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PBL-Driven New Model of Digital Performing Arts Education-Industry Integration: Theoretical Construction and Practical Exploration

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Abstract

This study provides an interpretation of the Project-Based Learning (PBL) teaching model, clarifying its instructional characteristics, implementation process, and application effects. It uses interviews and questionnaire surveys to explore the industrial transformation trends, social innovation characteristics, and new talent demands within the digital performing arts industry. This exploration aims to identify suitable digital performing arts specializations for the application of the PBL teaching model. Leveraging partnerships with industry enterprises and social organizations, a project-based teaching plan integrating education and industry was designed and implemented for digital performing arts students. This plan established authentic project contexts, formed project teams, assigned tasks and responsibilities, conducted practical operations, and culminated in project outcome presentations. During implementation, action research methodology was used, with quantitative assessment tools tracking and recording students' performance and improvement in creative generation, problem-solving, teamwork, and continuous learning abilities, to evaluate the teaching's effectiveness. The results indicate that the education-industry integrated PBL (Project-Based Learning) approach can effectively stimulate students' learning interest and foster their engineering awareness, innovative thinking, and teamwork skills. This approach enables students to quickly adapt to the industry's demand for versatile talents, leading to positive teaching outcomes. This study offers valuable practical insights for how digital performing arts majors can implement project-based teaching and achieve effective education-industry integration.

Keywords

PBL, Digital Performing Arts, Education-Industry Integration

1. Introduction

Digital technologies are driving the digital transformation of the performing arts industry, forming a new technology-centered emerging industry characterized by high technological integration, cross-disciplinary fusion, and personalized customization. The popularization of AIGC (AI-Generated Content) technology has lowered the barriers to digital content creation, improved creative efficiency, and emphasized original thinking and artistic sensibility. This is prompting design education to shift from skill training to fostering creative thinking and individual style development.

Customized digital performing arts content catering to personalized and fragmented demands is becoming a new trend, promoting industrial structure upgrades. AIGC technology is changing traditional workflows and role positioning, transforming designers from technical executors to creative leaders. The future digital performing arts ecosystem will reorganize around original content, with personalization and diversity replacing homogeneity.

Digital technology is profoundly transforming the traditional performing arts industry, leading it into a new wave of industrialization and intelligence. Although there is a technology-driven trend, humanistic care and artistic value remain the foundation for development. The industry landscape and creative concepts will undergo revolutionary changes as a result.

The digital performing arts industry is undergoing rapid transformation. The "Global Digital Performing Arts Industry Development Report" shows that the industry has maintained an average annual growth rate of over 15% in the past decade. Survey results indicate that 80% of respondents believe digital technology has a significant impact on the industry, while 70% think talent demands are shifting towards creativity, interdisciplinary skills, and innovation capabilities. 60% of respondents have noticed an increased demand for emerging positions such as virtual reality engineers, and 75% believe these new roles place greater emphasis on creativity and innovation skills.

This change has given rise to the concept of "super individuals", referring to comprehensive talents possessing interdisciplinary knowledge, innovative capabilities, teamwork skills, and the ability to learn continuously. These "super individuals" can adapt to the industry's rapid development and demonstrate innovation and leadership. They are not limited to a specific field but possess knowledge and skills across multiple domains, capable of integration and cross-disciplinary innovation.

Cultivating "super individuals" has become a crucial strategy for the digital performing arts industry to address the changing job structure and new talent demands brought about by technological advancements. This innovation and upgrade in talent cultivation models stem from a profound understanding of industry transformation and talent needs.

The traditional industry-education integration model faces challenges of insufficient application scenarios in the digital performing arts field. The 2023 Digital

Performing Arts Industry Development Report shows that over 75% of enterprises believe recent graduates lack practical project experience in complex application scenarios. More than 70% of practitioners think the traditional model suffers from a lack of application scenarios. Among 100 digital performing arts students surveyed, only 36% have a positive attitude towards their own innovation and practical abilities. This reflects the difficulty of the traditional model in meeting the digital performing arts industry's demand for innovative talents.

New training models should focus on introducing more practical projects and application scenarios to enhance students' hands-on experience and innovation capabilities. This would not only strengthen students' employability but also better meet the needs of industry development. Building a new digital performing arts training model to cultivate "super individuals" with interdisciplinary knowledge and innovative abilities is crucial for promoting healthy industry development.

