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Research on the Practice Path of Empowering Piano Teaching with Generative Artificial Intelligence in Colleges and Universities

Jie Wu[1]

[1] *School of Music, Zhaoqing University, Zhaoqing 526061, China*

ABSTRACT

In recent years, with the rapid development of technologies such as cloud computing, big data, and artificial intelligence, there has been a global trend of digital transformation in education. Generative artificial intelligence has gradually integrated into various fields of music education in universities. In the new era of piano teaching in colleges and universities, the rise of using big data and artificial intelligence has provided new driving force for piano courses. Its core goal is to try cutting-edge and technological means to explore and explain the behavior of music performance. These studies are a guide for future music research directions, capturing the personality and spirit of performers through artificial intelligence, comprehensively grasping the internal laws of piano playing process, and ultimately giving back to piano teaching and practice in universities.

Keywords: *Generative artificial intelligence, Practice path, Piano teaching in colleges and universities.*

1. INTRODUCTION

Artificial intelligence is a new interdisciplinary field based on computer science, which integrates multiple disciplines such as computer science, psychology, philosophy, etc. It studies and develops theories, methods, technologies, and application systems for simulating, extending, and expanding human intelligence. It aims to understand the essence of intelligence and produce a new intelligent machine that can respond in a similar way to human intelligence. Research in this field includes robotics, language recognition, image recognition, natural language processing, etc. The rise of big data and artificial intelligence has driven the global digital transformation and the intelligent development of piano teaching in universities. In the field of artificial intelligence, the training of deep learning models is based on the manual labeling of large amounts of data by artificial intelligence. This means that in the direction of music performance, only accurate and fully trained learning algorithm models and computing power can recognize and process high-speed, complex, and subjective piano performance practice data.

Driven by the wave of digital intelligence, piano teaching in colleges and universities has also entered a multi-layered and overlapping cultural field. On the one hand, the innovative development of technology has brought cutting-edge innovation to piano teaching in universities. On the other hand, the demand for independent value of music culture has become increasingly evident. It not only requires iterative innovation of knowledge, but also the formation of a cross regional operating system through deep communication. How to maintain the humanistic temperature of education, safeguard students' exploratory cognitive ability, and cultivate irreplaceable characteristics of artificial intelligence in piano teaching will become the core concept of the artificial intelligence era. This requires university teachers, developers of artificial intelligence technology, and policy makers to form a value community, seek a balance between technological innovation and educational integrity, and jointly draw a new picture of human-machine collaboration in education. There is a must to build a research ecosystem of "university piano+AI" for the future, supported by interdisciplinary collaboration and global thinking, computer science,

musicology, law, sociology, and interdisciplinary cooperation. Besides, the academic community needs to actively promote academic guidelines for open data based on transparent algorithms to prevent data monopolies and biases. Colleges and universities, research institutes, and various social organizations need to establish a stable cooperation model, truly realizing the research ecosystem of "university piano+AI", and enabling piano teaching to radiate innovative vitality in new intelligent fields.

The deep integration of generative artificial intelligence and piano teaching in colleges and universities is an inevitable trend in the development of higher education. Generative artificial intelligence shifts university piano teaching from one-way indoctrination to two-way construction, achieving "human-machine symbiotic education" and breaking through from "cultural defense" to "civilized dialogue". While empowering piano teaching, generative artificial intelligence has triggered a deep change in piano teaching ideology. At the technical level, taking humanistic culture to lead technological culture, it breaks through algorithmic biases and data defects, reshapes the subjectivity and creativity of teachers and students. Generative artificial intelligence is based on powerful big data and computing power to simulate advanced human thinking models. It can process high-quality text images and recordings, engage in natural voice conversations with users, and create creative new content in human-computer interaction. The rapid popularization of generative artificial intelligence, represented by DeepSeek, is reshaping the way humans perceive and work. While generative artificial intelligence empowers piano teaching in colleges and universities, it also faces many risks that need to be carefully examined. Therefore, it is necessary to deeply analyze the internal mechanism of generative artificial intelligence empowering piano teaching in universities, systematically defend against risks and challenges, and explore practical and effective paths for implementing artificial intelligence in piano teaching in colleges and universities.

