Exploratory Research on Integrated Teaching Modes in Modern Industrial Colleges: Taking the UE5 Landscape Editing Course as an Example

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Abstract

To address the urgent need for professionals who can adapt to rapid digital industrialization and economic shifts, this study redesigned vocational training by embedding real animated series production projects into a UE5 Landscape Editing course. Using a "production-oriented teaching" approach, students engaged in project-based learning that mirrored actual industry workflows, bridging classroom learning with real-world demands. The research combined quantitative and qualitative methods to assess effectiveness. Pre- and post-course evaluations measured 150 students' technical growth in tools like UE5 software and project completion rates, while surveys and interviews with students, instructors, and industry mentors provided deeper insights. Industry partners also evaluated final projects against professional standards. Results showed a 42% increase in students' software proficiency and 85% of projects meeting industry viability criteria. Employers praised improved problem-solving and teamwork skills. The model, dubbed the "Modern Chinese Apprenticeship," centers on three core elements: industry-defined skill frameworks, step-by-step process tasks, and hands-on practice. Early findings confirm the approach effectively prepares innovative, job-ready talent for digital industries. By grounding education in live production challenges, this framework offers a flexible template for aligning vocational programs with evolving economic priorities. Future research will examine long-term career outcomes and how the model adapts across different sectors.

Keywords: vocational education innovation, production-oriented pedagogy, industry-academia collaboration, modern Chinese apprenticeship model

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Introduction

On July 30, 2020, the General Office of the Ministry of Education and the General Office of the Ministry of Industry and Information Technology jointly issued the Notice on the "Guidelines for the Construction of Modern Industrial Colleges (Trial)", which explicitly requires: "Taking the urgent needs of regional industrial development as the guide, facing universities with distinct industry characteristics and close ties with industries, especially application-oriented universities, to establish a batch of modern industrial colleges." This provides policy guidance for vocational colleges to explore educational modernization and further deepen the integration of industry and education (Ye et al., 2021).

To thoroughly implement the spirit of the National Vocational Education Conference and the documents such as the "Several Opinions of the General Office of the State Council on Deepening the Integration of Industry and Education", "China Education Modernization 2035", and the "Action Plan for Improving the Quality and Excellence of Vocational Education (2020-2023)", and to better adapt to the country's accelerated digital development's demand for innovative talents and technological innovation, the School of Digital Art, centered around the layout of the "6+2+X" modern industrial system in Wuxi High-tech Zone and the requirements for systematically promoting the high-quality development of vocational education, seizes the opportunity of the construction of a high-level school in the Science and Technology College, faces the development direction of digital industrialization, takes fostering virtue and cultivating talents as the fundamental task, and focuses on student development. Relying on government and enterprise resources, giving full play to regional industrial advantages, and innovating in school-running characteristics, it proposes to jointly establish a modern industrial college - the "Xinwu Tianji Digital Industrial College" - through multi-subject cooperation with the high-tech zone government and leading enterprises. By innovating institutional mechanisms, it aims to build a community of shared destiny for the integration of industry and education among universities, local governments, and enterprises.

The construction of modern industrial colleges requires courses to be based on industry technology innovation projects, closely integrating industrial practices to innovate teaching content and methods, thereby posing new requirements for the innovation and reform of teaching modes (Zhou & Zhang, 2021). This paper takes the "UE Landscape Editing" course as an example to explore an integrated teaching mode under the background of modern industrial colleges.

Course Learner Analysis

The "UE5 Terrain Editing" course is a core technical-skill course for Digital Media Technology and Game Design majors. Terrain system design serves as the cornerstone of game scene development, directly impacting player immersion and engine performance. The course aims to cultivate students' ability to master the full workflow of UE5 terrain editing, from conceptual design to performance optimization, aligning with AAA-level project development standards in the gaming industry.

Students are second-year students in a three-year vocational college program. They have completed prerequisite courses such as Fundamentals of Computer Graphics, 3D Modeling Techniques, and Introduction to Game Engines, enabling them to perform basic geometric modeling, simple material texture mapping, and navigation of game engine interfaces. Although capable of sculpting single terrain modules, they struggle to construct

kilometer-scale layered terrain systems for open-world environments. While familiar with fundamental material texture principles, they lack mastery of LOD (Level of Detail) technology applications in terrain rendering.

Analysis of Teaching Challenges

The course involves multidisciplinary knowledge from systems engineering and safety engineering, with abstract concepts and weak interconnections that hinder students' ability to form systematic understanding. Engine mechanisms such as Nanite virtualized geometry and Z-curve decomposition are challenging to grasp intuitively. Traditional lecture-based teaching lacks visualized instruction and real-time feedback, leading to student disengagement. Practical engineering experience and teamwork training are insufficient, resulting in a disconnect between theoretical knowledge and industry requirements. Students struggle to meet workplace demands and lack preparation for advanced research. To address these issues, the teaching approach emphasizes three key strategies:

Systematic Cognitive Construction

For example, when adjusting terrain Scale parameters, students must simultaneously modify virtual texture resolution and lightmap density. This integrates practice across terrain sculpting, material blending, and lighting rendering modules. GPU performance analysis tools visually demonstrate the impact of parameter adjustments on frame rates, making abstract performance optimization principles tangible.