2. Related Studies and Tools

The competency model is a theoretical framework describing core capabilities for specific professions, originating in the early 1970s. It primarily includes transaction capability models and functional capability models. Traditional digital performing arts talent cultivation adopts the functional capability model, but it needs adjustment with industry development. The competency model is closely related to training models, guiding program design, supporting implementation processes, and optimization. It is significant for digital performing arts talent cultivation: determining professional quality requirements, guiding course settings and teaching designs, and aiding continuous optimization of training models. The competency model analyzes industry demands, clarifies core competencies, and lays the foundation for training program design. It ensures course content and teaching activities align with industry requirements, matching student abilities with industry needs. Through continuous comparison and adjustment, it promptly identifies and solves problems, improving training effectiveness. The growing demand for talent in the digital entertainment industry includes not only technical skills but also creativity and teamwork, underscoring the importance of the competency model.

The cultivation goals for digital performing arts talents should adapt to industry demands by establishing a matching competency model. The model construction starts from the cultivation objectives, clearly defining the required knowledge, skills, and qualities. All aspects of the cultivation process should connect with the model's requirements, including course settings, teaching methods, and practical training. An assessment feedback mechanism drives model optimization, identifying gaps through evaluations and forming feedback to guide revisions. Establishing a dynamic interaction mechanism between the model and cultivation ensures continuous development.

The construction process includes clarifying cultivation objectives, analyzing industry demands, establishing a four-factor model framework (creativity, technicality, integration, practicality), developing a matrix of competency indicators, and validating and refining the model. This process involves confirming objectives, analyzing job requirements, establishing frameworks, creating indicator systems, and practical validation, forming a scientific and systematic model construction process to ensure that cultivation goals are highly aligned with industry needs.

In the digital environment, high-skilled talents integrate technology and innovation, becoming both masters of digital technology and creators of digital content. High-skilled talents in digital performing arts possess the following characteristics: a profound understanding of digital technology trends, proficiency in advanced algorithms and tools, creative imagination and artistic expression, market insight and business decision-making abilities, interdisciplinary integration skills, rapid learning adaptability, and data-driven thinking.

Based on these characteristics, a closed-loop, sustainable competency model for digital performing arts talents has been constructed, comprising four levels: creativity and content creation capabilities, technology and innovation capabilities, interdisciplinary integration capabilities, and application practice capabilities are shown in Figure 1. This model forms a cyclical system from creativity to practice, realizing the implementation of ideas through technological support and interdisciplinary integration, accumulating experience in practice, and providing impetus for the next round of innovation, thus achieving sustainable development.

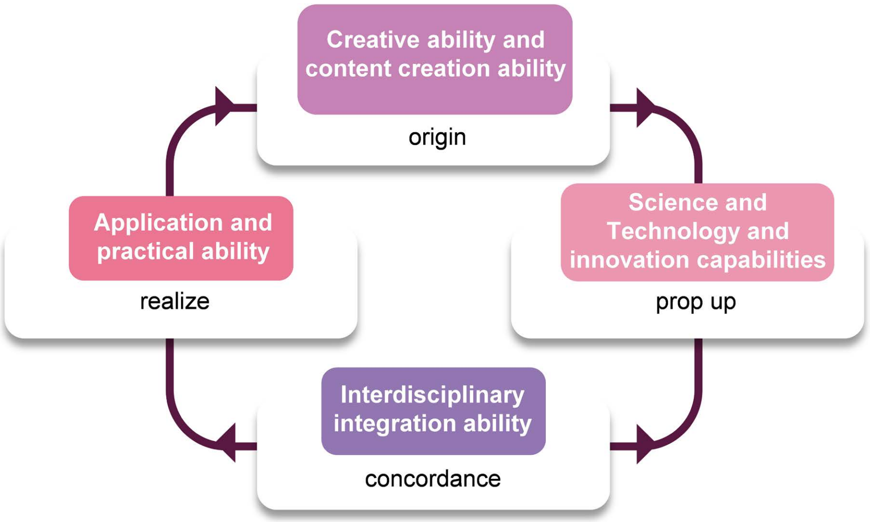

Figure 1. Occupational competency model.