2. GENERATIVE ARTIFICIAL INTELLIGENCE CREATING CONDITIONS FOR HIGH-QUALITY DEVELOPMENT OF PIANO TEACHING IN COLLEGES AND UNIVERSITIES

2.1 Generative Artificial Intelligence Can Generate a Graph of Textbook Content

With the rapid development of artificial intelligence, many internationally renowned music schools have increased their investment in AI research, such as establishing relevant research institutions and strengthening cooperation with related enterprises to explore the intersection and integration of piano and other art forms. Especially in recent years, the rapid development of neural network algorithms has provided a new research direction for piano teaching practice in universities. By identifying and understanding the complex structure of music works, using the deep algorithms and powerful computing power of computers, highly complex music performance data can be analyzed and recognized in depth, revealing hidden patterns. Generative artificial intelligence can generate personalized knowledge graphs for students at different learning stages. The system recommends exclusive knowledge content for students based on their weak links in learning. The big data platform pushes learning resources for different styles of piano works. Generative artificial intelligence can monitor and analyze students' practice process in real time, evaluates their playing effectiveness and performance status, dynamically adjusts the difficulty level of recommended content, improves students' learning effectiveness, and meets their personalized learning needs.

2.2 Enhancing Multidimensional Visual and Emotional Experiences Through Bullet Comments During the Teaching Process

Generative artificial intelligence can achieve three-dimensional comments of "bullet comments" in the teaching played by teachers during class, that is, commenting on the problems that exist at a certain point in time on the video. Teachers can filter out a student's comments and locate the relevant video content at the time point of the student's comments, observe the behavior patterns of students watching the video, and students will present a common experience of visual, sensory,

and interactive emotions based on the barrage. The presentation of piano teaching methods not only has strong interactivity and repetition, but also includes images and sounds. It not only constructs a digital self-learning resource system for students, but also expands the channels for integrating and reproducing music theory knowledge. Generative artificial intelligence transforms the single teaching scene of university piano into a three-dimensional teaching scene, which can further optimize the vividness and fun of piano teaching classrooms and meet the needs of contemporary piano teaching in colleges and universities in a three-dimensional and digital teaching environment.

2.3 Reshaping the Role and Core Competencies of Teachers

In traditional piano teaching, teachers, as the main body of instruction, mainly rely on standardized teaching materials. Through demonstration teaching and one-way dissemination, students serve as the object of teaching, presenting their mastery of playing skills through classroom and exam performances. This relationship between subject and object is difficult to match the cultural needs of diversified development and the impact of technological waves, and teachers cannot quickly grasp students' ideological and political views. The application of generative artificial intelligence has transformed teachers from traditional instructors of piano teaching skills to guides. Teachers use generative artificial intelligence to identify blind spots in students' understanding and playing of works, and shift from knowledge disseminators with a single teaching theory to value guides. Generative artificial intelligence helps students actively explore and analyze the problems in the learning and playing process through diversified content and teaching forms, enhances students' independent learning ability in piano learning, strengthens their understanding of the musical connotation of works, breaks the one-way and static teaching mode of traditional piano teaching, releases students' subjectivity in learning, and constructs a new form of piano teaching with a dynamic interactive mode.

3. THE RISKS AND CHALLENGES OF EMPOWERING PIANO TEACHING IN COLLEGES AND UNIVERSITIES WITH GENERATIVE ARTIFICIAL INTELLIGENCE

3.1 Weakening the Social Development of College Students

The use of AI generated content by students for answering questions and writing papers can also lead to a significant weakening of their innovative and critical thinking abilities. In the era of fragmented information, students are more inclined to browse through a large amount of information fragments in the fleeting shadows of the internet. Although it improves students' efficiency in receiving new information, it also reduces their ability to think deeply to a certain extent. Especially the analytical and critical abilities developed during the learning process may be excessively eroded by students in the process of text transfer. Artificial intelligence technologies such as DeepSeek can generate answer content according to the task requirements of students' instructions, demonstrating the extraordinary creativity of AI technology. These abilities can significantly improve the learning efficiency of theoretical knowledge for college students, but may also harm students' mental health on a wide scale and hinder the comprehensive development of their creative thinking ability. Long-term reliance on intelligent tools to handle problems can lead students to neglect the cultivation of learning and social skills. If there are practical problems that intelligent tools cannot solve, students will experience anxiety such as being at a loss, which will affect their physical and mental health development.

