Research on the Application of AR Technology in Teaching under the New Textbook Context — A Case Study of Elementary School Art Classes

Han Wang
The Affiliated Primary School of Chengdu No. 7 Middle School, Chengdu, Sichuan, China

Abstract: With the introduction and implementation of new textbooks, elementary school art education faces many new challenges. One major concern is the contradiction between the diversified teaching content and the limitations of teaching time and space. The increased breadth and depth of content, alongside limited time and space, pose difficulties in actual teaching. Moreover, students often lack initiative, interest, and motivation for active exploration. This study explores the application of AR technology in elementary art classroom teaching to improve teaching effectiveness, further achieve the goals of textbook reform, and address the teaching problems arising under the new textbook context.
***Keywords*:** AR technology, elementary art, classroom teaching

1. Problems in Elementary Art Teaching under the New Textbook Context

With the implementation of the new textbooks, significant changes have occurred in elementary art education content. The focus has shifted from traditional knowledge and skill acquisition to the cultivation of diverse competencies. As a result, the teaching content has become more varied, incorporating multiple sister art forms and an increased number of artistic knowledge points, covering broader and more in-depth material. These changes are highly beneficial for students' holistic development and the enhancement of core competencies. Under this context, teachers are required to thoroughly understand and master the new content and to plan lessons meticulously and thoughtfully.Given the increase in knowledge points that need to be delivered within fixed teaching hours, teachers must carefully select from among many art forms, balancing the students' learning needs with the importance of each topic. This demands that teachers deeply study the content and efficiently complete teaching tasks within limited class time, thereby placing higher demands on their ability to integrate knowledge and manage the classroom.

The new textbooks further emphasize the student-centered educational philosophy, paying close attention to individual differences and developmental needs. However, in actual elementary art teaching, students often exhibit a lack of initiative. To improve teaching efficiency, classroom models are frequently teacher-centered, with students passively receiving knowledge. This leads to insufficient student engagement and a lack of deep learning. Consequently, students lose interest in art classes and lack creative enthusiasm, which negatively affects teaching outcomes and makes it difficult to achieve the intended goals of the new textbook reforms.

2. Creating Authentic Teaching Scenarios Using AR Technology

Under the context of the new curriculum implementation, elementary art classes face numerous challenges. To address these issues, AR (Augmented Reality) technology can be introduced to construct immersive teaching scenarios. This technology integrates real-world environmental information with virtual object information into the same visual field or space, providing students with a more realistic learning environment that triggers emotional resonance. Immersed in such vivid scenarios and an innovative technological atmosphere, students' interest in learning is significantly enhanced, their classroom engagement is increased, and their creative abilities are effectively stimulated.

2.1 Enriching the Diversity of Teaching Activities

By applying AR technology, teachers can create more realistic and vivid teaching scenarios, enabling students to actively participate in class activities within an environment that combines virtual and real elements. For example, in the fifth-grade second-semester lesson "The Moving You" from the Renmei edition of the new textbook, teachers can begin the lesson by recording sample artworks titled "The Moving You". Then, using AR technology, these static images of people can be transformed into dynamic visuals. During the final presentation stage, students' own artworks can also be recorded and converted into dynamic images. Additionally, teachers can set up a virtual playground environment, making it appear as though the artworks come to life in the real world. In this way, scenarios that originally existed only as imaginary concepts

on paper are vividly brought to life through augmented reality. (Figure 1)

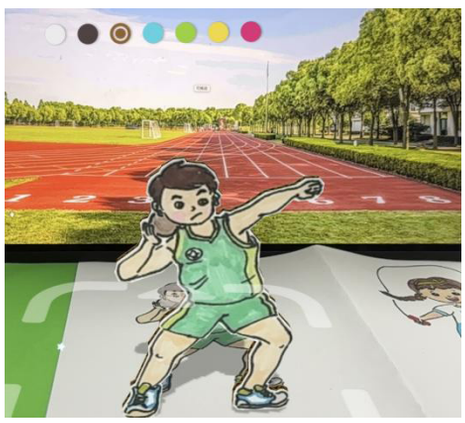

Figure 1. Augmented Reality Scene

2.2 Enhancing Students' Active Participation

With AR technology, students can engage in artistic creation and presentation within a three-dimensional space. This not only increases the fun of the creative process but also greatly expands their imagination and stimulates their enthusiasm for active learning. After completing their own artworks, students can use AR technology to place their creations in a virtual exhibition hall (Figure 2), as if they were in a real exhibition space. In this virtual gallery, students can freely view their work, observe it from different angles and distances, and even compare and interact with the works of others.

