Theoretical Framework and Practical Path of AI-Enabled Animation Teaching

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Abstract. Focusing on the teaching reform of animation majors in private colleges and universities in Liaoning Province, this study proposes a theoretical framework and practical path for AI-enabled animation teaching based on the TPACK theory. The research finds that animation majors in private colleges and universities in Liaoning Province have problems such as insufficient technical knowledge of teachers and disconnection between curriculum design and the industry. Based on this, a hierarchical improvement strategy for teachers' TPACK competence is put forward. Through practical training, teaching design workshops and school-enterprise cooperation, teachers' abilities of technical application and teaching innovation are enhanced; three major curriculum modules are constructed to improve students' AI technology application and practical abilities; and a diversified evaluation system is innovated to fully reflect the teaching effect. The purpose is to provide a practical plan for the teaching reform of animation majors in private colleges and universities, promote the high-quality development of the animation industry in Liaoning Province, and provide reference for colleges and universities in other regions.

Keywords: AI Empowerment; TPACK Theory; Animation Teaching; Practical Path.

1. Introduction

In recent years, the animation industry in Liaoning Province has accelerated its transformation towards digitalization and intelligence, and the demand for compound talents with both animation creation capabilities and artificial intelligence technology application capabilities has become increasingly urgent. However, there is an obvious structural gap between the supply of animation professionals in private colleges and universities and the industrial demand. On the one hand, the teaching model of animation majors in private colleges and universities is relatively backward, and the integration of AI technology with teaching content and methods is relatively low, which makes it difficult to meet the industry's demand for high-quality compound talents. On the other hand, the teaching content still focuses on traditional animation creation technology, and the investment in AI technology-related knowledge and skills is insufficient, leading to a disconnection between the talent training goals and industrial needs [1]. From the perspective of domestic and foreign research status, foreign scholars have extensively explored the application of the TPACK theory in animation and design majors. For example, some art colleges in the United States have realized the in-depth integration of AI and animation teaching through intelligent teaching platforms, forming a collaborative model of technology, teaching and content. However, there is still a gap in targeted research on private colleges and universities [2]. Domestic research mostly focuses on the cultivation of TPACK competence in animation majors of public colleges and universities, ignoring the particularities of private colleges and universities in terms of resource constraints and teaching characteristics. Moreover, regional research on the integration of the animation industry and teaching in Liaoning Province has not been carried out in depth, which is difficult to directly support local practice [3]. Based on the above background, this study, supported by the TPACK theory, clarifies the theoretical logic of AI-enabled animation teaching, diagnoses the TPACK competence shortcomings in animation teaching of private colleges and universities in Liaoning Province, and proposes adaptive practical paths. It aims to provide a phased and practical integration plan for the teaching reform of animation majors in private colleges and universities, and contribute to the high-quality development of the animation industry in Liaoning Province.

2. TPACK Theoretical Foundation of AI-Enabled Animation Teaching

The TPACK theory, namely Technological Pedagogical Content Knowledge, was proposed by American scholars Mishra and Koehler in 2006. It emphasizes that teachers need to integrate Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK) in the teaching process to achieve the optimization of teaching. This theory provides an important framework for teachers' professional development and teaching practice, helping teachers better understand how to effectively integrate technology into subject teaching, thereby improving teaching quality and students' learning effects [4].

In the animation major, Content Knowledge (CK) covers all aspects of animation creation, including professional knowledge such as animation character design, movement laws, and post-production. Animation character design requires students to master elements such as character modeling, proportions, and personality traits, and shape character images with unique personalities and charm through means of lines, colors, and so on. The law of movement is the core of animation, which involves aspects such as the movement mode, speed, and rhythm of objects. Students need to understand the movement characteristics of different objects, such as human walking and running, animal jumping and flying, so as to accurately present the movement state of objects in animation creation. Post-production includes links such as editing, special effects, and dubbing. Students need to master relevant software and technologies to conduct final improvement and polishing of animation works, making them more vivid and wonderful.

Pedagogical Knowledge (PK) also plays a crucial role in animation teaching. Animation teaching needs to adopt diversified teaching methods to meet the different learning needs of students and improve teaching effects. Project-based teaching is an effective teaching method. By dividing students into groups to complete a specific animation project collaboratively, students can comprehensively apply the learned knowledge and skills in the process of project implementation, thereby improving their ability to solve practical problems and teamwork ability [5]. Among them, personalized guidance is also an indispensable part of animation teaching. Teachers need to provide targeted guidance and suggestions according to the characteristics and learning progress of each student, helping students identify their own strengths and weaknesses, and continuously improve and enhance their works.

The importance of Technological Knowledge (TK) in animation teaching is becoming increasingly prominent. With the continuous development of science and technology, animation production technology is also constantly updated and advanced. Generative AI tools refer to tools that can generate new content based on user input by virtue of artificial intelligence technology [6]. In the field of animation, generative AI tools mainly include text-to-image tools, text-to-video tools, AI animation generation tools, etc. A common feature of these tools is that complex visual content can be generated by inputting simple text descriptions, which greatly lowers the threshold of creation and improves the efficiency of creation. For example, Jimeng AI can generate high-quality character designs and scene concept maps according to text prompts, and can convert static images into dynamic animations; AnimateDiff can continue to generate coherent animation sequences based on the generated effects. In addition, the AI learning situation analysis platform can understand students' learning conditions and needs by analyzing students' learning data, provide teaching decision support for teachers, help teachers adjust teaching strategies, and realize personalized teaching [7].