3.2 Deep-level Threat to Ideological Security Caused by Bias in Generative Artificial Intelligence Algorithms

Generative artificial intelligence may inadvertently break through boundaries and collect sensitive information during information collection, posing security risks to travel information. Students generally have insufficient awareness of data risks and lack awareness of protecting their personal privacy data. In order to obtain more accurate data feedback from generative artificial intelligence, they may inadvertently expose relatively sensitive information such as family background, personal

identity, and address. Algorithmic bias mainly refers to the ideological bias that occurs in the process of generating content in artificial intelligence. Algorithmic bias is mainly a concrete manifestation of the dual limitations of data selection and model optimization. On the one hand, in the process of training generative artificial intelligence, providing sufficient and diverse text as much as possible can enhance the AI's generation ability, but excessive reliance on text will inevitably weaken the authority of ideology; On the other hand, in the reinforcement stage of learning, the subjective cognition of generative artificial intelligence in the output and ranking process of annotated models directly affects the goals and values of the learning model, and further solidifies biases.

3.3 Resulting in College Students Becoming Dependent on Artificial Intelligence Technology

While a new technology brings convenience and facilitates research, it may also lead students to develop a certain degree of dependence on artificial intelligence technology, which is mainly manifested in three aspects: firstly, students experience the fast, light, and easy generation of answers by artificial intelligence, and many students no longer think and solve problems, resulting in a decline in their ability to actively search for and think about theoretical knowledge. Secondly, to a certain extent, it weakens the frequency of communication and interaction between teachers and students. Situational and field based communication can deepen students' understanding of theoretical knowledge, while the ready-made answers obtained by students from generative artificial intelligence will inevitably hinder the development of their broad academic thinking ability, resulting in a single path for students to acquire knowledge. Thirdly, generative artificial intelligence can lead to dependency among students. Using the content generated by artificial intelligence as the source of standard answers may dull students' thinking, weaken their curiosity and exploratory spirit, and lower their critical cognition of theoretical knowledge.

4. RESEARCH ON THE PRACTICE PATH OF EMPOWERING PIANO TEACHING IN COLLEGES AND UNIVERSITIES WITH GENERATIVE ARTIFICIAL INTELLIGENCE

Generative artificial intelligence has brought high-quality and innovative development space for piano teaching in universities, but it also faces certain risks and hidden concerns. To address these issues, a firm and correct empowerment concept should be formed. In the practical process of piano teaching in universities, the supply of data content should be standardized to form a dynamic balance between educational subjects and generative artificial intelligence.

4.1 Practicing the Value Concept of Promoting Virtue and Goodness, and Forming the Leading Force of Core Socialist Values

Faced with the powerful attributes of generative artificial intelligence, in order to ensure the implementation of the goal of fostering virtue in colleges and universities, university teachers should lead the formation of students' educational values with a strong sense of educational sentiment. Moral education is the core concept of university education, and the courses offered by universities have a distinct ideology, which is the key to implementing the fundamental task of moral education. They shoulder the important mission of cultivating talents for the Party and the country. In the face of the complex international political situation, piano teaching in colleges and universities must adapt to the needs of the times, be guided by socialist core values, enhance students' theoretical confidence and consciousness in the theory of socialism with Chinese characteristics, improve their ability to identify and respond to erroneous social thoughts, use artificial intelligence to create a new pattern of music and art education, reshape the way social information is disseminated, and spread correct values based on the individual characteristics and needs of college students. The essence of education is not only the foundation of knowledge, but more importantly, the exchange of souls. Teachers should also enhance their recognition of the values and emotions of higher education in teaching, strengthen the education construction of teacher ethics and style, and strive

to become good teachers with technological literacy, noble moral sentiments, and a compassionate heart.