Project-Based Learning (PBL) theory is an educational approach based on students' participation in real-world projects, promoting learning and skill development through solving practical problems. PBL theory offers three key insights for digital performing arts talent cultivation: emphasizing learning experiences through real projects, combining knowledge transfer with skill development, and promoting the integration of school and enterprise resources (Bosch & Klaus, 2020).

When constructing a new talent cultivation model for digital performing arts, it is essential to establish digital teaching environments, introduce real projects and application scenarios, achieve integration of production and education, and optimize professional competency models. Schools can design projects such as digital film and television production and virtual reality technology development, collaborating with enterprises to evaluate student performance and adjust training programs accordingly.

PBL theory provides important references for digital performing arts talent cultivation. Through project-based teaching, students can master professional knowledge and skills in practice, develop problem-solving abilities and innovative thinking, better meeting the needs of industry development. Schools can also provide personalized guidance based on students' strengths, promoting their all-round development.

The digital environment provides a technical foundation and practical platform for the talent model, promoting the development of students' comprehensive abilities. Through digital platforms, students can engage in creative exchanges, technical learning, and project collaboration, making the learning process more efficient and convenient. Application scenarios cultivate creativity and practical skills through real-world project cases, fostering problem-solving and teamwork abilities, better preparing students for future career demands.

The integration of industry and education combines academic teaching with industrial practice. Students interact with enterprise mentors, mastering cutting-edge technologies and engaging in interdisciplinary innovation, thus enhancing their technical and innovative capabilities. Project-driven approaches permeate the entire talent development process, with students participating in complete project cycles from initiation to conclusion, combining theory with practice, accumulating experience, and achieving sustainable development (Gao, 2019).

This "digital environment + application scenarios + industry-education integration + project-driven" training model highly aligns with the talent model, effectively promoting the comprehensive development of digital performing arts talents and laying a solid foundation for their future career development.

The "Digital Environment + Application Scenarios + Industry-Education Integration + Project-Driven" model for cultivating digital performing arts talent comprises four core elements. The digital environment provides students with a technological foundation and data support, expanding their learning space. Application scenarios cultivate students' creativity and practical skills through real-world project cases. Industry-education integration combines school teaching with industry practices, enabling students to master cutting-edge technologies. Project-driven learning runs throughout the entire cultivation process, promoting the integration of theory and practice.

Compared to traditional industry-education integration models, this new approach places greater emphasis on developing comprehensive abilities, including creativity, practical skills, and teamwork. It has a stronger practical orientation, enhancing students' problem-solving abilities through application scenarios and project-driven learning. The new model maintains closer ties with the industry, allowing students to stay abreast of industry trends and technological applications. Furthermore, this model demonstrates greater sustainability, accumulating experience and feedback through a closed-loop cycle, providing impetus for innovation, and enabling students to continuously adapt to industry changes and maintain competitiveness.

3. Methodology

In the digital performing arts visual effects design course, two key implementation aspects for constructing an immersive digital environment are scene construction and content development, as well as practical project and task design.

Scene construction involves creating various virtual scenes, encompassing elements such as backgrounds, characters, and objects to align with course learning objectives. Content development includes producing and adding visual effects, sound effects, and interactive elements. Visual effects should meet industry standards while being innovative, sound effects can enhance realism and immersion, and interactive elements can increase student engagement.

Practical project and task design is crucial for students to improve their skills. Project tasks should be relevant to real-world work, with an appropriate level of complexity and challenge, covering different areas such as special effects production, scene construction, and animation design. Task design should be graded and progressive, moving from simple to complex, gradually guiding students to master basic skills and workflows. Additionally, task design needs to consider students' interests and professional orientations to ensure comprehensive development.

Through careful design and implementation of these two aspects, students can be provided with a rich and vivid learning experience, effectively promoting their comprehensive development of skills and abilities.

Based on the application scenario, the integrated project-based teaching model combines practical applications in the digital performing arts with industry resources, cultivating students' innovation and practical abilities through project-based learning methods. This model focuses on projects, simulating real scenarios and tasks to achieve educational goals that integrate industry and academia, theory and practice.