The creative and practical characteristics of the animation major make it highly compatible with the TPACK theory. In terms of creativity, animation character design requires students to have innovative thinking and imagination, and AI technology can provide students with rich creative resources and inspiration, helping them break through the constraints of traditional thinking and create more novel and unique character images. In terms of practicality, the production of animated short films is an important practical link for animation major students. AI technology can provide efficient tool support; for instance, AI editing tools can quickly complete video editing and special effects addition, significantly improving production efficiency and work quality. The application of the TPACK theory in animation teaching needs to highlight "technology empowering creation" and

"tools supporting practice", and construct a theoretical logic that adapts to the animation creation process to meet the needs of talent cultivation in the animation major.

3. Implementation Path of AI-Enabled Animation Teaching

To promote the teaching reform of animation majors in private colleges and universities in Liaoning Province, this study proposes a practical path based on the TPACK theory, aiming to solve problems such as teachers' insufficient technical capabilities and the disconnection between curriculum design and industrial needs. Specifically, it includes improving teachers' capabilities, optimizing the curriculum system, and innovating the evaluation system. The integrated practical path is as follows.

3.1 Hierarchical Improvement of Teachers' TPACK Competence

In terms of improving teachers' capabilities, a hierarchical training strategy is proposed to address the current deficiencies in teachers' Technological Knowledge (TK) and TPACK integration capabilities. Firstly, by collaborating with local animation enterprises in Liaoning Province, practical training on generative AI tools (such as Jimeng AI and Xingliu AI) and AI editing tools (such as Jianying AI) is provided to teachers, ensuring that every full-time teacher can proficiently master and independently use these tools to complete teaching tasks. This training not only helps teachers become familiar with the use of tools but also enhances their ability to integrate AI technology with animation creation in practical teaching under the guidance of corporate technical experts. Secondly, relying on the Liaoning Private Education Association, "AI + Animation" teaching design workshops are organized to guide teachers in designing teaching modules such as AI-assisted character design and AI-optimized short film production, with 2-3 training sessions held each semester. Through case analysis, simulated teaching, group discussions, and other forms, these workshops help teachers integrate AI technology into teaching design and improve their teaching innovation capabilities. In addition, by cooperating with local enterprises to build an AI animation teaching practice base, corporate technical experts are invited to participate in teacher training and curriculum design, and real corporate projects are introduced into teaching cases to make up for the shortage of school resources [8]. This school-enterprise cooperation model not only provides a platform for teachers' practical teaching but also helps them understand the latest industrial technology trends and market demands, enabling them to better guide students in creating works that are compatible with the industry.

3.2 Reconstruction of the Animation Curriculum System

In optimizing the curriculum system, three core curriculum modules are constructed around the core concept of "AI empowering creation and practice supporting competence". The first module is "Fundamentals of AI Animation", which helps students master the application methods of AI technology in animation creation by explaining the principles of AI animation and the operation of basic tools. The curriculum content includes the basic functions of AI tools, operation processes, and specific application scenarios in animation creation, aiming to lay a solid technical foundation for students. The second module is "AI Character and Scene Design", which adopts a project-driven approach to guide students in using AI tools to assist in creative generation. At the same time, combined with group mutual evaluation and teacher guidance, students' creative design capabilities are enhanced. In this module, students learn to use AI tools to generate content such as character designs and scene concept maps through practical project exercises, and complete creative expression and optimization in team cooperation. The third module is "AI Animation Project Practice", which focuses on Liaoning's local characteristic themes, such as "Liaoning Cultural IP" and "Intangible Cultural Heritage Themes", to carry out inter-university collaborative creation, optimize works with the help of AI technology, and conduct data analysis [9]. This module emphasizes practicality and innovation; through participating in real projects, students become familiar with the entire process of

animation creation and improve the quality and efficiency of their works using AI technology. At the same time, the inter-university collaborative creation model also promotes communication and cooperation among students and cultivates their teamwork and communication abilities.

3.3 Evaluation Upgrading

In innovating the evaluation system, a diversified evaluation model of "AI-assisted + Process-oriented + Summative" is proposed [10]. Specifically, AI tools are used to conduct a preliminary evaluation of the color, composition, and other aspects of animation works, helping students quickly identify problems and optimize their works; at the same time, attention is paid to students' performance in the use of AI tools and the creative design process, and process-oriented evaluation is used to record students' growth trajectories and skill improvement. Finally, by combining the quality of works and industrial compatibility, the teaching effect is comprehensively reflected. This evaluation model not only focuses on students' final results but also pays attention to their skill improvement and creative expression during the learning process. For example, when students complete character design, teachers can use process-oriented evaluation to record how students use AI tools to generate initial ideas and further revise and improve them on this basis, thereby comprehensively evaluating students' technical application capabilities and creative design capabilities.

4. Conclusion and Prospects

The teaching reform of animation majors in private colleges and universities in Liaoning Province is crucial for promoting the development of the animation industry. Based on the TPACK theory, this study proposes paths for improving teachers' capabilities, optimizing courses, and innovating evaluation systems, which effectively address the issues of insufficient technical knowledge and the disconnection between courses and the industry. Through training and school-enterprise cooperation, teachers' abilities in technical application and teaching innovation have been enhanced; the curriculum reconstruction has strengthened students' AI technology application and practical abilities; and the diversified evaluation system fully reflects the teaching effect. This provides a feasible plan for the reform of animation majors in private colleges and universities in Liaoning Province and also offers a reference for colleges and universities in other regions. In the future, it is necessary to explore the in-depth application of AI technology, optimize teaching models, strengthen the construction of teaching staff and school-enterprise cooperation, cultivate more interdisciplinary talents who meet market demands, and contribute to the development of the local animation industry.

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