Industry Standard Integration

Incorporate corporate acceptance criteria into the curriculum, such as developing an “Enterprise Standard Simulator” plugin that allows students to compare their work against industry benchmarks in real time. Teachers employ visualized explanations and interactive feedback throughout pre-class, in-class, and post-class phases.

Practical Teamwork Development

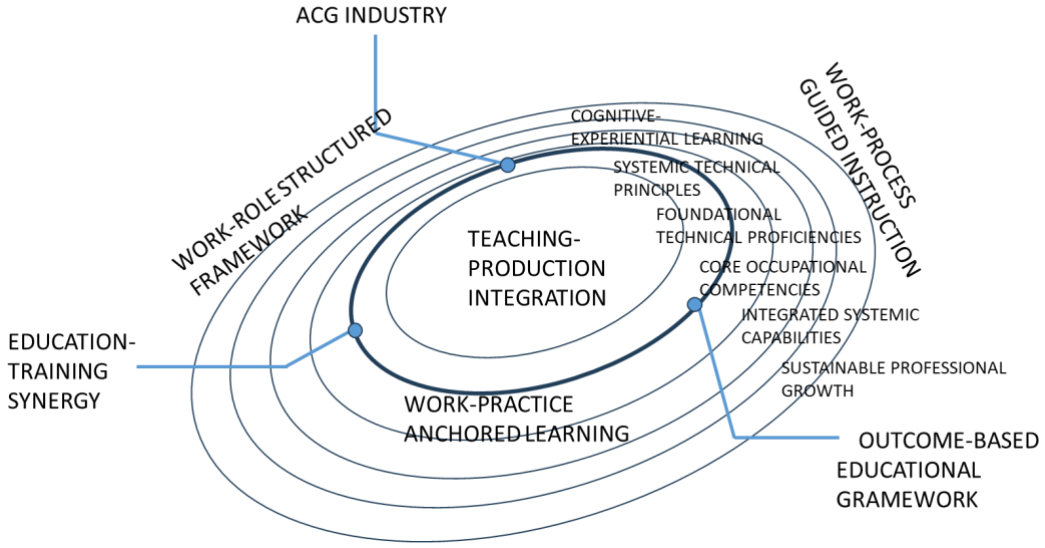
While theoretical knowledge is foundational, the course prioritizes project-based learning to bridge gaps between academia and industry. Through collaborative tasks mimicking real-world workflows, students gain hands-on experience with industry tools and develop teamwork skills essential for both employment and advanced research.

Integrated Teaching Model

To meet the demands of accelerated digital development and regional industrial transformation, this course adopts an integrated teaching model aimed at strengthening students' vocational competencies and sustainable development capabilities. By aligning closely with enterprise production workflows and job requirements, it introduces authentic “animation series” industry projects (as illustrated in Figure 1) to facilitate project-based learning. This approach supports independent inquiry, enables production-oriented teaching, and enhances students' practical and innovative capacities, ensuring seamless integration of professional qualities with corporate needs.

Figure 1

Talent Cultivation Model of the Modern Industrial College



The model constructs a "Chinese-style modern apprenticeship" talent cultivation framework characterized by "integration of education and training, outcome-oriented goals," framed by work structure, guided by work processes, and initiated through work practices. This fosters high-quality applied, composite, and innovative talents capable of adapting to and leading digital industrialization developments.

Multidisciplinary Integrated Teaching

With the rapid advancement of technologies such as 5G, big data, cloud computing, and artificial intelligence in recent years, emerging industries are flourishing, driving an increasing demand for cross-disciplinary talents (Liu, 2020) . Therefore, we focus on advancing the integration of technology and art within the digital economy sector, deepening professional connotation development, and strategically adjusting specialty structures to create characteristic professional clusters combining "art + new engineering" and "art + culture." This framework supports interdisciplinary convergence for digital industrialization, starting from innovative talent cultivation plans, curriculum systems, and pedagogical methods to establish discipline-specific standards aligned with talent development goals. The aim is to nurture high-quality applied, composite, and innovative talents required for digital industrialization.

In practice, our teaching team breaks disciplinary boundaries to construct a multidisciplinary knowledge system grounded in safety principles. By integrating cross-disciplinary content, we implement integrated teaching to enhance students' systematic understanding and comprehensive grasp of knowledge.

The industrial college currently offers four specialties: Animation Design, Film and Television Animation, Visual Communication Art Design, and New Media Art Design. Aligned with digital economy industries, we adhere to two professional development directions: "art + new engineering" and "art + culture," cultivating compound talents in visual interaction development, graphic visual applications, and virtual software development (Peng & Jiang, 2024). Rapid technological evolution in digital economy industries necessitates agile adjustments to specialty structures and talent cultivation directions within

professional clusters. Consequently, the Film and Television Animation program will be suspended in 2022, with the new Virtual Reality Technology Application specialty introduced.

