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# Research on the Use of Intangible Cultural Heritage (ICH) Music in Primary and Secondary School Music Education in the Era of Artificial Intelligence

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**Abstract:** Recently, the General Office of the Ministry of Education issued the Notice on Strengthening Artificial Intelligence Education in Primary and Secondary Schools, which will basically popularize artificial intelligence education in primary and secondary schools before 2030. Nowadays, in the era of artificial intelligence, how to intelligently integrate intangible cultural heritage (ICH) music into primary and secondary school music education, this paper elaborates in detail from building digital curriculum system, exploring intelligent teaching methods, and applying scientific teaching evaluation, and puts forward practical reform paths to better promote the reform and development of primary and secondary school music curriculum teaching in the era of artificial intelligence, and to cultivate students with high aesthetic literacy and innovation ability that meets the needs of the times.

**Keywords:** Artificial Intelligence; Intangible Cultural Heritage (ICH) Music; Primary and Secondary Music Education.

## 1. Introduction

Recently, the General Office of the Ministry of Education issued the Notice on Strengthening Artificial Intelligence Education in Primary and Secondary Schools, which proposes to strengthen top-level design and departmental collaboration, study and formulate a general education guide on AI for primary and secondary schools and a popularity reader, combine the characteristics of the disciplines and the characteristics of the development of the students, and further improve the requirements of AI education in the courses of information technology, science, comprehensive practical activities, labour, etc., and implement cross-disciplinary learning and large-unit teaching, disciplinary practice and other teaching modes, and encouraging the incorporation of AI education into local and school-based curricula.

Intangible cultural heritage (ICH) music is a treasure of national culture, containing a rich variety of musical forms, such as folk songs, operas and tunes. Incorporating it into music education in primary and secondary schools can enable these precious cultural heritages to be passed on and continue the vein of national culture. Through learning ICH culture, students can learn about the humanities of different regions and then understand the connotation of ICH culture, which is a kind of exercise for students' comprehension and imagination, broadens their knowledge and enhances their sense of national identity. It has a positive aesthetic educational significance for primary and secondary school students.

And music education has an irreplaceable role in aesthetic education. The integration of ICH resources allows students to come into contact with and understand the knowledge and experience of different cultures and different backgrounds, and to broaden their musical horizons. By combining artificial intelligence technology into music teaching and learning knowledge related to ICH cultures, it increases the fun and cultural nature of the music classroom, and lets students experience the charm of ICH cultures, improves their aesthetic ability, and stimulates their creativity and imagination.

How to use artificial intelligence to integrate ICH music into primary and secondary school music curricula will be elaborated in the following three aspects: building a digital curriculum system, exploring intelligent teaching methods, and applying scientific teaching evaluation.

## 2. Building a Digital Curriculum System

### 2.1. Establishment of a Database on ICH Music

At present, there is no uniform and perfect model and standard for the construction of the database of ICH music, so it is necessary to introduce practical relevant standards and norms, and a comprehensive and systematic database of ICH music can be established to support the protection and inheritance of intangible cultural heritage, which is a systematic project.

First of all, the objective and scope are clearly defined and the specific use of the database is determined. For example, the establishment of a set of ICH music database matching the music education in primary and secondary schools is used for teaching practice, academic research, cultural inheritance and so on. At the same time, delineate the region, type and other scope of the covered music intangible cultural heritage, such as the world, China, a province or detailed to a certain region.

Secondly, form a professional team: members need to cover musicology experts, ICH inheritors, database engineers, archivists, etc., in order to collect, organise, enter and manage data from a professional perspective. Carry out collection of resources to obtain rich ICH resources, including text, pictures, audio, video, etc., through field investigation, interviewing inheritors, reviewing historical documents, collecting folk collections, and so on.

Thirdly, it is necessary to design the database architecture, determine the data source according to the online music platform, personal collection or specialized music library, and clean, format and standardize the collected data to ensure the quality and consistency of the data. Pay attention to the copyright issues of the data and ensure that the use of the data is legal. Design a reasonable database structure, including the definition of elements such as tables, fields, indexes, etc., store the metadata of musical scores (e.g., title, artist, album, genre, etc.) as well as the audio files themselves, consider the performance and scalability of the database, and select appropriate database technology and hardware resources to support large-scale data storage and processing needs. Intelligent services such as automatic tagging, personalised recommendation and search optimisation should also be provided. Automatic tagging can be achieved through audio feature extraction and machine learning algorithms to automatically identify the style, genre, emotion and other tag information of the music; personalised recommendation can use collaborative filtering, content filtering and other algorithms to recommend music works that meet the user's taste; search optimisation can be achieved through full-text search, semantic analysis and other technologies to improve the accuracy and efficiency of the user's search.