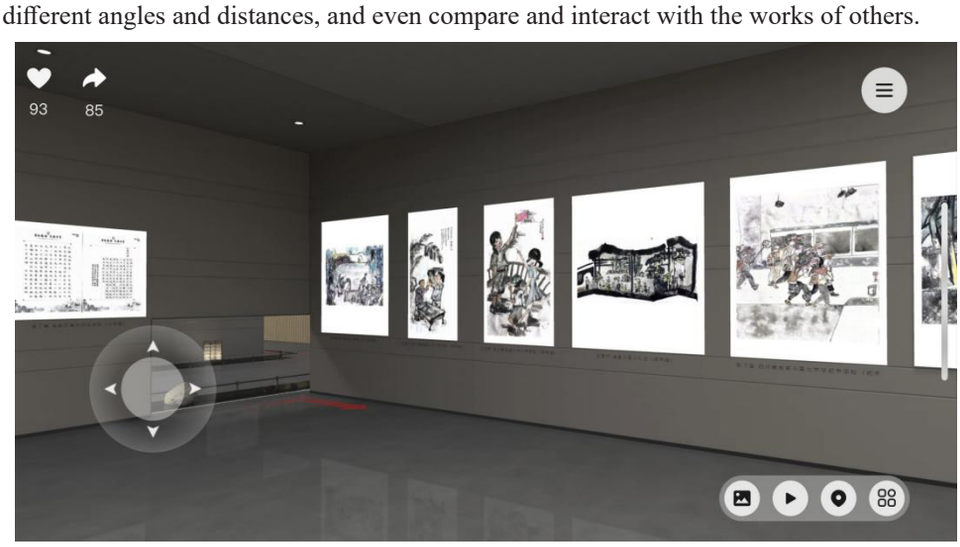

Figure 2. Virtual Exhibition Hall

This immersive experience not only allows students to more intuitively see the actual effect of their works, but also helps them better understand the sense of space and visual impact of artistic creations. Through this approach, students can gain a deeper artistic experience, thereby stimulating their interest and passion for art.In addition, AR technology can promote communication and collaboration among students, as they can discuss and evaluate each other's works together in the virtual exhibition hall, thereby enhancing their critical thinking and aesthetic abilities. In summary, the application of AR technology in art education provides students with a brand-new learning platform, enabling them to create and present in a more vivid and interactive environment, and to engage more actively in the learning process.

3. Promoting Deep Learning through AR Technology Intelligence

In 1956, American educational psychologist Benjamin Bloom proposed the taxonomy of educational objectives, in which he divided learners' cognitive thinking goals into six progressively deeper levels: knowledge — comprehension — application — analysis — evaluation — creation. Deep learning, especially in the classroom, centers on activating students' subjectivity and initiative in learning activities. It is characterized by higher-order thinking, holistic understanding,

meaningful connections, and social interaction. (Figure 3)

In the context of elementary school art education under the new curriculum, the learning content is extensive, and some of it is not easily understood or accessed intuitively by students. Much of the content is abstract and fragmented, making it difficult for students to engage in thorough exploration within a limited time, and preventing them from truly engaging in step-by-step deep learning.AR technology, however, can offer solutions to these challenges. It provides students with immersive experiences and increases classroom interactivity, thereby strengthening the learners' cognitive processing and understanding construction. This allows for a more intuitive grasp of abstract art concepts, facilitating deeper and more meaningful learning.

