

Practical Pathways for Artificial Intelligence to Facilitate the Development of Early Childhood Art Education

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ABSTRACT

Currently, the development of artificial intelligence (AI) technology is gradually transforming the form of early childhood art education, which not only provides more abundant resources to early childhood art education, but also offers new possibilities for enriching young children's creative experiences. The AI-powered painting generation tool enables young children to discover the joy of painting through experimentation, while the intelligent music perception system allows young children to be exposed to more wonderful sounds and enhance their sensitivity to music. With the continuous integration of these technologies into young children's art classes and families, teachers and parents can help young children maintain their curiosity and inspiration about art in the art world mediated by technology. In this regard, this paper explores the practical path of AI in early childhood art education, and considers how to make AI technology a support for the growth of children's imagination, which is of great significance to early childhood art education.

KEYWORDS

Artificial intelligence; Early childhood art education; Practical exploration

1 Introduction

In the process of exploring the high-quality development of early childhood education, the innovation in the field of art is the first to show the power brought by technological change. With the continuous integration of artificial intelligence (AI) technology into the education system, the "National Medium- and Long-Term Plan for Education Reform and Development (2010-2020)" explicitly states "comprehensively improving the quality of early childhood education", and emphasizes the need to "focus on cultivating young children's innovative spirit and practical ability". Meanwhile, the "Education Informatization 2.0 Action Plan" proposes to "promote the in-depth application of information technology in teaching". The introduction of these policies has provide a new path for exploration in early childhood art education. More and more preschool teachers are beginning to consider how to enable AI tools to evolve their roles of demonstration and assistance in art education into partners that stimulate imagination and guide children to express their own emotions. The curiosity and courage of young children in exploring AI can also reveal that a more interactive and open form of art learning is on the rise. Based on this, the paper will take the application advantages of AI in early childhood art education as the entry point to explore the current situation and practical paths of applying AI technology to early childhood art education, in order to realize the wish that "every child can grow up immersed in aesthetic experiences".

2 Advantages of Applying AI to Early Childhood Art Education

2.1 Expand Young Children's Art Expression Methods

In early childhood art education, paper, pencils, pigment or basic materials are usually chosen for creation. These limited media will weaken young children's rich inner visions. The application of AI can make the process of art creation more imaginative. For instance, AI-powered painting tools can automatically generate multi-layered images based on children's lines or color blocks, and present their immature drafts in a more childlike and storytelling way. Meanwhile, AI music tools can capture the vocal characteristics of young children from their casual singing and generate music clips in different styles. Such an experience expands young children's understanding of musical conceptions, and enables them to gradually focus on the emotions and intentions of music.

2.2 Promote the Differentiated Development of Young Children's Aesthetics and Abilities

The development speed of young children's artistic abilities is not consistent, and their interests often vary as well. AI can adjust the intensity and presentation of tasks in a timely manner based on the performance characteristics of young children during activities to enable each child to embark on an artistic path that aligns with their own development pace. When analyzing young children's paintings, AI systems can automatically identify their color preferences. For instance, some young children excel in large-scale color application, while others prefer detailed weaving. Based on this, preschool

teachers can more accurately identify young children's artistic states and choose guidance methods more in line with young children's styles. This differentiated art teaching guidance is not a simple division of stratified teaching, but rather a continuous update of the understanding of children's artistic abilities through dynamic analysis. As young children gradually accumulate experience, their comprehension of aesthetics will also become more individualized^[1].

2.3 Enhance Participation and Immersion in Art Activities

AI makes the interaction methods in young children's art activities more flexible. In the "dialogue" with AI technology, young children will naturally immerse themselves in the artistic situations. All the generation of visual works, the feedback of sounds, and the linkage between images and physical movements can enable children to quickly have artistic experiences. For instance, through the AI-powered painting interactive installation, every brushstroke made by young children will instantly trigger visual effects on a large screen, such as color block diffusion, shape jumping, and character movement. At the same time, young children will feel excited when they see the screen responding to their actions. Such real-time feedback strengthens their creative motivation and makes their art activities more exploratory. In addition, in children's cooperative art activities, AI can generate shared works based on the interactions among multiple young children. Through young children's joint operation, it can gradually form an overall structure of color blocks, graphics or musical rhythms. This "multi-person creation" approach strengthens the sociality and the sense of immersion of art activities.