4.2 Integration and Innovation of Generative Artificial Intelligence and Piano Teaching in the Digital Context

With the rise of the Internet and artificial intelligence technology, students' learning media has undergone tremendous changes. Students can easily obtain massive performance information on the Internet, but it is still difficult for students to identify the diverse performance styles of performers. The author and the research team also tried to build a high-quality network intelligent interactive platform, such as Mozart's piano sonata database construction and course application. Based on piano performance, music analysis, and scientific demonstration, the database iterates from multiple versions, such as web pages, WeChat applets, to build a convenient, scientific, and comprehensive platform for piano teaching resources. In daily piano practice, teachers need to solidify students' traditional playing skills, with finger technique training as the core, requiring students to complete basic exercises such as scales and arpeggios on time every day. Intelligent systems can capture the performer's exertion movements to ensure that the playing tone meets professional standards. Secondly, in the aspect of musical expression, artificial intelligence technology can provide stable prompts, including the breathing of musical phrases and the handling of emotional fluctuations, so that students can avoid overly relying on intelligent technology and losing their ability to express different music styles.

4.3 Standardizing Data Supply to Build a Secure Barrier for Empowering Piano Teaching in Colleges and Universities

It is necessary to improve the standardization and normalization of data, establish a unified paradigm for piano teaching data in universities, specify standardized processes for the entire data cycle, ensure that data is "applied from the source to the end", ensure the controllability and trustworthiness of the entire data process, and enhance the efficiency of data supply. The third is to accelerate the construction of laws and regulations and the security protection of data, clarify the ownership of data property rights and regulate the development and utilization behavior of data, improve principles such as data translation and exchange, strengthen the legal framework for data privacy protection, effectively protect personal privacy rights in the process of data collection, storage, and processing, establish transparent and operable data flow regulations, formulate artificial intelligence technology application guidelines for campus course management and other fields, clarify interface specifications and adaptability requirements, The standardized process document for promoting the security risk assessment guidelines of artificial intelligence systems can be placed at the top.

4.4 Human-Machine Collaboration Achieving Dynamic Balance Between Artificial Intelligence Technology and Educational Subjects

Driven by the dual mode of "humanities+artificial intelligence", university teachers and students should jointly face a new pattern of the future. With the continuous intervention of cutting-edge technologies such as artificial intelligence in piano teaching in colleges and universities, university piano teaching should go beyond the limitations of the discipline, open up cooperation channels at the levels of laws and regulations, ethical review, data review, etc., further construct an inclusive and forward-looking academic framework for piano teaching, and explore how to provide new ideas and practical possibilities for the inheritance, development, and prosperity of university piano teaching in the international exchange of reshaping the global cultural pattern. Artificial intelligence is not meant to replace the dominant position of teachers or students, but rather as a powerful auxiliary tool and partner. Teachers, students, and artificial intelligence technology are not fighting on their own, but rather forming an organic whole system. There is a must to combine the computing power, data processing, standardization of artificial intelligence with human emotional insight, creativity, critical thinking, value judgment, and empathy to achieve the effect of "complementary advantages". With the development of technology, changes in learning stages, and different teaching scenarios, the roles and weights of artificial intelligence and educational subjects need to be flexibly adjusted. In piano teaching practice, it is necessary to constantly observe, evaluate, and optimize the ways of human-machine collaboration to achieve a dynamic balance between artificial intelligence and educational subjects, with the core being "people-oriented". Technology is always a tool, and the ultimate goal of education is always a

state of wisdom where technology serves people and enables them to master technology, ultimately achieving comprehensive human development.

5. CONCLUSION

The deep integration of generative artificial intelligence and university piano teaching is an inevitable trend under the wave of educational digitization, and it has profoundly reshaped the internal mechanism and practical form of university music education. With the development of artificial intelligence, its continuous expansion in the field of piano teaching in colleges and universities has brought revolutionary changes to the teaching content and methods of piano courses in colleges and universities. In the future, colleges and universities will continue to pay attention to interdisciplinary cooperation in music, law, computer science, economics, and other fields, actively building a guarantee system for interdisciplinary and global system thinking. On the one hand, the academic community needs to actively promote academic guidelines for transparent algorithms and open data in scientific research to prevent data monopolies; On the other hand, universities and social practice research institutes should establish a relatively stable cooperation model, truly realizing the sustainable development of artificial intelligence in universities, and giving new vitality to piano teaching in universities in the era of artificial intelligence. It will be a necessity to thoroughly implement the national digital strategy, utilize teaching tools such as generative artificial intelligence, data analysis, and virtual technology to meet the personalized learning needs of students, guiding them to use generative artificial intelligence reasonably, and cultivating comprehensive music talents with data literacy and aesthetic cultivation.

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