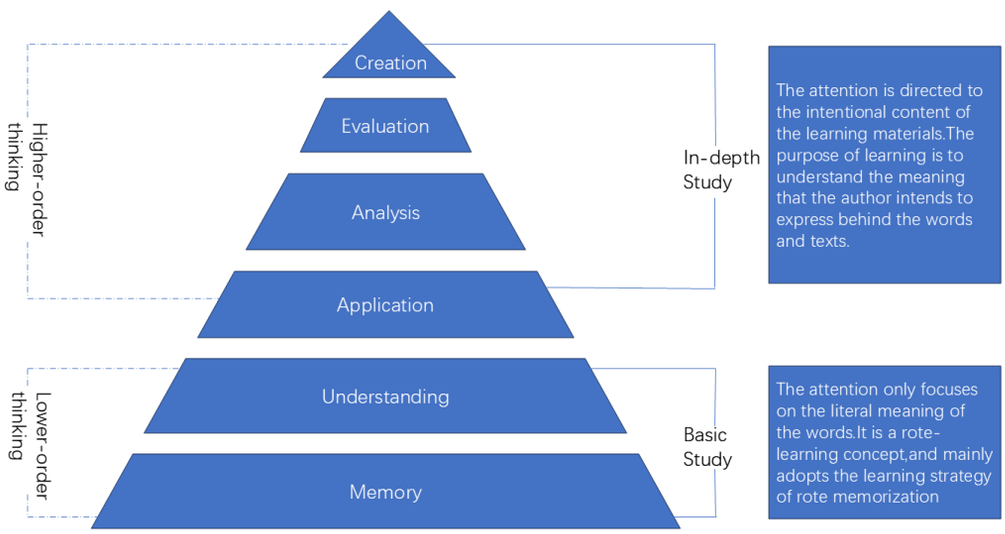

Figure 3. Levels of Learners' Cognitive Thinking Objectives

3.1 Immersive Learning Analysis

In the lesson "The Sound of Frogs Carries Ten Miles" from the third-grade second-semester Renmei edition of the new textbook, in order to help students gain a deeper understanding of the beauty of ink tones in Chinese painting, the teacher used AR technology to invite students on a cloud-based tour of an exhibition of Qi Baishi's works (Figure 4). Through AR technology, students could witness historical masterpieces come to life, as if they were traveling through time and space to observe the vivid details of these classic works firsthand. At the same time, they could learn about the artist's creative background and the context of each piece, enabling them to analyze and understand the story and meaning behind each painting more comprehensively, thus fostering higher-order thinking required for deep learning.

This virtual exhibition tour breaks the limitations of time and space, allowing students—regardless of their physical location—to experience a sense of immersion through the three-dimensional presentation of artworks. Students can participate together in the classroom and feel as though they are truly present at the exhibition, engaging closely with these masterpieces. This kind of interaction not only effectively supplements the teacher's explanation but also helps students gain a deeper appreciation of the essence of Chinese painting and the unique charm of traditional Chinese culture.Such an innovative teaching approach not only eases the contradiction between limited class time and rich teaching content, but also overcomes constraints of time and space. Students are not only able to admire the masterpieces of Qi Baishi, but also learn more about Chinese painting through interaction, including the use of brush and ink, composition techniques, and color matching. This immersive experience allows students to enjoy art while also sparking their interest and love for traditional Chinese culture, thereby better promoting and inheriting the rich heritage of Chinese painting.

Figure 4. Cloud-Based Exhibition of Qi Baishi's Works

3.2 Concretizing Abstract Concepts

Through AR technology, content that is originally difficult to understand or cannot be intuitively presented in a traditional classroom setting can be transformed into multi-dimensional, three-dimensional augmented reality scenes. The interactive nature of this technology enables students to gain a more comprehensive and in-depth understanding, making otherwise dull textbook content vivid and engaging. As a result, the appeal of both the classroom and the curriculum is greatly enhanced. At the same time, AR technology promotes immersive and self-directed learning, helping students achieve deep learning.

For example, in the lesson "The Infinite Starry Sky" from the third-grade second-semester Renmei edition of the new textbook, teachers can make full use of AR resources related to planets. Through these resources, students can visually observe otherwise hard-to-grasp concepts such as the size and distance relationships between planets, which are presented in multi-dimensional, three-dimensional scenes. This kind of presentation not only stimulates students' interest in learning, but also fosters the integration of science and art.In the art class, students not only learn how to depict the starry sky through artistic skills but also, within a deep learning environment, come to understand scientific knowledge through artistic expression. In doing so, they achieve interdisciplinary and integrated learning.

Figure 5. Classroom Scene of "The Infinite Starry Sky"

At the same time, AR technology can present detailed content of artworks from multiple angles or add dynamic elements, enabling real-time interaction and knowledge feedback with students during class. This allows students to intuitively experience the emotions and meanings conveyed by the works.For example, in the third unit "Animal Friends" from the first-semester second-grade Renmei edition elementary art textbook, when students study the lesson "My Favorite Animal," they systematically learn about the structure of animals for the first time. Traditional teaching methods typically use images to present animals' colors, forms, and structures. While this helps students recognize, learn, and draw animals, considering their strong cognitive abilities, broad range of acceptance, and active creative thinking, such conventional methods of knowledge

delivery fall short of meeting their cognitive needs and do not support the deepening of their understanding.Therefore, teachers can make full use of AR technology and AR resources to present a variety of virtual animal models to students. These models can be “placed” on desktops or “suspended” in the air, allowing students to observe them from all directions, actively explore, and analyze the subjects from multiple perspectives. In this way, students can intuitively and efficiently grasp the key knowledge points of the lesson and observe the different movement patterns of animals, thus laying a solid foundation for the third lesson of the unit, “Animal Party.”

Figure 6. Classroom Scene of "My Favorite Animal"

Students’ aesthetic abilities, observational and exploratory skills, as well as their capacity for collaboration, are all greatly enhanced during the teaching process. Moreover, the application of AR technology is not limited to static displays—it can also incorporate interactive games and simulated experiments to further stimulate students' interest.

Through this teaching approach, students not only acquire knowledge but also develop their creativity and imagination. The introduction of AR technology transforms otherwise dry theoretical content into something vivid and engaging. While enjoying the fun of learning, students are also able to better grasp and apply what they have learned. This integration of technology and pedagogy brings new possibilities to elementary art education and offers fresh insights for the future development of education.