3 Practical Paths of AI Empowering the Development of Early Childhood Art Education

3.1 Construct Intelligent Resource Platforms to Expand the Creative Space for Young Children's Art Activities

In early childhood art education, the accessibility of art resources and the diversity of the creative environment to a certain extent determine whether young children can truly release their creativity in art activities. To this end, relevant institutions can leverage AI technology to jointly build an open and extensible art resource platform. This platform not only contains multimodal materials such as images, sounds, and movements, but also continuously pushes suitable creative resources based on young children's exploration behaviors, thus enabling them to generate new artistic creation and expression paradigms through free combination and continuous experimentation^[2]. For instance, during painting activities, the system can provide texture templates that better match young children's interests based on their current line drawing progress to assist them in their painting creation. When young children begin trying to learn music, the intelligent system can actively present rhythm segments or timbre samples that appeal to them to help them find their own musical expression logic through experimentation. In order to enable preschool teachers to flexibly master the operation of this platform, developers should make the management method of the resource library more intuitive. therefore, when preschool teachers preset activities, they only need to select an art theme, and the platform will automatically integrate relevant materials and generate multiple activity proposals to facilitate teachers to make adjustments according to the characteristics of different classes. Meanwhile, this platform should also be able to timely track the usage trajectories of young children, and record changes in their selection of art materials and creative achievements to provide clear reference for the arrangement of art activities in the kindergarten in the later stage.

3.2 Integrate a Data-Driven Learning Support System to Promote the Development and Personalized Presentation of Artistic Abilities

The data analysis ability of AI have opened up new possibilities for early childhood art education. The integration of data-driven learning support system can continuously record the operation process of young children on the platform, and generate a growth curve about their artistic behaviors. For instance, when young children frequently experience delays in completing music rhythm tasks, the system should automatically mark this feature on the teacher panel to enable them to determine the cause based on young children's daily performance and provide targeted guidance^[3]. Meanwhile, in order to ensure that the data can support the personalized development of young children, teachers should also use the personality portraits generated by the system as the basis for adjusting art courses. When the learning support platform detects that some children persistently prefer the soft color system, teachers can design more activities related to the emotional expression through colors in the painting course, and guide young children to explore more layers through color perception. If the system identifies that a young child shows a tendency to repeatedly try structures in the process of modeling creation, teachers can incorporate small tasks of structural construction and spatial combination in the class, so that the child can naturally extend his original creative interest. After the art class, the data system can

convert young children's immediate reactions during the activity into visual information prompts for teachers and provide an analysis report on the activity process, thus enabling teachers to design subsequent activities that better meet the children's needs. Notably, teachers should maintain an attitude of "technology as support and education as leadership" when using the system, to help young children fully unleash their artistic individuality.

3.3 Expand Immersive Interactive Experience Scenarios to Advance Art Learning toward Comprehensive Perception

The integration of AI technology and the art space environment enables kindergartens to create an art experience scene with multi-sensory interactions, so that young children can connect with virtual art content through touch, hearing, motion capture and other means. For instance, in a painting classroom, kindergartens can install interactive walls that can recognize body movements to make young children generate colors and lines on a large screen through their body movements, arm swings or rhythm steps to create painting. Through this way, young children's painting experience is not confined to paper, but turns into a full-body sensory activity. Certainly, the immersive experience in music teaching can also be achieved through AI. Kindergartens can build a small sound space, where children only need to gently touch the wall or step on the sensing area on the floor, and the system will present corresponding sounds in the space. This space allows young children to gradually develop an understanding of rhythm, melody and timbre in the chain of "exploring sound - triggering sound - creating sound"^[4]. Additionally, if a young child shows a particular interest in a certain sound, the system can automatically generate more diverse sound variations to support their in-depth perception. In drama performances, kindergartens can apply AI tools to identify young children's movements in real time and map those movements into visual effects. For instance, when young children play the role of small animals, the performance background can automatically change according to their movements, and present different scenes such as grasslands, forests, and raindrops, allowing them to perform artistic expressions in a realistic context.

