotation and Cultivation of Music Creativity

Music creativity refers to an important form in which individuals express their emotions, thoughts, and innovative abilities through music, covering various aspects such as improvisation, composition, and arrangement. Music creativity not only relies on the accumulation of music knowledge and skills, but also requires students to have flexible thinking, keen aesthetic ability, and unique creative inspiration. The key to cultivating musical creativity lies in providing students with diverse learning resources, a free exploration environment, and tools to support their independent thinking. However, the traditional music teaching method that focuses on skill training often neglects the cultivation of creativity, and the learning process of students lacks diversity and interactivity [3]. This requires the introduction of new teaching models and tools to stimulate students' creative potential and help them enhance their ability to create music through practical experience and multidimensional learning.

2.3. Research Progress on AI assisted Music Teaching

In recent years, significant progress has been made in the application of artificial intelligence technology in music education, providing diverse technical support for the cultivation of music creativity. The breakthrough of AI technology in the field of music generation, such as DeepMind's WaveNet technology, can generate highly realistic music sounds, giving teaching tools more expressive power; MuseNet, as a multi style music generation technology, can create various styles of music from classical to popular, providing students with rich learning materials and creative references. In addition, AI assisted music teaching is also reflected in the development of intelligent accompaniment systems, such as adjusting accompaniment rhythm through real-time detection of students' performance progress and providing real-time interactive feedback for students [4]. At the same time, the intelligent scoring system and learning progress analysis platform can help students accurately evaluate their own learning effectiveness and provide personalized exercise suggestions for weak areas. These technological advancements not only greatly improve the efficiency and quality

of music teaching, but also provide inspiration and support for the development of students' creativity.

3. The Impact of AI Music Assisted Teaching on Music Creativity

The unique advantages of AI technology in personalized teaching, instant feedback, resource integration, and cross-cultural experience provide important support for the cultivation of students' music creativity. AI assisted teaching can not only stimulate students' musical potential, but also guide them to innovate boldly, promoting the development of music education towards intelligence and creativity, as shown in Figure 1.
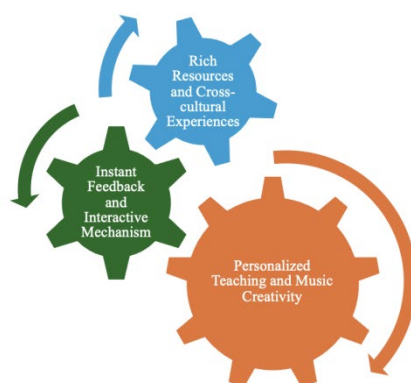

Figure 1. The impact of AI music assisted teaching on music creativity

3.1. Personalized Teaching and Music Creativity

Personalized teaching is a major advantage of AI technology in music education, which can design tailored learning content based on students' learning levels, interests, and goals. Through big data analysis and machine learning algorithms, AI systems can accurately evaluate students' music proficiency, including their pitch accuracy, rhythm sense, and music creation ability. Based on these evaluations, AI systems can recommend practice tracks and creative tasks that are suitable for students, such as providing simple melody creation guidance for beginners and designing multi voice arrangement challenges for advanced learners. This personalized teaching not only allows students to feel a sense of achievement in learning, but also fully stimulates their musical inspiration, thereby enhancing their musical creativity. In addition, AI systems can track students' learning progress, dynamically adjust teaching content, ensure that students always maintain interest and enthusiasm for music learning, and thus stimulate them to constantly try new forms of music creation [5].

3.2. Instant Feedback and Interactive Mechanism

The real-time feedback capability of AI systems is incomparable to traditional music teaching. During the process of music performance or creation, AI can evaluate students' performance in real-time through technologies such as speech recognition, audio analysis, and pattern matching. For example, when students create melodies, AI systems can analyze the harmony logic and structural integrity of the melody, and provide immediate optimization suggestions; when students play musical instruments, AI can identify problems and provide improvement solutions by detecting pitch accuracy, rhythm, and intensity. This real-time feedback mechanism not only helps students quickly correct mistakes, but also encourages them to boldly try new ways of musical expression [6]. Through this dynamic interaction, students can gain clear growth directions in every practice, thereby enhancing their musical creativity. In addition, AI systems can incorporate interactive feedback into music learning through gamified design, allowing students to exercise their music creation skills in a relaxed and enjoyable atmosphere.