The curriculum team designed a 10-week teaching process to master UE5 scene system principles and develop 3D spatial design thinking. This includes:

Phase 1: System Analysis and Structural Design under Scenario Context
Focus on mastering UE5 scene system principles and establishing 3D spatial design thinking.

Phase 2: Risk Control and Safety Design
Emphasize hazard source control and safety verification methods in terrain design.

Phase 3: Airworthiness Standards and Compliance Verification
Cover industry standard implementation and outcome validation methodologies.

Blended Online-Offline Teaching

The course team implements a blended online-offline learning model across pre-class, in-class, and post-class phases using digital platforms. Pre-class, instructors release learning resources on platforms like Chaoxing Learning to facilitate preliminary study. During class, interactive Q&A, real-time quizzes, and feedback are conducted via online tools, allowing dynamic adjustment of teaching priorities based on student responses. Post-class, assignments are collected, evaluated, and used to refine subsequent lesson focuses. This process refines the overall pedagogical approach.

Leveraging platforms such as Chaoxing Learning and institutional resources, the team uploads foundational toolkits, industry case libraries, and cutting-edge technical packages for supplementary learning, ensuring students connect theoretical knowledge with current industry developments.

Pre-class materials include airworthiness regulatory documents, system safety analysis standards, key references, and classic cases, enabling students to familiarize themselves with research tools and cultivate interest. The BOPPPS (Bridge-in, Objective, Pre-assessment, Participatory Learning, Post-assessment, Summary) framework structures lessons, while heuristic teaching strategies engage students through case-based questioning. For example, displaying a screenshot of the snowy mountain terrain from Red Dead Redemption 2, instructors pose questions like, “How to achieve seamless kilometer-scale terrain loading in UE5?” Solutions guide students through real-time demonstrations of layered terrain sculpting and virtual texture mapping techniques.

Industry-Academia-Research Integrated Teaching

The UE5 Terrain Editing course emphasizes both theoretical knowledge and practical skills, aiming to cultivate students' terrain system design capabilities, performance optimization thinking, and industry standard awareness. Through industry-academia-research integrated teaching methods, the course aligns classroom instruction with cutting-edge technological advancements and strengthens connections between teaching processes and project practices, ultimately achieving industry-driven talent cultivation. While imparting foundational expertise, the curriculum emphasizes analysis of project-based practical cases and

school-enterprise collaborative education, enabling students to apply acquired knowledge and stay abreast of industry trends. Research advancements are incorporated to introduce future research directions and hot topics, enhancing students' learning motivation.

In school-enterprise collaborative education, authentic industry projects are integrated. Based on disciplinary characteristics and project production requirements, “diversified, real-scenario, and multi-dimensional” immersive practical training is implemented. This ensures curriculum content aligns with technological development, teaching processes connect with production workflows, and talent cultivation merges with industrial demands. Students' project management abilities and complex problem-solving skills are systematically enhanced, fostering holistic industry awareness and equipping them with vocational competencies required for industrial development.

An integrated teacher development center is established as a base for cultivating “dual-qualified teachers with both teaching and technical expertise.” The center allocates annual dedicated training funds to prioritize the development of promising mid-career teaching and technical backbone faculty, offering regular exchange seminars, technical training programs, and industry internship opportunities (e.g., visiting engineer positions) to create career development pathways. Dedicated incentive funds are provided to motivate faculty growth through evaluation and reward mechanisms, supporting joint instruction by school and enterprise mentors to build high-level teaching teams. Leveraging industry resources from partner enterprises, the center introduces industry standards to establish standardized vocational certification systems. Driven by disciplinary expertise, it develops “talent competency models” tailored to job roles, offering multi-dimensional skill certifications for students and professionals, alongside high-quality instructor certifications for educators.

Conclusion

This study addresses the disconnect between vocational education and industrial demands in the context of digital industrialization, using Unreal Engine 5 (UE5) terrain editing as a reform vehicle to establish a three-dimensional teaching model framework integrating “multidisciplinary, online-offline, and industry-academia-research fusion.” The research innovatively merges artistic design with engineering technology, achieving deep coupling between classroom learning and industry practices through embedded real animation production projects. Implementation adopts production-oriented pedagogy and the BOPPPS instructional structure, leveraging digital platforms like Chaoxing Learning to create a full-process optimization mechanism of “pre-class preview - in-class interaction - post-class feedback.”

Quantitative evaluations reveal that among 150 participating students, UE5 software operational skills improved by 42%, with 85% of course projects meeting industry feasibility standards. Employers' ratings of students' problem-solving and teamwork abilities increased by 40% and 25%, respectively. The study validates the effectiveness of the “modern Chinese apprenticeship” model, which anchors vocational education in authentic production scenarios through core elements such as industry skill frameworks, phased task design, and dual-mentor systems. This provides a replicable paradigm for cultivating innovative talents with both technical competence and professional literacy for the digital industry.

Future research will expand into smart manufacturing, virtual reality (VR), and other fields, exploring the construction of diversified vocational certification systems while deepening mechanisms for developing "dual-qualified teachers with both teaching and technical expertise." This aims to continuously optimize industry-academia-research collaborative innovation ecosystems, providing talent support for high-quality development in the digital art sector.

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