To prevent immersive experiences from being merely technical demonstrations, preschool art teachers should maintain openness in activity designs. For instance, scenes generated by AI systems can offer multiple change paths, and young children can decide whether the subsequent presentation will be light changes, sound intensification or image extension through discussion, voting or hands-on operation. Such a mechanism can prompt young children to think actively and make choices. To ensure children's safety, kindergartens should give preference to lightweight equipment and flexible materials when building immersive scenes to prevent young children from being bumped or tripped during activities. At the same time, before the activity, teachers need to give a brief explanation of the experience rules to help young children understand which actions are supported by the space and which may not be recognized by the system, so as to create a safe and comfortable artistic atmosphere for them.

4 Key Considerations for Applying AI to Early Childhood Art Education

4.1 Technical Intervention May Undermine Young Children's Independent Expression

Applying intelligent systems to art activities can easily lead children to be led by preset logic during the interaction process. Over time, children's desire for exploration will be restricted to a certain extent. The core functions of intelligent tools usually are providing references and automatic generation. When children frequently rely on these outcomes, the brushes, building blocks or musical instruments in their hands will become dispensable. Some children will gradually grow accustomed to waiting for the system prompts instead of actively trying different lines, colors or rhythms. Furthermore, young children are in the germination stage of artistic expression awareness and should develop their unique aesthetic experiences through exploration and self-trial-and-error. If the patterns provided by technology are overly stable, it will be difficult for children's aesthetic personalities to develop within the repetitive framework.

4.2 Data-Driven Observation Invades Children's Privacy and Psychological Boundaries

The application of intelligent systems in art education scenarios requires the collection of children's facial expressions, physical movements, voice features, and even the subtle changes in the creative process. This seemingly efficient recording way may give rise to another hidden concern: children's learning trajectories and emotional responses are continuously captured to form highly detailed digital portraits. To some extent, this is an intrusion into young children's private information. Since young children lack the ability to judge the scope of data usage, once this information is transmitted among kindergartens, parents, and even technology companies, their growth experiences will be exposed to unnecessary attention. Furthermore, overly quantitative observation methods may alter the psychological feelings of young children, and cause them to reduce the extent of their artistic expression due to excessive exposure, so that the sense of relaxation in artistic activities gradually fades. For this reason, teachers should pay attention to protecting

children's information during the art teaching process, and the information platforms they build should be equipped with information protection modules to protect children's information data from being leaked to the greatest extent.

4.3 Virtualized Experiences May Dilute the Perceptual Value of Real Artistic Materials

The painting interfaces, virtual musical instruments or immersive image spaces provided by intelligent devices can enable young children to quickly obtain visual and auditory stimulation, but these experiences lack the tactile warmth of real materials. For instance, in traditional art activity classes, young children's perception of materials such as the texture and weight of plasticine was achieved through direct physical contact with their hands and bodies. However, virtual environments hardly replicate the delicate feedback from paper, soil, watercolors or wooden instruments. If the artistic experience is increasingly concentrated on the screen, children's sensory worlds may become impoverished, and their exploration ability may be compressed within the "click-drag-confirm" operation mode. At this time, young children are prone to frustration or burnout, and their motivation to keep trying will be undermined. In the teaching process, teachers should rationally design the arrangement of virtual courses and practical art courses, so as to meet children's needs for virtual art exploration, and provide more opportunities for hands-on experience in art activity classes.

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