Finally, digital technology should be used to collect and classify music, digitally archive traditional music, traditional opera and musical arts ICH projects, construct vector data sets of high-quality information on ICH, create indexes to improve the efficiency of the query, and establish the correlation between the data tables to achieve the integration of data and rapid querying, for example, by linking the project number to the information of the project and the inheritor. At the same time to do a good job in the development and protection of digital resources, the use of digital technology to collect, classify and digitally archive the music category of ICH.

## 2.2. Constructing a Knowledge Map of ICH Music

It is a complicated process to construct the knowledge graph of ICH music, which involves many steps such as data collection, ontology construction, knowledge extraction, knowledge fusion and knowledge service.

The first step is to carry out data collection and archival organisation, digital collection and archival organisation of ICH music resources, which is the first step of digitisation, and also the basic prerequisite for realising the effective protection of music-based ICH in the information society. Secondly, music scores, fieldwork notes and other materials can be recorded with the help of high-definition digital photography and laser scanning technology, so as to realise the digital transformation of paper materials. For the musical instruments used in the performance, the acoustic measurement and spectrum analysis technology can be used to collect all-round data such as pitch, loudness and sound length. For the entire music exhibition process, in addition to the use of video recording, motion capture technology can also be used to track the movement trajectory of each node of the performer in three-dimensional space.

Secondly, ontology construction: as the core of constructing knowledge map, the design of ontology is directly related to the quality of knowledge map. It is necessary to clarify the category system of ICH music ontology, such as folk music, traditional musical instruments, etc., and construct the corresponding hierarchical relationship. It can be based on the Intangible Cultural Heritage List to divide the music ICH into traditional music, folk music, operatic music, traditional theatre music, traditional dance music, traditional sports, amusement and acrobatic music traditions, etc., and based on the ethnic characteristics of the ICH to divide into the categories of Han Chinese, Tujia, and Miao ethnicity.

Thirdly, knowledge extraction, analysis and fusion are carried out to analyze and summarize the entities and entity relationships in the text content and refine them into the core humanistic metadata, such as literary genres, included zither scores, embedded emotions, guqin styles and so on. Integrate all metadata extracted from the text (characters, time, zither music, etc.) to form a domain knowledge framework, and then display and gain insight into the internal knowledge structure of the framework. Fuse the collected data and extracted metadata to form a domain knowledge framework.

Finally, knowledge service is carried out to realise ICH semantic knowledge service driven by users' humanistic needs, provide comprehensive and fine-grained humanistic entity or attribute values, quickly gain insight into the overall overview of domain knowledge, accurately grasp the detailed clues of humanistic objects, and deeply excavate the humanistic connotation of ICH knowledge. From the perspectives of metadata feature analysis and ontology modeling, text semantic association analysis, entity and entity relationship fusion, and human knowledge service based on knowledge ontology, this paper discusses the technical realization path of ICH music knowledge graph. Taking the "Guqin Art" in the United Nations Intangible Cultural Heritage list as a case study, we discuss the technical implementation path of humanities knowledge map of ICH in China from the perspectives of metadata feature analysis and ontology modelling, text semantic association analysis, entity and entity relationship fusion, and humanities knowledge service based on knowledge ontology.

Through the above steps, a comprehensive and structured knowledge map of ICH music can be constructed, which can not only preserve and pass on the ICH music culture, but also meet the future needs of music teaching in primary and secondary schools, and better promote its dissemination and research in the global context.

## 2.3. Building School-Based Curricula and Teaching Materials for the Music Discipline

School-based curricula are diversified curricula for students to choose from, developed by schools on the premise of ensuring the basic quality of the national and local curricula, through scientific assessment of the needs of students in their own schools, and by making full use of the curricular resources of the local community and the school. School-based teaching materials are school-based teaching materials, prepared by schools in accordance with their own educational philosophy and curriculum objectives, taking into account the characteristics of the school and the actual situation of the students; they focus on practicality and relevance to meet the teaching and learning needs of the school.

The following steps and strategies can be followed in building school-based curricula and school-based teaching materials for music programmes in primary and secondary schools:

First of all, the objectives of the curriculum should be

clearly defined, with aesthetics as the main line, highlighting the essential features of aesthetic education and strengthening the subjective and aesthetic awareness. The construction of the school-based music curriculum should aim at cultivating students' artistic sentiment, aesthetic ability and comprehensive quality. It should establish the students' subject position in music education, so that the curriculum and teaching materials become aesthetic objects that students enjoy.