3.3. Rich Resources and Cross-cultural Experiences

The advantages of AI technology in resource integration and acquisition provide students with richer materials and sources of inspiration for enhancing their music creativity. Through AI systems,

students can easily access music works of different styles and cultural backgrounds, from classical to modern, from ethnic music to world music. AI can also present these diverse music resources in an interactive way, such as allowing students to "immerse" themselves in a specific cultural context through virtual reality technology. This rich cross-cultural music experience not only helps students broaden their artistic horizons, but also provides new perspectives and sources of inspiration for their music creation. AI technology can also analyze and deconstruct music works, helping students gain a deeper understanding of the creative logic and artistic ideas behind them, thereby providing strong support for their original music creation [7]. In addition, by using AI models to generate music clips or accompaniments, students can try to create music in different styles of backgrounds, thus exploring diverse ways of musical expression.

4. Implementation Mechanism of AI Music Assisted Teaching

The implementation mechanism of AI music assisted teaching is based on data-driven, generative AI, and immersive learning environments. By combining these advanced technologies, AI systems can improve the quality and efficiency of music education from multiple levels, providing diverse and innovative support for cultivating students' music creativity, as shown in Figure 2.
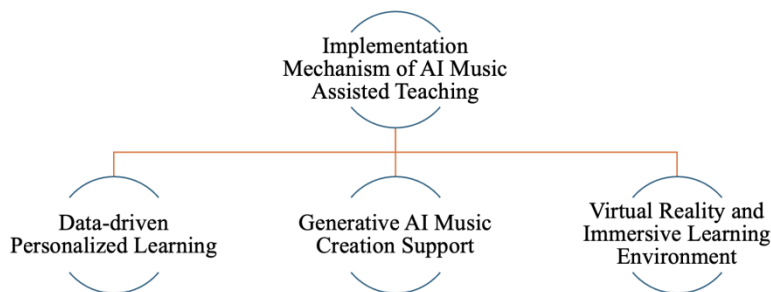

Figure 2. Implementation mechanism of AI music assisted teaching.

4.1. Data-driven Personalized Learning

One of the core advantages of AI technology is its data-driven capability, which enables personalized teaching strategies by analyzing students' learning data. Based on machine learning and big data analysis, AI systems can track students' performance during the learning process, delve into their interests, skill levels, and weaknesses. For example, AI can analyze students' practice records and creative works, predict their learning preferences, and recommend the most suitable music courses and practice materials for them. This data-driven and precise recommendation can not only improve students' learning efficiency, but also enhance the fun and pertinence of learning, thereby stimulating students' music creativity. In addition, AI systems can dynamically adjust teaching objectives based on students' progress, ensuring that learning content always aligns with students' ability development stages and helping them gradually challenge higher difficulty creative tasks. This highly personalized learning experience is difficult to achieve with traditional teaching methods.

4.2. Generative AI Music Creation Support

Generative AI technology provides powerful support tools for music creation. Generative AI models like GPT-4 and MuseNet can generate diverse styles of music clips based on user instructions, ranging from classical to popular, from monophonic melodies to complex polyphonic works. These generated music clips can not only provide students with creative inspiration, but also serve as materials for learning and imitation, helping students understand the structure and characteristics of different styles of music. Students can modify, expand, and even rearrange based on these fragments to create unique and creative works [8]. In addition, generative AI can also respond in real-time to students' creative needs, such as generating harmonic accompaniment or variation segments based on a simple melody provided by students, making their works more diverse. This human-machine collaborative creative approach not only lowers the technical threshold for music creation, but also

provides students with a platform for experimentation and innovation, further enhancing their creativity and confidence.

4.3. Virtual Reality and Immersive Learning Environment

The combination of virtual reality (VR) technology and AI has brought a new immersive learning experience to music education. Through virtual reality, students can enter a highly simulated music learning environment, such as a virtual orchestra, music creation studio, or concert hall. In a virtual orchestra, students can simulate conducting and experience the performance effects of different instruments; In a virtual creative studio, students can use AI systems to adjust the timbre, rhythm, and style of musical instruments in real-time, exploring the infinite possibilities of music creation. This immersive environment allows students to more intuitively experience the charm of music, enhancing their interest and participation in learning. In addition, the scene design of virtual concerts also provides students with opportunities to showcase their creative achievements, enhancing their confidence and performance abilities [9]. Through this dynamic and interactive learning approach, AI not only helps students achieve more efficient music creation, but also provides them with a learning space where they can freely explore and express themselves.