In the teaching process, project objectives and requirements are first clearly defined, with corresponding tasks and activities designed. For example, in LED screen visual effects design courses, students need to master relevant technologies and complete actual projects. Schools collaborate with enterprises to conduct teaching activities, providing resources and guidance. Teachers act as mentors guiding project implementation, while students actively participate and solve real-world problems.

Actual project cases are integrated into the curriculum through performance projects such as the Shanghai Science and Technology Festival and master plays.

Students take on specific roles within project teams, with practical outcomes linked to market feedback. Four to six practical training projects with assessment standards are developed, teaching teams are formed, and quality monitoring is implemented.

Projects collaborate with upstream and downstream enterprises to develop scenario-based teaching projects covering various performance types. Students participate in the complete design process, enhancing their ability to solve complex problems. Enterprises are deeply involved in teaching, realizing "embedded" industry-education integration. Through multi-party cooperation, a comprehensive industry-education integrated curriculum ecosystem network is constructed, achieving deep-level extension.

Breaking traditional teaching boundaries, we will construct a modular teaching system based on digital performance application scenarios and workflows. This modular curriculum system shown in Figure 2 will cultivate professional abilities, emphasizing actual work processes to ensure students' comprehensive design capabilities. The courses will cover application scenarios such as LED screen visual effects, irregular projection, holographic projection, real-time green screen keying, laser video, and AIGC visual effects, restoring the complete workflow including creative conception, content production, and system debugging.

Each application scenario will feature multiple work projects, allowing students to master knowledge and hone skills through project completion. Projects will involve relevant professional knowledge points, with students applying this knowledge to achieve objectives in practice. Through development in four dimensions, we will achieve systematic decomposition and integration of professional knowledge and skills.

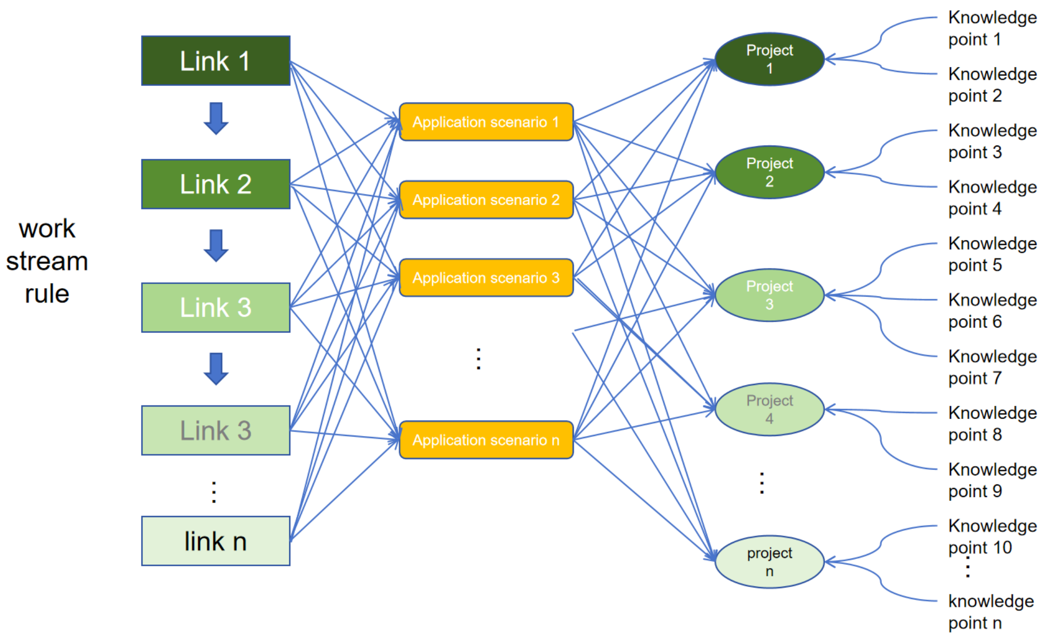

Figure 2. Application scenario-based curriculum system.

Students can play different roles, learning and completing tasks in virtual scenarios, exposing them to the complete industry ecosystem. This system enhances learning autonomy and effectiveness, improves professional awareness, and increases employment competitiveness. By constructing a contextualized teaching system based on digital performing arts design application scenarios, we ensure course content closely aligns with real work environments, improving students' professional qualities.