Secondly, the content of the curriculum takes into account the local humanistic and geographical environment and ethnic cultural traditions, and develops music curriculum resources with regional, ethnic and school characteristics. Ethnic and folk music of the region (especially music items in the intangible cultural heritage) is applied to the music curriculum. Relying on the original cultural characteristics of the school, such as the lantern masters' workshop, the martial arts club and the dragon and lion dance team, to enrich the school curriculum system. Combining with ICH resources, such as Xianju lanterns, coloured stone inlay and thread lion, students can understand and pass on the local traditional culture. According to the students' characteristics, they are divided into social practice and interest and speciality categories, and are introduced to the history and culture of ICH items, basic techniques and other contents.

Thirdly, school-based curricula and teaching materials for the subject of music should be open and modern, drawing on the essence of the outstanding musical cultures of countries around the world, drawing on the advanced experience of foreign countries, accepting musical works that have recently been successfully applied for inscription as cultural heritage, the latest ICH adaptations, and making use of modern science and technology in the means of preparation. At the same time, they should strengthen their interface with social resources and make use of the resources of the community and enterprises to provide support for the curriculum.

A scientific, systematic and comprehensive school-based curriculum system can be constructed to enable students to develop in an all-round way, while effectively passing on and promoting intangible cultural heritage.

# 3. Exploring Intelligent Teaching Methods

The Circular mentions that, in implementing AI education, primary and secondary schools should take into account the characteristics of AI technology, focus on cultivating the ability to solve practical problems, and vigorously promote teaching based on task-based, project-based and problem-based learning. Targets are also set by lower, middle and upper primary school grades, and by middle and high school stages. Lower primary school grades focus on cultivating a sense of rhythm and musical interest, such as learning simple children's songs; upper primary school grades can begin to learn simple musical instruments; middle school grades strengthen knowledge of music theory and musical expression; and high school grades focus on the cultivation of music appreciation and creative ability. According to the above requirements, teachers need to explore intelligent teaching methods.

## 3.1. Diversely Integrate Resources

In traditional music teaching in primary and secondary schools, teachers have relatively limited access to teaching resources, relying mainly on textbooks, teaching guides and limited Internet resources. The implementation of music teaching related to ICH is even weaker. Generative AI breaks geographical restrictions and enables globalised learning resource sharing, which provides teachers with a powerful tool for resource integration. For example, in the teaching of music related to ICH, teachers can make use of AI to open generative AI platforms, such as Wenxin Yiyan, Zhipu Qingyan, Doubao, Xunfei Starfire, Kimi, etc., to input keywords related to the teaching content, and integrate the resources such as pictures, historical documents, and historical documentaries of ICH from all over the world. These resources are rationally integrated into the teaching content.

To teach "Hakka Mountain Songs", for example, the teacher inputs "Hakka Mountain Songs", and the AI can provide a wealth of resources such as artistic characteristics, lyrics, tunes, inheritance, representative works, high-definition pictures, videos, etc., of Hakka mountain songs from the Poetry and Classic of Poetry to each region of Guangdong. resources. From the many search results, resources that meet the teaching objectives and students' cognitive level are filtered. For primary and junior high school students, choose ICH pictures and video resources that are easy to understand and visually appealing; for senior high school students, choose ICH literature with in-depth analyses.

## 3.2. Personalised Learning Experience

Traditional music teaching in primary and secondary schools mostly adopts a uniform teaching method, making it difficult to meet the individual learning needs of each student. Generative AI can help teachers provide personalised learning guidance for students based on their learning data and behavioural patterns. Taking the teaching of ICH as an example, teachers can use AI to develop personalised learning plans for each student based on data such as students' existing ability, direction of interest, performance ability and learning speed. For students who are weak in certain aspects of the ICH learning process, such as the biting and spitting of lyrics, the rhythmic grasp of tunes, the training of the hand, eye, body and step, and the imitativeness of the characters, etc., the AI may suggest that the teacher provide them with more videos explaining the ICH music learning techniques, relevant rehearsal and performance platforms, and formulate a specialised learning progress arrangement. For example: the teacher collects data related to students' ICH music learning, including pre-study, homework completion, classroom performance, performance, etc.; inputs these data into the generative AI tool, and the AI generates a personalised learning plan for each student based on these data, including learning objectives, learning content, learning progress, etc. Finally, the teacher will provide personalised learning guidance to each student according to the plan provided by the AI, such as arranging one-on-one tutoring or group learning activities according to the student's learning progress. This reflects the teaching of task-based, project-based and problem-based learning.