5. Challenges and Countermeasures of AI Music Assisted Teaching

AI music assisted teaching demonstrates the profound impact of technological innovation on education, but also faces challenges such as technological limitations, changes in teacher roles, and unequal resource allocation. This section explores these issues and proposes strategies to promote AI technology to better serve the fair and innovative development of music education, as shown in Figure 3.
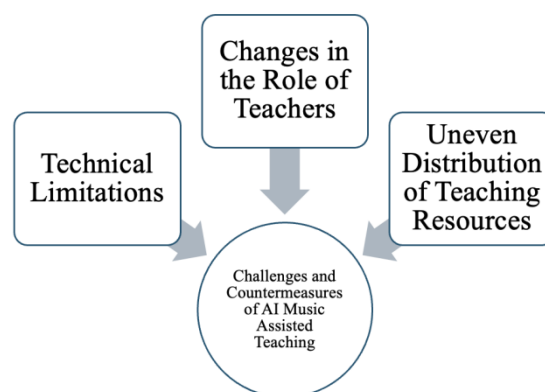

Figure 3. Challenges and countermeasures of ai music assisted teaching.

5.1. Technical Limitations

Although AI technology has shown great potential in music assisted teaching, its ability in emotional understanding and complex creation still has significant limitations. Music is a highly emotional art form, and AI systems often fail to fully understand the emotional expression and cultural connotations behind music when generating it. For example, AI can create harmonious melodies or complex arrangements, but lacks a true understanding of emotional changes, emotional progression, and deep cultural significance in music. In addition, AI assisted teaching systems may have difficulty fully adapting to some unstructured learning or creative expression methods when facing personalized needs of students [10].

To address these technological limitations, it is necessary to continuously strengthen the research and development of AI technology in the field of art, especially in breakthroughs in music emotion analysis, generation, and interaction technology. By introducing more interdisciplinary research, such as combining research results from psychology, neuroscience, and musicology, AI systems are expected to achieve higher levels of development in emotional understanding and complex creative abilities. At the same time, in the process of technological research and development, it is necessary

to pay attention to the mechanism design of human-machine collaboration, so that AI can become an emotional and creative tool in music teaching, rather than just a technical means [11].

5.2. Changes in the Role of Teachers

The widespread application of AI technology not only changes the traditional teaching mode, but also poses new challenges to the role of teachers. With the increasing role of AI systems in personalized teaching and intelligent feedback, the need for teachers to transform from knowledge transmitters to learning guides and creators of creativity has become more urgent. However, this role transition is not an easy task. On the one hand, some teachers may find it difficult to quickly adapt to AI assisted teaching models due to insufficient technical skills; On the other hand, teachers also need to explore how to establish deeper emotional interaction and creative guidance relationships with students with the assistance of AI [12].

Therefore, it is necessary to strengthen the technical training and professional development of teachers, and help them master the basic application of AI technology and teaching integration methods. In addition, more adaptable teaching modes can be designed to enable teachers to collaborate with AI systems. For example, in the classroom, AI systems can undertake tasks such as data analysis and imparting basic content, while teachers are responsible for stimulating students' creative thinking and guiding them to understand the emotional connotations and cultural backgrounds of music. This human-machine collaborative teaching model not only leverages the technological advantages of AI, but also highlights the irreplaceable role of teachers in education.

5.3. Uneven Distribution of Teaching Resources

Currently, there is still a significant imbalance in the distribution of AI music assisted teaching resources across different regions, schools, and social groups. Especially in economically underdeveloped areas, the shortage of educational resources prevents students from fully experiencing the learning advantages brought by AI technology. At the same time, the high cost of teaching equipment and the complexity of technical maintenance have also to some extent limited the widespread promotion of AI assisted teaching.