Project-based learning is a teaching method that closely integrates theory and practice, aiming to improve students' practical skills and professional qualities. This article summarizes three project-based teaching design processes based on application scenarios, suitable for different teaching environments and objectives.

The first design is suitable for laboratory environments. The teaching process begins with presenting operational problems from actual projects, guiding students to find answers through small-scale experimental demonstrations, revealing relevant principles. Subsequently, virtual rehearsals are conducted in simulated environments, ultimately completing the project in real applications. This method helps students gradually understand theoretical knowledge and apply it to practice.

The second design is based on students' multiple role transitions. First, students conduct field observations of work scenarios, such as theaters, to understand project cases. Then, students simulate work content as interns, mastering relevant skills. Next, students transform into creators, applying learned skills to complete project cases. Finally, through social service output, students give back to society with their acquired knowledge. This method helps students comprehensively understand project processes and cultivate various abilities.

The third design focuses on project requirement points. By breaking down project requirements into specific tasks, targeted skill teaching is conducted. This method ensures students master every key skill required for the project, improving teaching efficiency and relevance.

These three design methods each have their characteristics. Teachers can choose the appropriate method based on specific situations to achieve the best teaching results.

The core competency assessment elements in the digital performing arts visual effects design course include creativity generation, problem-solving, teamwork, and continuous learning ability. Students need to demonstrate the ability to propose unique ideas that combine digital technology and artistic creativity; analyze problems and propose effective solutions; possess good teamwork spirit; and adapt to changes in new knowledge and technology. These elements are important criteria for measuring students' comprehensive abilities and should be emphasized in course design and teaching.

The theoretical foundations for determining these assessment elements include educational psychology, cognitive psychology, and educational assessment theory (Acadasia, 2020). Educational psychology provides a framework for comprehensive capability assessment, cognitive psychology supports the evaluation of creativity and problem-solving abilities, and educational assessment theory focuses on effective assessment methods. In the field of digital performing arts, using diverse assessment methods combined with practical projects can provide a comprehensive understanding of students' core competency levels.

The Likert scale method is a commonly used quantitative survey and assessment tool, with important applications in evaluating academic core competencies. This method is based on measurement theory, psychometrics, and educational assessment theory, using declarative statements to measure respondents' attitudes or opinions.

When applying the Likert scale to assess academic core competencies, it is necessary to clarify assessment objectives, translate core competencies into clear and objective statements, and design them into a multi-level scale format. The scale needs to be validated and revised to ensure accuracy, effectiveness, and reliability.

In practical application, students are assessed using the scale, and the collected data is statistically analyzed to calculate average scores, standard deviations, and other indicators to understand respondents' performance levels in various core competencies. Results should also be interpreted and compared.

The advantages of the Likert scale method include objectivity, standardization, and ease of data analysis. When applying it, attention should be paid to ensuring the validity and reliability of the scale, avoiding ambiguity in statements, and considering respondents' backgrounds to improve the accuracy of assessment results.

4. Results

In this study, we used a questionnaire containing 22 items, with a total of 1200 participants divided into control and experimental groups. We calculated the Cronbach's α coefficient to assess the reliability of the questionnaire. The results showed a Cronbach's α coefficient of 0.967 in **Table 1**, indicating high reliability. This means that there is high internal consistency among the questionnaire items, and participants' responses are reliable. Therefore, we can confidently use this questionnaire to collect data and analyze and interpret the results.

The questionnaire covers four aspects: creativity generation, problem-solving, teamwork, and continuous learning, which were found to be attributed to a common factor through factor analysis, indicating intrinsic correlation.

Items across all aspects demonstrated high consistency and strong correlation with the factor. Item 6 in creativity generation, item 9 in problem-solving, item 13 in teamwork, and item 18 in continuous learning had the highest factor loadings, best representing their respective abilities.

The questionnaire design is of high quality, with all four aspects effectively reflecting individual capabilities. The KMO value of 0.958 in **Table 2** indicates excellent suitability for factor analysis, and Bartlett's test of sphericity results also support the validity of the questionnaire design. Overall, the questionnaire demonstrates high validity and can accurately reflect individual capabilities in these four areas.

Table 1. Assessment reliability matrix.