## 3.3. Enquiry-based Learning Support

Generative AI can support inquiry-based learning. In primary and secondary music classes, teachers can use AI to provide students with background knowledge, music culture, music creation and all-round experience for their inquiry projects. For example, when exploring the ‘Mongolian Long

Tune Folk Song', the teacher determines the theme of inquiry-based learning, inputs keywords related to the 'Mongolian Long Tune Folk Song' to the generative AI, and the teacher collates and filters the background knowledge, ICH culture, and audio and video of performances provided by the AI. Students are guided to use this information to carry out exploratory learning on the grassland culture of 'Mongolian long tune folk song', the characteristics of long tune folk song, and the development of traditional and modern long tunes, etc. In the process of students' exploration, teachers provide necessary guidance and supervision. For example, when students encounter difficulties in the process of audio and video learning, teachers can refer to the specific singing or performance examples provided by artificial intelligence to give guidance, and encourage students to put forward their own opinions, boldly try, learn, experience, perform and carry out stage practice.

### 3.4. Instant Knowledge Update

Subject knowledge is constantly evolving and teachers need to keep their teaching content up to date. Teachers identify areas of updated knowledge in the subjects they teach, enter relevant keywords, and learn and understand the latest knowledge content provided by the AI. Generative AI can help teachers to acquire the latest knowledge quickly. Nowadays, the declaration and establishment of ICH items are also increasingly updated and increased, teachers can use AI to learn about the latest types of ICH, in addition to music ICH there are also theatre ICH, dance ICH, if the teacher is teaching the latest types of ICH, the AI can provide the new features about the latest types (assuming that the latest version at that time), such as the artistic characteristics of the new ICH items, the structure of the tunes, the performance of the audio-video etc., and the teacher can impart this new knowledge to the students in a timely manner. In classroom teaching, new knowledge is integrated into the original teaching system in an appropriate way, such as the introduction of new knowledge on the basis of reviewing old knowledge, so that students can gradually adapt to the updating of knowledge.

## 4. Applying Scientific Teaching Evaluation

### 4.1. Data-driven Evaluation

Traditional teaching evaluation often relies on subjective teacher judgement and has limitations. Generative AI can provide data-driven evaluation. Taking the evaluation of ICH music teaching in primary and secondary music education as an example, teachers can use AI to quantitatively analyses the number of works mastered by students, the degree of mastery of artistic features, and the ability to perform. Teachers determine the various indicators of evaluation and their weights, for example, setting the percentage of the number of works accumulating ICH music at 30%, the degree of mastery of artistic characteristics at 30%, and the performance ability at 40%, etc., and inputting these criteria into the generative AI tool. The AI will give an objective score or evaluation grade based on the pre-set evaluation criteria. Teachers can refer to this objective result and combine it with their overall understanding of the student to make a more accurate and comprehensive evaluation. After receiving the evaluation results from the AI, the teacher can add or adjust the evaluation results by combining with his/her own understanding of the student's usual learning attitude and progress trend.

### 4.2. Comprehensive Process Evaluation

In traditional music course teaching evaluation, it tends to focus more on outcome-based evaluation and pays insufficient attention to students' learning process. Generative AI helps to achieve comprehensive process evaluation. Teachers identify the types of process data that need to be collected, such as the time of completion of assignments, ideas for learning ICH music, quality of questioning, etc., and inform the generative AI tool. As students learn and complete their assignments, the relevant data is automatically recorded and transferred to the AI system (in the case of online learning platforms, this process can be automated; in the case of offline assignments, the data can be entered by scanning or manual input, etc.). The AI analyses this data according to set algorithms, for example, to analyse whether the student's problem solving is clear, whether there is a unique method of presentation, and whether the completion time of the work study or performance is stable or progressively shorter.

Teachers adjust their teaching strategies in a timely manner according to the process evaluation results provided by the AI. If it is found that a student has been relatively single-minded in the learning of ICH music, the teacher can give more guidance to inspire thinking in the classroom; if the student's ICH music adaptation takes too long to complete, the teacher can find out whether there is a lack of mastery of the knowledge points or artistic features, and then carry out targeted counselling.

Through data-driven evaluation, intelligent learning systems can analyse large amounts of learning data to help teachers, schools and even education departments make data-driven decisions. For example, teachers can learn about each student's learning progress and problem areas through student learning data so that they can adopt more effective teaching strategies.

## 5. Conclusion

The above elaboration through the construction of digital curriculum system, exploration of intelligent teaching methods, application of scientific teaching evaluation of three aspects, can be seen that artificial intelligence for the integration of ICH music into primary and secondary school music education provides a richer means of teaching and a more scientific approach to teaching management, which can help to improve the quality of teaching, better meet the learning needs of students, and promote the development of education in the direction of a more intelligent and personalised.

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