Overall, various AR technologies and resources can be appropriately adjusted and adapted according to the specific teaching content in the Renmei edition of the new textbook. The key lies in teachers combining students' developmental needs with the actual classroom context, engaging in careful and thoughtful instructional design. Teachers should avoid applying AR technology blindly, and instead ensure that its use genuinely meets practical teaching needs, thereby effectively enhancing both teaching effectiveness and students’ learning experience.

4. Challenges in the Application of AR Technology in Teaching Practice

AR technology has broad prospects for application in education but also faces multiple challenges related to technology, resources, design, and evaluation. Future research needs to focus on overcoming these issues to achieve deep integration and widespread use of AR technology in education.

(1) Technical Barriers and Cost Issues: Developing and applying high-quality augmented reality (AR) applications often encounter technical barriers and high costs. These applications typically rely on expensive hardware devices, such as professional AR glasses and headsets. The high prices of such advanced equipment make it difficult for many educational institutions and schools to afford them, thereby limiting the widespread adoption and application of AR technology in the educational field.

(2) Lack of Teaching Content and Resources: Although some AR educational applications have appeared on the market, high-quality teaching resources tailored to specific subjects and different educational stages remain scarce. To fully realize the potential of AR technology in education, more educational content developers and professional teams need to participate in jointly developing and providing richer and more diverse teaching resources to meet various learning needs and teaching scenarios.

(3) Instructional Design and Activity Planning: Effectively integrating augmented reality technology into instructional design, as well as planning and designing corresponding teaching activities, is an important challenge for educators today. Educators need to continuously explore and innovate to find best practices that combine AR technology with traditional

teaching methods to enhance students' learning interest and teaching effectiveness. At the same time, educators must consider how to design highly interactive and educationally meaningful AR teaching activities to fully leverage AR technology's advantages in education.

(4) Evaluation of Teaching Effectiveness: How to assess the effectiveness of AR technology in teaching — including improvements in student learning outcomes and motivation — requires more empirical research to provide support.

(5) Device Usage and Classroom Management: In practical teaching, managing and allocating AR devices as well as maintaining classroom order are real issues that educators need to address.

5. Conclusion

In summary, this study analyzed the challenges potentially encountered in elementary art teaching under the new textbook context and proposed that AR technology demonstrates great potential and value in this field. It further discussed specific implementation measures.

By using AR technology to create authentic teaching scenarios, enrich the diversity of teaching activities, enhance students' active participation, and intelligently promote deep learning, AR technology not only improves students' learning interest and creativity but also effectively addresses issues such as completing teaching tasks efficiently within limited class time and students' passive acceptance of knowledge, which lead to insufficient engagement and levels of deep learning.

However, the application of AR technology also faces challenges including technical barriers, costs, lack of teaching content and resources, instructional design and activity planning, and the evaluation of teaching effectiveness. Therefore, future research and practice need to focus on overcoming these challenges to achieve deep integration and wide application of AR technology in education. Teachers and educators should carefully consider students' developmental needs and actual classroom conditions to reasonably plan the use of AR technology, ensuring it truly enhances teaching effectiveness and students' learning experiences. Overall, AR technology brings new possibilities to elementary art education and the entire education field, providing new ideas for the future development direction of education.

References

[1] Zhou Sen, Yin Bangman. Current Status and Development Opportunities of Augmented Reality Technology and Its Application in Education [J]. Research on Educational Technology, 2017, (03).

[2] Wang Tongju. Application and Prospects of Virtual and Augmented Reality (VR/AR) Technology in Teaching [J]. Digital Education, 2017, (01).

[3] Zhang Hongbo. Research on the Application of Augmented Reality Technology in Teaching [D]. Henan: Henan University, 2012.

[4] Jin Zhenwei. Application of Augmented Reality Technology in Mobile Learning Environments [D]. Jilin: Northeast Normal University, 2014.

[5] Ma Yujie. Research on the Application of Augmented Reality Technology in Education [D]. Beijing: Beijing Institute of Graphic Communication, 2016.

[6] Li Ting. Application of Multimedia Technology in Art Classroom Teaching [J]. Research on Art Education, 2024, (21):178-180.

[7] Huang Weili, Chen Weidong. Exploration of the Application of Augmented Reality Technology in Primary and Secondary School Art Teaching [J]. Research on Art Education, 2024, (05):170-173.

[8] Zhong Qiquan. Modern Curriculum Theory [M]. Shanghai: Shanghai Education Publishing House, 2003:134.

[9] Yin Shaochun. Interpretation and Teaching Guidance of the New Curriculum Standards [M]. Beijing: Beijing Normal University Publishing Group, 2022:309-310.