Cronbach Confidence Analysis			
Name	Correction Total Correlation (CIT)	Item Deleted α Coefficient	Cronbach α Coefficient
1. Can you independently propose novel ideas or ideas?	0.764	0.965	0.967
2. Can different solutions be proposed when solving problems?	0.722	0.965	
3. Does it show the unique aesthetics and creativity in the creation?	0.748	0.965	
4. I am good at seeing things from multiple angles.	0.735	0.965	
5. I am good at connecting all kinds of ideas together.	0.709	0.965	
6. I dare to put up with new and unique ideas.	0.766	0.965	
1. Can we quickly locate problems and propose solutions when facing practical problems?	0.752	0.965	
2. Can expertise make the most of problem solving?	0.689	0.966	
3. Can different solutions be used flexibly?	0.735	0.965	
1. Do you actively participate in collaborative activities in teamwork?	0.736	0.965	
2. Are you able to communicate effectively, listen to others, and respond?	0.781	0.965	
3. Can you balance your personal goals with your team goals?	0.698	0.965	
4. I take the initiative to communicate my ideas and opinions with others.	0.787	0.965	
5. I am willing to play various roles in the team.	0.723	0.965	
6. I listen to others to expand my thinking.	0.727	0.965	
4. Continuous learning ability	0.700	0.966	
2. Can we learn independently learn and apply new technologies to solve practical problems?	0.714	0.965	
3. Can we proactively try to use new technologies in innovative projects?	0.760	0.965	
4. I take the initiative to learn all kinds of new knowledge to expand my thinking.	0.738	0.965	
5. I am good at summing up my experience and constantly improving myself.	0.766	0.965	
6. And I can actively analyze the failure and keep moving on.	0.766	0.965	
What is your ability in creative generation, problem solving, teamwork and continuous learning?	0.792	0.965	

Normalized Cronbach's α coefficient: 0.967.

Table 2. Assessment validity matrix.

Validity analysis results		
Name	Factor load factor	Common degree (common factor variance)
	factor 1	
1. Can you independently propose novel ideas or ideas?	0.789	0.622
2. Can different solutions be proposed when solving problems?	0.749	0.561
3. Does it show the unique aesthetics and creativity in the creation?	0.775	0.600
4. I am good at seeing things from multiple angles.	0.762	0.580
5. I am good at connecting all kinds of ideas together.	0.736	0.542
6. I dare to put up with new and unique ideas.	0.791	0.625
1. Can we quickly locate problems and propose solutions when facing practical problems?	0.778	0.605
2. Can expertise make the most of problem solving?	0.718	0.515
3. Can different solutions be used flexibly?	0.762	0.580
1. Do you actively participate in collaborative activities in teamwork?	0.763	0.582
2. Are you able to communicate effectively, listen to others, and respond?	0.803	0.645
3. Can you balance your personal goals with your team goals?	0.725	0.525
4. I take the initiative to communicate my ideas and opinions with others.	0.811	0.658
5. I am willing to play various roles in the team.	0.750	0.562
6. I listen to others to expand my thinking.	0.754	0.568
4. Continuous learning ability	0.728	0.531
2. Can we learn independently learn and apply new technologies to solve practical problems?	0.743	0.551
3. Can we proactively try to use new technologies in innovative projects?	0.785	0.616
4. I take the initiative to learn all kinds of new knowledge to expand my thinking.	0.764	0.583
5. I am good at summing up my experience and constantly improving myself.	0.790	0.624
6. And I can actively analyze the failure and keep moving on.	0.791	0.625
What is your ability in creative generation, problem solving, teamwork and continuous learning?	0.816	0.667
Characteristic root value (before rotation)	12.969	-
% variance interpretation rate (before rotation)	58.948%	-
% cumulative variance interpretation (before rotation)	58.948%	-
Characteristic root value (after rotation)	12.969	-

Continued

% variance interpretation rate (after rotation)	58.948%	-
% cumulative variance interpretation rate (after rotation)	58.948%	-
KMO price	0.950	-
Bart spherical value	1624.174	-
df	231	-
p price	0.000	-

An evaluation compared the core competency levels of two groups of students: a control group using traditional industry-education integration teaching, and an experimental group using a new "digital environment + application scenario + industry-education integration + project-driven" model. The results showed that the experimental group scored significantly higher in four dimensions: creative generation ability (4.23 points), problem-solving ability (4.17 points), teamwork ability (4.21 points), and continuous learning ability (4.32 points), compared to the control group (2.2, 2.2, 2.19, and 2.31 points respectively), with an overall improvement of over 82% as shown in Figure 3. This indicates that the new training model has clear advantages in enhancing students' core competencies, better stimulating creativity, strengthening problem-solving and teamwork abilities, and promoting continuous learning. The research results provide effective methods and strategies for cultivating digital performance talents and offer important reference value for educational and teaching reforms.