In order to achieve educational equity, it is urgent to take various measures to promote the equal development of AI teaching resources. Firstly, the government and educational institutions should increase funding for educational informatization construction in underdeveloped areas, and improve the hardware conditions in these areas through donating equipment, providing technical support, and other means. Secondly, we can explore the distance education model based on cloud computing, and share high-quality AI assisted teaching resources to more regions through the Internet. In addition, universities are encouraged to collaborate with enterprises to jointly develop AI teaching systems with lower costs and easier operation, providing affordable technological solutions for schools with different economic backgrounds.

6. Conclusion and Prospect

6.1. Research Conclusion

This study explores the impact and implementation mechanism of AI music assisted teaching on cultivating students' music creativity, and analyzes the challenges and countermeasures it faces in practical applications. The research results indicate that AI technology can effectively promote the development of students' music creativity through personalized teaching, intelligent feedback, and resource optimization, injecting new vitality into traditional music education. However, some issues have also been exposed during its application process, such as technological limitations, changes in teacher roles, and unequal distribution of teaching resources. The existence of these challenges indicates that although AI technology has enormous potential, it still needs continuous improvement and refinement.

6.2. Future Research Directions

With the further development of technology, future research can deepen the exploration of AI

music assisted teaching from multiple aspects. Firstly, at the technical level, the focus should be on researching the understanding and processing capabilities of AI systems for emotional expression in music, and exploring their potential applications in multimodal music creation. Secondly, in terms of educational practice, further attention should be paid to the impact of AI assisted teaching on students' long-term creativity development, especially its applicability to students of different age groups and cultural backgrounds. In addition, the transformation of teachers' roles and the reconstruction of teacher-student relationships are also key topics for future research. By studying how to better implement human-machine collaborative teaching models and exploring the continuous support of AI technology for teachers' professional abilities. Finally, strengthen the cross-border integration of AI music assisted teaching with other disciplines, such as language learning, mental health, etc., to provide students with a more diverse learning experience.

Looking ahead to the future, AI music assisted teaching will continue to play an important role with the advancement of technology and changes in educational models. However, behind the application of technology, it requires the joint efforts of educators and technology developers to ensure that AI technology truly serves the comprehensive development of students and opens up broader prospects for art education.

References

[1] Ma X. Analysis on the Application of Multimedia-Assisted Music Teaching Based on AI Technology[J]. Advances in Multimedia, 2021, 2021(1): 5728595.

[2] Dai D D. Artificial intelligence technology assisted music teaching design[J]. Scientific programming, 2021, 2021(1): 9141339.

[3] Xue X M, Jia Z H. The Piano-Assisted Teaching System Based on an Artificial Intelligent Wireless Network[J]. Wireless Communications and Mobile Computing, 2022, 2022(1): 5287172.

[4] Li P, Wang B. Artificial intelligence in music education[J]. International Journal of Human–Computer Interaction, 2024, 40(16): 4183-4192.

[5] Wei J, Karuppiah M, Prathik A. College music education and teaching based on AI techniques[J]. Computers and Electrical Engineering, 2022, 100: 107851.

[6] Bartneck C , Lyons M J , Saerbeck M .The Relationship Between Emotion Models and Artificial Intelligence[J].Proceedings of Sab Workshop on the Role of Emotion in Adaptive Behavior & Cognitive Robotics, 2017.DOI:10.48550/arXiv.1706.09554.

[7] Li S. Intelligent Construction of University Music Education Teaching System Based on Artificial Intelligence Technology[J]. Journal of Electrical Systems, 2024, 20(3s): 530-539.

[8] Han X, Chen F, Ullah I, et al. An evaluation of AI-based college music teaching using AHP and MOORA[J]. Soft Computing, 2023: 1-11.

[9] Zhai Y, Xu C. The Application of Artificial Intelligence-Assisted Computer on Piano Education[J]. Computer-Aided Design and Applications, 2023, 20(S5): 157-167.

[10] Wang X. Design of vocal music teaching system platform for music majors based on artificial intelligence[J]. Wireless Communications and Mobile Computing, 2022, 2022(1): 5503834.

[11] Yu H, Zou Z. The music education and teaching innovation using blockchain technology supported by artificial intelligence[J]. International journal of grid and utility computing, 2023, 14(2-3): 278-296.

[12] Zhang Y, Song W. Design of an online interactive teaching platform for rural music education based on artificial intelligence[J]. Applied Mathematics and Nonlinear Sciences, 2023.