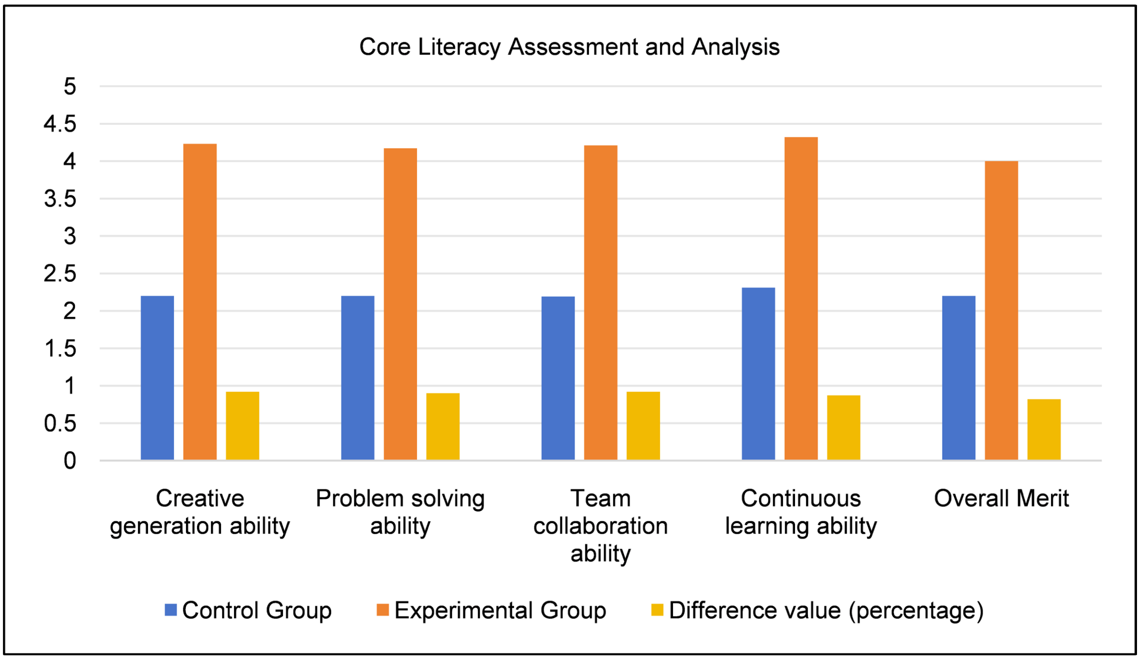

Figure 3. Core literacy assessment and analysis.

5. Conclusion

This study is based on a closed-loop sustainable vocational competency model for digital performance talents, encompassing four levels: creative content, technological innovation, interdisciplinary integration, and practical application. Through a training model of "digital environment + application scenarios + industry-education integration + project-driven approach", students enhanced their core competencies in creative generation, problem-solving, teamwork, and continuous learning through practical experience. The exploration of Project-Based Learning (PBL) in industry-education integrated project-based teaching practices has provided an effective pathway for cultivating digital performance talents with multi-dimensional competencies. The research results indicate that this new training model is better adapted to the evolving needs of the digital performance industry.

However, some limitations and areas for improvement are worth noting. Self-reported surveys may introduce biases, and diversifying data collection methods can strengthen the research findings. The proposed model may require certain infrastructure and industry collaboration that not all institutions can easily obtain, so the feasibility of implementation needs further discussion. While the research cited multiple theoretical frameworks, deeper theoretical analysis and clearer connections between theory and practical application would be beneficial. Further elucidating the psychological mechanisms underlying the observed competency enhancements would also strengthen the theoretical contributions.

In the future, this model can be further optimized and promoted to facilitate industry development.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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